WORLD HEALTH ORGANIZATION
GLOBAL PROGRAMME TO ELIMINATE
MALARIA AND NEGLECTED
TROPICAL DISEASES

INTEGRATING THE ASSESSMENT OF ONCHOCERCIASIS INTO A LYMPHATIC FILARIASIS TRANSMISSION ASSESSMENT SURVEY

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iTAS

A MANUAL FOR NATIONAL ELIMINATION PROGRAMMES

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Integrating the assessment of onchocerciasis into a lymphatic filariasis transmission assessment survey: a manual for national elimination programmes

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Preface

Countries have made significant progress in implementing mass drug administration (MDA) with ivermectin for treatment of onchocerciasis. During the onchocerciasis control era, MDA was conducted only in meso- and hyper-endemic areas. As the global target shifted from control to elimination of transmission, ivermectin is now required in all areas where levels of anti-*Onchocerca volvulus*-specific antibodies are above the target threshold. Identification and treatment of hypo-endemic areas are needed to achieve elimination targets.

As of 2024, it is estimated that 40 million people live in areas where onchocerciasis and lymphatic filariasis (LF) are co-endemic. It is likely that the use of a two-medicine regimen of ivermectin and albendazole MDA for LF programmes has resulted in hypo-endemic areas for onchocerciasis receiving ivermectin treatment. As LF programmes approach the threshold for MDA cessation, it must be assessed whether stopping MDA with ivermectin and albendazole for LF may lead to a resurgence of onchocerciasis transmission.

The integrated transmission assessment survey (iTAS), a modification of the transmission assessment survey for LF, offers an opportunity to co-evaluate transmission levels of both diseases in areas receiving MDA for LF and onchocerciasis. It provides a standardized platform for the joint assessment of LF and onchocerciasis to effectively coordinate treatment cessation decisions in known or suspected co-endemic areas and thereby maximize resources. The iTAS can be used to map onchocerciasis transmission in areas of unknown or hypo-endemicity, or to assess the status of transmission in onchocerciasis meso- and hyper-endemic areas after several rounds of MDA.

The iTAS was developed by the World Health Organization with guidance from technical experts, informed by research and the implementation experiences of country programmes. This manual is designed to help programme staff, implementing organizations and partners in elimination efforts conduct iTAS, use modified sampling strategies and make decisions related to discontinuing MDA based on data collected through the iTAS.

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Abbreviations

APOC	African Programme for Onchocerciasis Control
CFA	circulating filarial antigen
CI	confidence interval
DBS	dried blood spot or sample
ELISA	enzyme-linked immunosorbent assay
EA	census enumeration area
EMS	epidemiological monitoring survey
EU	evaluation unit
ESPEN	Expanded Special Project for Elimination of Neglected Tropical Diseases
FTS	filariasis test strip
GIS	geographical information system
GPELF	Global Programme to Eliminate Lymphatic Filariasis
IU	implementation unit
iTAS	integrated transmission assessment survey
L3	third-stage *Onchocerca volvulus* (infective) larva
LF	lymphatic filariasis
MDA	mass drug administration
Mf	microfilaria/e
NOEC	National Onchocerciasis Elimination Committee
NTD	neglected tropical disease
OEM	onchocerciasis elimination mapping
OEPA	Onchocerciasis Elimination Program for the Americas
OV	*Onchocerca volvulus*
PCR	polymerase chain reaction
RDT	rapid diagnostic test
REMO	rapid epidemiological mapping of onchocerciasis
SSB	survey sample builder
TAS	transmission assessment survey
WHO	World Health Organization

Glossary

The definitions given below apply to the terms as used in this manual. They may have different meanings in other contexts. The definitions were adapted from WHO (2016), WHO (2023), WHO (2024a), WHO (2024b) and WHO (2025a).

active transmission

Transmission of infection characterized by new incident cases that occur locally, requiring presence of both vector and infected individuals.

annual transmission potential

A value calculated as the product of the annual biting rate, the proportion of black flies with infective-stage *Onchocerca volvulus* larvae and the mean number of infective larvae per infective fly. The value refers to the approximate number of infective larvae any one individual may be exposed to in a year.

cluster sampling

A sampling method where a geographically defined collection of households is used to construct a sampling frame, typically corresponding to a village or census enumeration area, and a random sample of clusters is selected. Within each selected cluster, either all units or a random subset of units are surveyed.

control

Reduction of the incidence, prevalence, intensity, morbidity and/or mortality of disease as a result of deliberate efforts. Continued interventions may be required to maintain this reduction.

critical cut-off value

A designated value used in a standardized survey to measure the threshold of infection prevalence and trigger a programmatic decision.

elimination as a public health problem

Achievement of measurable global targets for both infection and disease. When reached, continued actions are required to maintain the targets and/or to advance to interruption of transmission.

elimination of transmission

Reduction to zero of the incidence of infection in defined areas, with minimal risk of reintroduction, as a result of deliberate work. Continued actions to prevent re-establishment of transmission may be required.

endemic area for lymphatic filariasis

An implementation unit (IU) or any subunit in which the average antigenaemia or microfilaraemia positivity rate is ≥ 1% in the resident population.

endemic onchocerciasis focus

An area within a country where a local cycle of *Onchocerca volvulus* transmission is maintained and gives rise to local infections; that is, where the basic reproduction ratio exceeds 1 (apart from

temporal fluctuations). Operationally defined as places where the prevalence of onchocerciasis exceeds the threshold established by WHO. Endemicity is stable where the incidence and prevalence of the infection shows little or no increasing or decreasing trend over time.

Endemic foci (and transmission zones) can be classified as having (i) active transmission, (ii) suppressed transmission; and (iii) interrupted transmission.

Countries are classified as endemic when *Onchocerca volvulus* transmission and infection are present; or as post-endemic when a country with a previous history of endemic onchocerciasis is officially confirmed as having successfully completed a post-treatment surveillance period of at least 3–5 years of interrupted transmission in all its previously endemic onchocerciasis foci.

(See **hyper-endemic area, hypo-endemic area and meso-endemic area for onchocerciasis**.)

entomological evaluation

Collection and tracking of data on black fly vectors in time and space to assess progress in onchocerciasis control or elimination.

epidemiological assessment

Assessment of the patterns and determinants of infection and/or disease occurrence in a population.

epidemiological monitoring survey (EMS)

A survey designed to measure whether the prevalence of lymphatic filariasis at sentinel and spot-check sites has been lowered below threshold levels. EMS is used as the first part of a two-tier strategy for deciding to stop MDA for LF. Once epidemiological criteria are met in sentinel and spot-check sites, the EU can conduct an IIS or a TAS.

evaluation unit (EU)

An area selected for an epidemiological survey (EMS, TAS or IIS); it may comprise several implementation units (IUs) or part of an IU.

cluster

A group of localities of the same size linked together and forming the evaluation unit.

first-line village

The closest community to an active or suspected black fly breeding site or a river that can support breeding of the vector that transmits onchocerciasis. Most commonly, a first-line village is defined as a community located within 10 km of an active breeding site or a river thought to be suitable for black fly vector breeding.

hyper-endemic area for onchocerciasis

An area where nodule prevalence was 40% or more among those individuals examined. These areas were targeted for treatment with ivermectin following APOC REMO activities.

hypo-endemic area for onchocerciasis

An area where nodule prevalence was less than 20% during REMO surveys, and not treated with Mectizan through community-directed treatment with ivermectin. OEM focuses on these areas.

implementation unit (IU)

The administrative unit in a country that is used for mass drug administration.

interruption of transmission of *Onchocerca volvulus*

Permanent reduction of onchocercal transmission in a defined geographical area after all adult worms (and microfilariae) in the human population in that area have died, been exterminated by some other intervention, or become sterile and infertile.

integrated transmission assessment survey (iTAS)

A modification of the transmission assessment survey (TAS) for lymphatic filariasis to include assessment of onchocerciasis transmission. The type of modification will depend on whether the needs of the onchocerciasis elimination programme are to conduct mapping (e.g. in hypo- or unknown endemicity areas) or a Stop MDA survey (in meso- or hyper-endemic areas). The purpose of iTAS is to provide a standardized platform for the joint assessment of LF and onchocerciasis that meets the epidemiological needs of both diseases.

lymphatic filariasis (LF)

A vector-borne disease in humans caused by infection with the filarial parasites *Wuchereria bancrofti*, *Brugia malayi* and *B. timori*. Infections damage the lymphatic vessels and impair vessel function, leading to clinical manifestations such as lymphoedema and hydrocele.

mass drug administration (MDA)

Distribution of medicines to the entire population of a given administrative setting (for instance, state, region, province, district, subdistrict or village), irrespective of the presence of symptoms or infection in individuals. Symptoms of infection in the community require MDA.

meso-endemic area for onchocerciasis

An area where nodule prevalence was 20% or more but less than 40% during REMO surveys. These areas were targeted for treatment with ivermectin (Mectizan) following APOC REMO activities.

microfilaraemia

Presence of microfilariae in the blood.

microfilariae (Mf)

Microscopic larval stage of LF parasites that circulates in the blood and is transmitted by mosquitoes.

onchocerciasis

A neglected tropical disease, also known as river blindness, caused by infection with the nematode *Onchocerca volvulus*, spread by the black fly vector (genus *Simulium*). Onchocerciasis is the second leading infectious cause of blindness worldwide after trachoma.

onchocerciasis elimination mapping (OEM)

The process of identifying all those areas previously excluded from onchocerciasis control programmes because they had been defined as hypo-endemic or assumed to be non-endemic and must now be reassessed to determine whether or not onchocerciasis is endemic at a level above the threshold at which ongoing transmission is possible.

Ov16

A recombinant *Onchocerca volvulus* antigen to which IgG4 antibodies are produced and are detectable using immunological methodologies.

polymerase chain reaction

A biochemical method in molecular biology to amplify a single or a few copies of a piece of DNA across several orders of magnitude, generating millions to billions of copies of a particular DNA

sequence. PCR is used in onchocerciasis and LF to detect the presence of parasite (e.g. *O. volvulus* or *W. bancrofti*) DNA in human or vector specimens.

Poolscreen

A software program that employs a statistical model to calculate the probability of infection of an individual black fly with *O. volvulus* from the number of positive pools and the size of the pools using the results of polymerase chain reaction. The model takes into account the biting rate, the fly density and the prevalence of infection rate in the black fly sample to calculate estimates of annual transmission potential or seasonal transmission potential and associated 95% confidence intervals.

post-elimination surveillance (PES)

Following WHO verification of onchocerciasis elimination in a country, PES activities take place to detect possible recrudescence or reintroduction of *O. volvulus*. PES is conducted at the national level in previously endemic areas and in areas where imported cases might be expected to occur (i.e. due to cross-border migration). PES should be conducted at regular intervals until elimination is verified in all countries in the relevant WHO region, or until any risk of recrudescence or reintroduction can be excluded.

post-treatment surveillance (PTS)

Activities conducted after cessation of treatment for onchocerciasis to document that interruption of transmission has occurred and to detect possible resurgence of *O. volvulus*. PTS is conducted for a period of at least 3–5 years at the subnational (implementation unit) level in endemic areas after the end of the treatment phase. During the PTS period, countries prepare a dossier that is submitted to WHO to initiate the process of verification of elimination.

pre-Stop MDA survey

A survey conducted in first-line villages in areas that have been receiving MDA for onchocerciasis and are believed to be eligible for a Stop MDA survey. The purpose of the pre-Stop MDA survey is to assess quickly and at low cost whether transmission of onchocerciasis appears to have been interrupted. If the pre-Stop MDA survey detects little or no Ov16 in the population, then the evaluation unit may proceed to a full Stop MDA survey; if a significant Ov16 signal is detected during the pre-Stop MDA survey, the area should continue MDA.

prevalence

The proportion of the host population infected at a particular point in time.

resurgence

A resumption of transmission after a period when it was believed to have been interrupted. Resumption may occur because of premature cessation of MDA (Stop MDA surveys have been conducted with results indicating that treatment can be stopped, but transmission has not been truly interrupted), or because infection has been reintroduced from less well controlled areas by human and/or vector movement.

sentinel site for lymphatic filariasis

A community or similar geographical area selected for periodic collection of parasitological data to monitor the success of an LF elimination programme. The same site should be maintained throughout a programme, until the level of infection is below target thresholds.

spot-check site for lymphatic filariasis

A community or similar geographical area selected for collecting parasitological data to complement data collected at sentinel sites. Spot-check sites that are considered to be at greatest

risk for LF infection should be selected for each assessment. These could change during the programme.

stop MDA surveys

A survey to assess whether transmission of onchocerciasis is deemed to have been interrupted in an area that has been receiving mass drug administration for a prolonged period with high coverage. If the prevalence of Ov16 IgG4 antibodies is found to be below the target threshold of < 0.1% in the sentinel population of children aged < 10 years, and the entomological assessment using O-150 PCR indicates fly infectivity rates below the target threshold (i.e. the upper bound of the 95% confidence interval is < 0.1% (< 1/1000) in parous flies or < 0.05% (< 1/2000) in all flies), then the evaluation unit may stop MDA for onchocerciasis and enter the post-treatment surveillance phase.

suppression of transmission of onchocerciasis

The absence of infective (L3) larvae in the *Simulium* vector population as determined in vector population samples (see **Poolscreen**). Infectivity can be suppressed through drug (ivermectin) pressure, despite the potential for reinitiation of transmission through the presence of a population of adult worms capable of producing microfilariae if the drug pressure is removed.

target population

The eligible population in an implementation unit that is targeted for treatment, according to criteria for drug safety.

target threshold

The prevalence below which disease transmission becomes unsustainable.

transmission assessment survey for lymphatic filariasis (TAS)

A survey to measure whether EUs have reduced the prevalence of LF infection to a level at which recrudescence is unlikely to occur, even in the absence of MDA.

transmission zone (equivalent to a transmission focus)

A geographical area where transmission of *O. volvulus* occurs by locally breeding vectors and which can be regarded as a natural ecological and epidemiological unit for interventions.

validation

The process whereby WHO recognizes that a country has achieved elimination of a disease as a public health problem and grants official recognition of the achievement.

verification

The process whereby WHO recognizes a country's claim to have achieved elimination of transmission of a disease and grants official recognition of the achievement.

1. Introduction

Since the introduction of ivermectin for treatment of onchocerciasis in the late 1980s, countries and regional programmes have achieved great success in scaling up mass drug administration (MDA). This led to a shift from the target of morbidity control to elimination of transmission in the first World Health Organization (WHO) road map for neglected tropical diseases (WHO, 2012). The WHO 2021–2030 road map targets the elimination of onchocerciasis from 12 countries (WHO, 2020). As of 2024, four countries have been verified for having achieved elimination of transmission, and several more achieved elimination of transmission in one or more foci (WHO, 2024a). In 2025, Niger became the first African country to be verified by WHO as having eliminated onchocerciasis. Similarly, tremendous progress has been made towards the elimination of lymphatic filariasis (LF) across 72 endemic countries. As of 2023, WHO had validated 19 countries for having eliminated LF as a public health problem, while MDA remains a requirement in 39 countries (WHO, 2024b).

It is estimated that 96 million people live in areas where onchocerciasis and LF are co-endemic (Cano, 2018). The strategies to eliminate these two diseases are closely linked; ivermectin is used in MDA for both onchocerciasis and LF in co-endemic countries.

During the onchocerciasis control era, only meso- and hyper-endemic communities were prioritized for ivermectin treatment. With the shift from control to elimination of transmission, ivermectin is now required in all areas where levels of anti-*Onchocerca volvulus*-specific antibodies are above the target threshold (WHO, 2023). This has led to a dramatic expansion in the need for onchocerciasis elimination mapping (OEM) to identify all hypo-endemic areas for initiation of ivermectin treatment.

Since 1997, the WHO LF programme has scaled up MDA activities with the two-medicine regimen of albendazole and ivermectin. As a result, there are likely many hypo-endemic areas for onchocerciasis that have been receiving ivermectin treatment through the LF programme. While some of these areas are known due to historical mapping efforts, onchocerciasis endemicity may not be known in other areas that receive MDA for LF.

Stopping MDA for LF without considering whether ivermectin MDA for onchocerciasis should be continued could provoke a resurgence of onchocerciasis transmission and threaten progress towards its elimination. Therefore, there is a need to assess the status of onchocerciasis endemicity in these low-endemicity and unknown areas once the LF programme is ready to stop treatment with ivermectin and albendazole to determine whether treatment with ivermectin alone should be continued for onchocerciasis. Furthermore, in co-endemic areas where onchocerciasis was initially meso- and hyper-endemic, the assessment of LF transmission presents an opportunity to assess the transmission status of onchocerciasis.

The integrated transmission assessment survey (iTAS) is a modification of the transmission assessment survey (TAS) for LF to include assessment of onchocerciasis transmission. Its purpose is to provide a standardized platform for the joint assessment of LF and onchocerciasis that meets the epidemiological needs of both diseases. Integration through the iTAS platform can help to maximize resources and coordinate decisions on stopping treatment in known or suspected co-endemic areas. Furthermore, iTAS can serve as a mid-term monitoring tool for onchocerciasis

programmes to assess current status of transmission, even if the evaluation unit (EU) is not ready to stop MDA for onchocerciasis.

1.1 Why conduct iTAS?

There are several reasons why iTAS could be conducted. These include:

- the substantial geographical overlap of onchocerciasis and LF in Africa;
- the fact that MDA for both diseases uses ivermectin in co-endemic countries; and
- that strategies to eliminate onchocerciasis can be developed in areas ready to stop treatment for LF.

1.2 Manual aims

The aims of this manual are:

- to present a standardized approach to conducting iTAS for onchocerciasis and LF;
- to instruct endemic country programmes on how to conduct iTAS for onchocerciasis and LF, including the use of modified sampling strategies required to conduct integrated assessments; and
- to provide guidance on the use of iTAS data to guide decisions on continuing regular ivermectin MDA for eligible populations in onchocerciasis-endemic areas.

1.3 Intended readership

This manual is intended for national NTD programme staff and implementing partners, policy-makers in endemic countries, and donors and partners involved in elimination efforts for onchocerciasis and/or LF.

1.4 Methods

Details of the methods used to develop this manual can be found in Annexes 1 and 2.

1.5 How to use this manual

This manual provides guidance for neglected tropical disease (NTD) programmes on how to conduct iTAS using step-by-step instructions and decision algorithms. The current best available tools and evidence are presented; future updates may include revised guidance as the field evolves.

This manual is not intended as a complete guide to all procedures involved in surveillance for LF and onchocerciasis. Rather, it should be used concurrently with other LF and onchocerciasis technical guidance materials including:

- *Guidelines for stopping mass drug administration and verifying elimination of human onchocerciasis: criteria and procedures* (WHO, 2016).
- *Entomological manual for onchocerciasis elimination programmes* (WHO, 2023).
- *Onchocerciasis elimination mapping: a handbook for national elimination programmes* (WHO, 2025a).

- *Monitoring and epidemiological assessment of mass drug administration in the global programme to eliminate lymphatic filariasis: a manual for national elimination programmes, second edition* (WHO, 2025b).

1.6 Evidence from countries

Integrated impact assessments for onchocerciasis and LF were implemented in programmatic and operational research settings in multiple countries (Table 1). The benefits reported by national programmes resulting from integration include coordinated decision-making regarding MDA and effective use of budgets and resources. The lessons learnt from these initial country experiences informed the development of the guidance included in this manual.

Table 1. **Country experiences with integrated onchocerciasis and LF impact assessments**

Country (reference)	Study and findings
Burkina Faso (WHO, 2018)	Pre-iTAS and iTAS were conducted in three EUs (two hypo-endemic for onchocerciasis and one meso-endemic for onchocerciasis). MDA for LF was stopped in two districts based on findings; ELISA and entomological evaluation were needed to determine if ivermectin MDA is required for onchocerciasis.
Cameroon (Nana Djeunga et al., 2016)	A total of 31 health districts in nine EUs were surveyed using FTS immunochromatographic test and SD Bioline Oncho/LF IgG4 biplex (Ov16-Wb123), with positives confirmed using microscopy and molecular testing. LF MDA was stopped in nine EUs; onchocerciasis was determined to remain endemic.
Equatorial Guinea (Herrador et al., 2018)	Entomology and serology for Ov16 and Wb123 were conducted on Bioko Island. No evidence of current infection or recent transmission of OV was found; MDA cessation and post-treatment surveillance were recommended.
Ethiopia (Hassen et al., 2023)	OV impact assessment was integrated with LF TAS protocol in three woredas (districts) endemic for onchocerciasis and LF. LF transmission was below the Stop MDA critical threshold, while OV remained above the Stop MDA threshold. The potential for cross-border transmission was identified.
Mali (Dolo et al., 2019)	A cross-sectional survey for onchocerciasis was combined with a TAS in two EUs using the SD Bioline biplex and ICT. Findings indicated that the antigen prevalence of LF infection did not reach the cut-off point of 2%, and that the O. volvulus antibody level was above the elimination threshold of 0.1%.
Nigeria (Anagbogu et al., 2022)	Pre-iTAS and iTAS were conducted in five local government areas. LF transmission was below the Stop MDA critical threshold in all IUs; MDA for onchocerciasis was recommended to continue.
Senegal (Wilson et al., 2016)	The APOC onchocerciasis methodology was used in three districts, which included assessment for LF antigenaemia using immunochromatographic testing combined with skin-snip microscopy. Findings indicated that LF prevalence remained above the stop treatment threshold, as well as recent transmission of OV.

Table 1 *continued*

Country (reference)	Study and findings
Sierra Leone (Kargbo-Labour et al., 2024)	iTAS was conducted in eight health districts; all four EUs qualified for LF Stop MDA and transitioned to post-MDA surveillance. OV transmission was found to be ongoing, and continued MDA with ivermectin was recommended.
United Republic of Tanzania (WHO, 2024c)	Integrated assessments were carried out between 2016 and 2021. In 2021, integrated TAS2, TAS3 and OEM for eight districts (seven EUs) were conducted. There was no indication of resurgence of LF. Two EUs did not pass the OV Stop MDA threshold.
Niger	A blood collection for ELISA Ov16 was conducted in 2023 during the TAS surveys of Gaya and Dioundiou for post-elimination surveillance of onchocerciasis. Community onchocerciasis relays have also been trained for post-elimination surveillance of lymphatic filariasis and onchocerciasis. Schoolteachers teach students about both diseases through integrated school booklets.

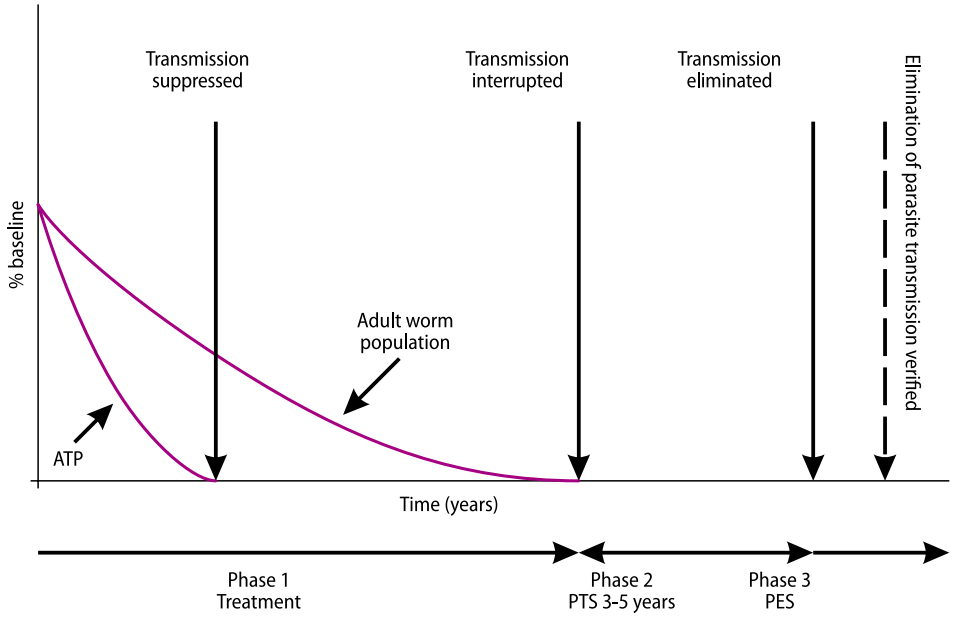
APOC: African Programme for Onchocerciasis Control; EU: evaluation unit; FTS: filariasis test strip; ICT: immunochromatographic card test; iTAS: integrated transmission assessment survey; IU: implementation unit; LF: lymphatic filariasis; MDA: mass drug administration; OEM: onchocerciasis elimination mapping; OV: *Onchocerca volvulus*; TAS: transmission assessment survey; WHO: World Health Organization.

2. Planning for iTAS

2.1 Phases of onchocerciasis elimination

Elimination of human onchocerciasis has three phases: the treatment phase; the post-treatment surveillance phase (PTS) and the post-elimination surveillance (PES) phase (Fig. 1).

Fig. 1. **Phases in the elimination of human onchocerciasis**



ATP, annual transmission potencial; PES, post-elimination surveillance; PTS, post-treatment surveillance

Source: Guidelines for stopping MDA and verifying elimination of human onchocerciasis (WHO, 2016).

Onchocerciasis elimination mapping

Current guidelines recommend onchocerciasis elimination mapping[1] (OEM) to assess if treatment is needed in areas not currently receiving MDA due to prior classification of hypo-endemic or unknown endemicity. In ivermectin-naive settings, OEM determines where interventions are required and provides evidence to support reclassification. OEM involves identifying suitable transmission areas, conducting entomological and epidemiological assessments, and using the data to determine which assessment units require interventions (WHO, 2025a).[2]

[1] Refer to *Onchocerciasis elimination mapping: a handbook for national elimination programmes* (WHO, 2025a) for detailed guidance on conducting OEM.

[2] Step 3A of OEM requires an epidemiological survey of 100 adults aged ≥ 20 years in at least five first-line villages per IU. Step 3A is a component of the integrated epidemiological monitoring survey (see section 2.4) and iTAS (see section 3).

Phase 1: Intervention/treatment

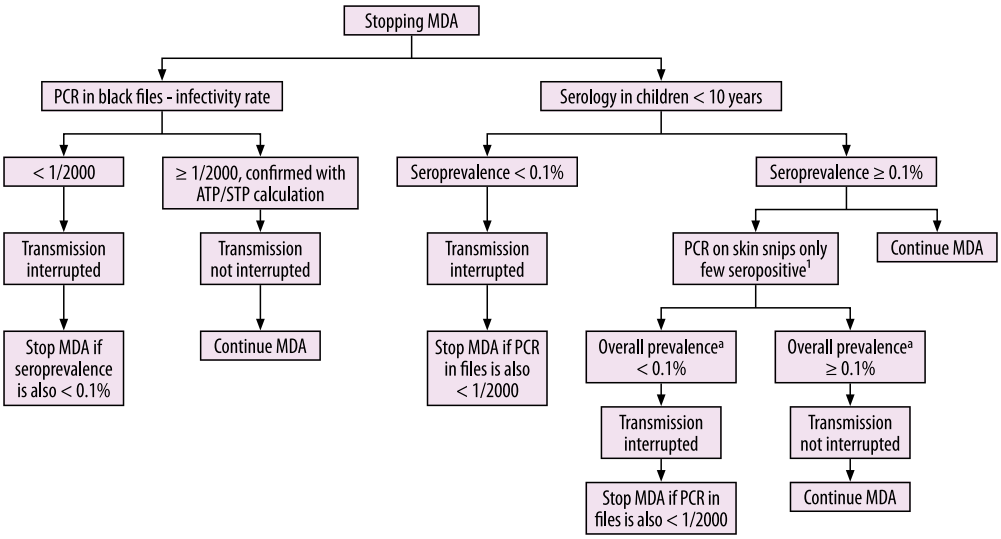
The first phase is characterized by regular ivermectin treatment with a minimum requirement of 80% therapeutic coverage of the eligible population. This phase typically lasts at least 12–15 years, corresponding to the reproductive lifespan of the adult worm when exposed to drug pressure. However, in areas of high baseline (pre-intervention) endemicity, this phase can be longer. The minimum number of years of treatment applies whether the MDA is conducted either annually or biannually, given that the medicines being used are not macrofilaricidal and the limited macrofilaricidal effect is not fully understood to advise otherwise.

Phase 1 includes regular entomological and serological surveys to assess if transmission suppression and interruption have been achieved. A pre-Stop sentinel site survey can be conducted to assess rapidly and at relatively low cost and effort whether an area that has been receiving MDA warrants a full Stop MDA assessment (WHO, 2019). If the pre-Stop MDA sentinel site survey detects little or no Ov16 antibody levels in the population, then the EU may proceed to a full Stop MDA survey. This survey involves:

- determining the seroprevalence of Ov16 IgG4 antibodies in children aged 5–9 years, which indicates recent transmission; and
- measuring the prevalence of infection in black flies using polymerase chain reaction (PCR) and assessment of transmission potential.

Fig. 2 shows the Stop MDA[3] evaluation process undertaken at the end of Phase 1 and before Phase 2.

Fig. 2. **Decision tree for stopping MDA for onchocerciasis**



ATP, annual transmission potencial; MDA, mass drug administration; PCR, polymerase chain reaction; PTS, post-treatment surveillance; STP, seasonal transmission potential

[1] Few is defined here as below 10.

[a] Overall prevalence: the number of seropositive children minus the number of seropositive children who tested negative at PCR on skin snips, divided by the number of children who were tested for serology.

Source: *Guidelines for stopping MDA and verifying elimination of human onchocerciasis: criteria and procedures* (WHO, 2016).

[3] Refer to *Guidelines for stopping mass drug administration and verifying elimination of human onchocerciasis* (WHO, 2016) for more detail about serology in children; and *Entomological manual for onchocerciasis elimination programmes* (WHO, 2023) for detailed guidance on conducting PCR in black flies.

Phase 2: Post-treatment surveillance (PTS)

The PTS phase immediately follows the intervention or treatment phase and typically lasts 3–5 years. Following the demonstration of sustained suppression of transmission through the Stop MDA process, it is concluded that interruption of transmission has been reached in the EU. Countries undertake a process of independent assessment of findings that culminates in the preparation of a country report (dossier) that is submitted to WHO to initiate the process of verification of elimination.

Phase 3: Post-elimination surveillance (PES)

The PES phase follows country verification of elimination of onchocerciasis. During this phase, active and passive surveillance is conducted at the national level to detect possible recrudescence or reintroduction of *O. volvulus*. PES should be conducted at regular intervals until elimination is verified in all countries in the relevant WHO region, or at least until any risk of resurgence or reintroduction can substantially be excluded.

2.2 Framework for LF elimination and TAS

The framework to eliminate LF has five programmatic steps: mapping, MDA, Stop MDA, post-MDA surveillance and post-validation surveillance, as shown in Fig. 3.

Fig. 3. **Programmatic steps in the LF elimination framework**

The Global Programme to Eliminate Lymphatic Filariasis (GPELF) has two main aims: stopping transmission of infection to prevent disease; and alleviating suffering among people already affected by filarial lymphoedema and hydrocoele.

Step 1 is mapping to identify active transmission and identify areas, or IUs, in need of MDA.

Step 2 is MDA to administer single-dose combination therapy of albendazole and ivermectin, albendazole and diethylcarbamazine (DEC)[4] or triple-drug combination treatment of ivermectin, DEC and albendazole (IDA). At least 5–6 years of annual MDA with two-medicine regimens and annual effective coverage (65% of the total population) is required to reduce infection below target thresholds.

Step 3 is to Stop MDA once the coverage target has been achieved in an IU for the recommended number of MDA rounds and the IU becomes eligible for Stop-MDA surveys. The LF Stop-MDA strategy involves an epidemiological monitoring survey or EMS (formerly known as pre-TAS) to determine if the prevalence of LF in sentinel and spot-check sites is below the target threshold (i.e. < 2% antigenaemia or < 1% microfilaraemia among adults). Areas that pass the EMS (i.e. the

[4] *Note*: DEC and IDA are administered only in countries where onchocerciasis is not endemic given their potential to cause severe reactions to released filarial antigens that can damage the eyes, the skin and the cardiovascular system (WHO 2017a).

observed prevalence is below the target threshold) must then implement TAS to determine if the prevalence of LF among children aged 6–7 years in the EU has been reduced below target thresholds (i.e. < 1% antigenaemia). TAS[5] are designed to help programme managers determine whether the prevalence of LF has been lowered to a level where resurgence is unlikely to occur (Chu et al., 2013). Table 2 summarizes the characteristics of a TAS.

Step 4 is done once the EU passes EMS and TAS and MDA can stop. During this post-treatment or post-MDA surveillance phase, the TAS is repeated twice over 2-year intervals to determine if infection levels have increased above the thresholds. Passing a TAS in all EUs no sooner than 4 years after MDA has stopped meets the GPELF criteria for elimination as a public health problem. Countries must also document two criteria for the provision, readiness and quality of care for persons affected by lymphoedema and hydrocoele. National programmes must document both criteria in a dossier to be acknowledged for achieving elimination of LF as a public health problem, evaluated by WHO in a process called validation (WHO, 2017b).

Step 5 is the post-validation surveillance phase, which is done once countries have been validated. During this final phase, continued surveillance to monitor and respond to any increase in infection levels takes place.

Table 2. **Characteristics of a TAS for LF**

Characteristic	Description
Aim	To determine if LF incident infection (i.e. infection in children) is below target thresholds at which transmission is unsustainable and MDA is no longer required (Step 2 of the stop MDA strategy).
Geographical area	EU; this may be the same as or composed of partial or multiple IUs.
Timeframe	TAS should be conducted once all IUs in the EU have completed at least five effective years of annual MDA with an epidemiological coverage rate of ≥ 65%, and IUs have passed EMS.
Target population	Children aged 6–7 years in community-based surveys; age may be approximated by grade in school-based surveys (typically grades 1–2).
Diagnostic tools	CFA RDT, as recommended by WHO.
Survey designs[a]	Cluster survey (most frequently used), systematic sampling, or census; survey design depends on number of children in target age group in the EU and species of vector.
Target sample size[b]	Cluster: ~ 800–1700 Systematic: ~ 284–895

CFA RDT: circulating filarial antigen rapid diagnostic test; EMS: epidemiological monitoring survey; EU: evaluation unit; IU: implementation unit; LF: lymphatic filariasis; MDA: mass drug administration.

[a] Survey design and sample size should be determined using the most recent WHO guidance on TAS, or by using the Survey Sample Builder tool (COR-NTD, 2021).

[b] See the M&E manual (WHO, 2025b) for a more detailed description of TAS.

[5] Refer to *Monitoring and epidemiological assessment of mass drug administration in the global programme to eliminate lymphatic filariasis: a manual for national elimination programmes, second edition* (WHO 2025b) for a more detailed description of TAS.

2.3 When should iTAS be conducted?

iTAS should be conducted if a TAS for LF is planned in the following areas.

- Areas known to be hyper- or meso-endemic for onchocerciasis. If less than 12 years of MDA with ivermectin have been completed, with at least 65% coverage, the iTAS serves as a monitoring survey to determine if transmission has been suppressed. If more than 12 years of MDA have been completed, iTAS serves as a Stop MDA survey to determine if onchocerciasis transmission has been interrupted, and whether MDA for onchocerciasis needs to continue when the LF programme stops treatment.
- Areas of unknown endemicity for onchocerciasis or in an area previously classified as hypo-endemic where it is potentially suitable for black flies, iTAS is conducted with OEM Step 3A. If results are above the OEM Step 3A critical cut-off, iTAS can be used as an optional monitoring survey. If results are below the OEM Step 3A critical cut-off, iTAS is used to determine if MDA with ivermectin is needed for onchocerciasis.

2.4 Should the LF epidemiological monitoring survey be integrated as well?

Before conducting the first TAS, LF programmes should conduct an epidemiological monitoring survey or EMS, formerly referred to as a "pre-TAS", to determine if the EU is eligible to proceed with a TAS (WHO, 2025b). The EMS provides another potential platform for integrating LF and onchocerciasis assessments. However, EMS integration may not provide the same resource-saving advantages as the iTAS due to differences in how sites are selected and which age group is targeted for LF vs onchocerciasis assessments. Therefore, programmes may determine that integration is more advantageous at training and coordination levels but not within specific sites. Integration of the EMS should be based on programme discretion. The integrated EMS procedure is described in Annex 4.

2.5 How does iTAS differ from TAS?

There are several modifications to the original TAS protocol to accommodate the integration of onchocerciasis, depending on its endemicity in the area being assessed. When conducted in a known onchocerciasis hyper- or meso-endemic area, the iTAS includes either a monitoring or a Stop MDA survey, depending on the number of years that MDA has been conducted. When conducted in a hypo-endemic area or in an area of unknown endemicity, the iTAS includes an OEM survey (see section 2.6 for explanations of age groups, sample size and critical cut-off calculations).

Table 4 details how the TAS is modified to meet the needs of the onchocerciasis survey.

Table 4. **Survey design comparison of TAS and iTAS**

	TAS	iTAS in hyper- or meso-endemic areas (iTAS for Monitoring or for Stop MDA survey)	iTAS in hypo- or unknown endemicity areas (iTAS + OEM Step 3A)
Diseases assessed	LF	LF OV	LF OV
Cluster sampling	SSB[1]-dependent (~ 30 clusters)	SSB-dependent (~30 clusters)	SSB-dependent (~ 30 clusters)
Target sample size and population	SSB-dependent (~ 800–1700 children) Children aged 6–7 years in community, or grades 1–2 in schools	**iTAS for Monitoring survey** (< 12 years of IVM MDA completed): • LF and OV: SSB-dependent; ~ 800–1700 children aged 5–9 years (or attending grades 1–3 or 4 in schools) **iTAS for Stop MDA** (≥ 12 years of IVM MDA completed) • LF and OV: 3000 children aged 5–9 years (or attending grades 1–3 or 4 in schools)	**iTAS for Mapping** • LF and OV: SSB-dependent; ~ 800–1700 children aged 5–9 years (or attending grades 1–3 or 4 in schools)
Diagnostics	CFA RDT	LF: CFA RDT OV: DBS for RDT or ELISA	LF: CFA RDT OV: DBS for RDT or ELISA

Passing criteria	Upper limit of one-sided 95% CI of CFA < 1% (refer to SSB or Annex 3 critical cut-off table)	**iTAS for Monitoring**
		• LF: upper limit of one-sided 95% CI of CFA < 1% (refer to SSB or Annex 3 critical cut-off table)
		• OV: mean prevalence of Ov serology in the target age group is below the critical cut-off, indicating prevalence < 2% (refer to SSB or Annex 3)
		iTAS for Stop MDA
		• LF: below iTAS critical cut-off (< 10 CFA positives)
		• OV: Ov serology prevalence is below Stop MDA threshold (< 0.1%)
			iTAS for Mapping
			• LF: upper limit of one-sided 95% CI of CFA < 1% (refer to SSB or Annex 3 critical cut-off table)
			OV:
			• OEM Step 3A critical cut-off by diagnostic (number of positives per village):
			  · Ov serology with DBS: 4
			  · OEPA ELISA: 1
			  · AP ELISA: 2
			• iTAS: use Annex 3. The survey is designed to measure whether the mean prevalence of Ov serology in the target age group is < 2%.

CFA RDT: circulating filarial antigen rapid diagnostic test; CI: confidence interval; ELISA: enzyme-linked immunosorbent assay: EU: evaluation unit; IU: implementation unit; LF: lymphatic filariasis; MDA: mass drug administration; OEM: onchocerciasis elimination mapping; OEPA: Onchocerciasis Elimination Program for the Americas; SSB: survey sample builder; OV: *Onchocerca volvulus*.

[1] SSB: Survey Sample Builder.

2.6 Age groups, sample size and critical cut-off values

Selecting age groups

Children aged 6–7 years are sampled during an LF TAS (WHO, 2025b). The WHO guidelines for stopping MDA and verifying elimination of onchocerciasis recommend sampling children aged under 10 years (WHO, 2016) for the Stop MDA survey. In order to integrate onchocerciasis with EMS and/or TAS, WHO recommends sampling children in the lowest primary school grades, which most likely includes children aged 5–9 years. This age group is more likely to be positive than children aged under 5 years and therefore represents a more conservative sample.

Calculating sample size

The survey design and sample size for iTAS can be calculated with the Survey Sample Builder tool (COR-NTD, 2024). The sample size can also be determined using the tables in *Monitoring and epidemiological assessment of mass drug administration in the global programme to eliminate lymphatic filariasis: a manual for national elimination programmes, second edition* (WHO, 2025b).

Defining sample size and critical cut-offs

- **OEM Step 3A critical cut-off by diagnostic**
  Number of test results in a single village: Ov serology with DBS: 4. OEPA ELISA: 1. AP ELISA: 2. Refer to the OEM manual (WHO, 2025a) for rationale of how critical cut-offs for various diagnostic tools are determined for OEM Step 3A.
- **Onchocerciasis critical cut-off for iTAS**
  Appropriate critical cut-off values are defined from the Table in Annex 3 or the SSB tool (COR-NTD, 2024). The sample size for iTAS is based on the TAS for LF (WHO, 2025b). The survey is designed to measure whether the mean prevalence of Ov serology in the target age group is < 2%. The critical cut-off and sample size are based on testing the null hypothesis (H0) that the prevalence in the population is ≥ 2% with a Type 1 error (alpha) of < 5% and to maintain the power of the test greater than or equal to 75% under the alternative hypothesis (H1) that the true prevalence in the population is < 1%.
- **iTAS critical cut-off value for LF when conducting the Stop MDA survey for onchocerciasis, where 3000 children aged 5–9 years are sampled**
  Because the sample size for the iTAS exceeds the range of sample sizes in the standard LF TAS table when used as a Stop MDA survey, it is necessary to use a separate critical cut-off. If the number of children testing positive for LF (by filariasis test strip (FTS) or another WHO-approved rapid diagnostic test (RDT)) is ≤ 10 then the LF programme can conclude that it has passed the iTAS. If the number testing positive for LF is > 10 then it is considered a TAS failure. The critical cut-off is designed to measure a threshold of < 1 % antigenaemia in the population using a hypothesis testing framework with < 5% chance of Type 1 error (alpha), which refers to the likelihood of *falsely* concluding that the prevalence is < 1% when it is truly ≥ 1%. Similarly, the critical cut-off and sample size have at least 75% power to correctly identify areas that are below the target threshold when the true prevalence is 0.5%. The critical cut-off takes into consideration the fact that cluster sampling is used by applying a design effect of 2.0.

2.7 Diagnostics

The following diagnostic tests are recommended for use by WHO during iTAS.

- LF: Two rapid diagnostic tests are available to measure circulating filarial antigen (CFA): the Alere™ filariasis test strip (FTS) and the Standard Q Filariasis Antigen Test (QFAT).[6]
- Onchocerciasis: At the time of publication, the primary diagnostic test recommended for integrated EMS and iTAS is laboratory-based dried blood spot or sample (DBS) analysis using the SD Bioline Ov16 RDT or ELISA.
  - Job aid: SD BIOLINE Onchocerciasis IgG4 RDT (COR-NTD, 2016)
  - Job aid: SD BIOLINE Onchocerciasis IgG4 Field Training (PATH, 2024)
  - Video: SD BIOLINE Onchocerciasis IgG4 RDT (PATH, 2016)
  - Using dried blood spots on SD BIOLINE Onchocerciasis IgG4 Rapid Test (PATH, 2019)

2.8 Site selection

Site selection procedure for LF[7]

A numbered list of all primary schools for school-based surveys or census enumeration areas (EAs) for community-based surveys in the EU should be prepared in advance by the national programme manager. This list should be numbered by geographical proximity, not alphabetical order, to achieve a better geographical distribution of the EU. The TAS SSB (COR-NTD, 2021) should then be used to randomly generate numbers that correspond to the schools/EAs in the list to be selected for surveying. For systematic sampling, all schools/EAs on the list will be selected. For cluster sample surveys, a minimum of 30 schools/EAs will be selected.

Site selection procedure for onchocerciasis

iTAS should be considered only if assessments for both LF and onchocerciasis are being considered in the same EU. Vector breeding-site assessment and the selection of first- and second-line villages should have been done before either TAS1, TAS2 or TAS3 to determine if the sites for the assessment of both diseases overlap or are sufficiently close to enable the NTD programme to integrate.

- Where sites for OEM are unknown but can be selected before any of the TAS, follow the site assessment and selection procedures for first- and second-line villages in the OEM manual (WHO, 2025a).
- Where both diseases are known in the EU, map sites geographically to identify overlap and select sites for integration. A person with a minimum knowledge of geographical information system (GIS) analysis may be required to assess the distance between sites. There are different options for generating maps with information on onchocerciasis endemicity at the IU level, depending on whether the programme has data managers or data analysts with experience in GIS software and in conducting simple spatial

[6] Refer to *Monitoring and epidemiological assessment of mass drug administration in the global programme to eliminate lymphatic filariasis: a manual for national elimination programmes, second edition* (WHO, 2025b) for up-to-date guidance on diagnostic testing for LF.

[7] For more information, see also the M&E manual (WHO, 2025b).

analysis. Annex 4 in the OEM manual (WHO, 2025a) provides greater detail on the available tools for generating action maps. Alternatively, NTD teams may rely on health personnel and local people in the EUs to assess the proximity between sites.

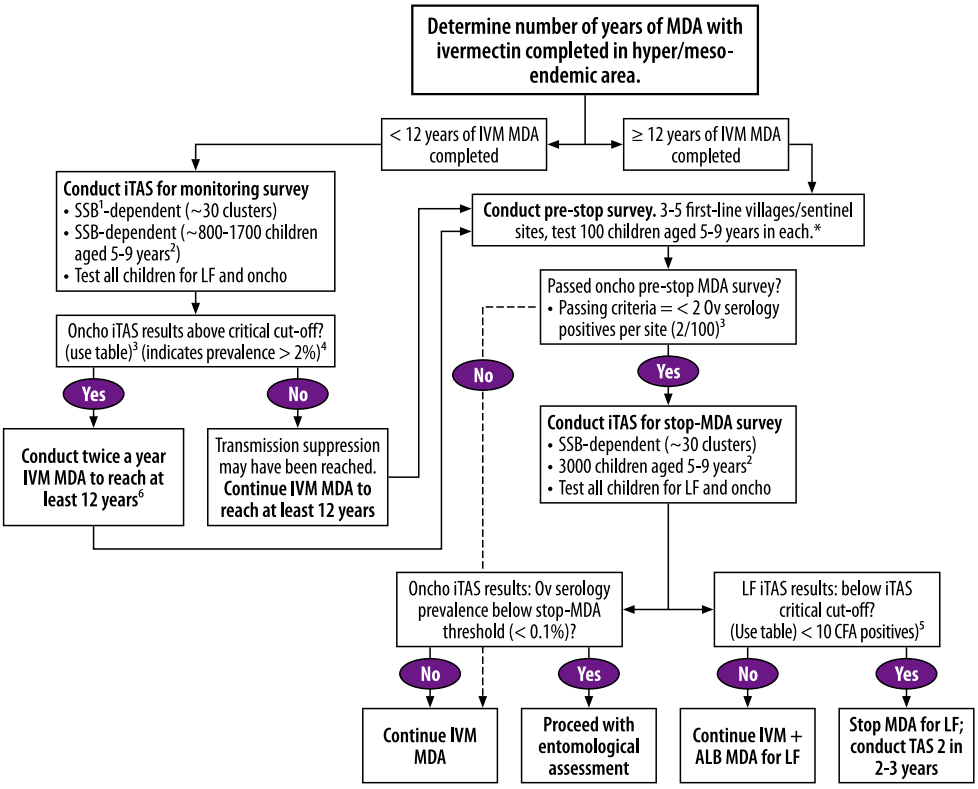
- Where sites do not significantly overlap sufficiently but the cost savings for integration justify the need to integrate assessments in the same EU, seek guidance from the National Onchocerciasis Elimination Committee (NOEC) if required. Cost savings should be assessed to inform the decision for integration, including any reduction in transportation costs, personnel costs and personnel time.

3. Conducting iTAS

This section provides guidance on when and how to conduct iTAS. The algorithms in Fig. 5a and 5b illustrate the procedure, decision points and activities, which are described in detail below.

3.1 Conducting iTAS for LF and onchocerciasis in hyper- or meso-endemic areas

Fig. 5a. **Procedure for conducting iTAS for LF and onchocerciasis in hyper- or meso-endemic areas**



ALB: albendazole; iTAS: integrated transmission assessment survey; IVM: ivermectin; LF: lymphatic filariasis; MDA: mass drug administration; oncho: onchocerciasis.

[1] SSB: survey sample builder.

[2] Children aged 6–7 years are sampled during an LF TAS (WHO, 2025b) The WHO guidelines for stopping MDA and verifying elimination of onchocerciasis recommend sampling children aged under 10 years for the Stop MDA survey (WHO, 2016). In order to integrate onchocerciasis with TAS, WHO recommends sampling children in the lowest primary school grades (grades 1–3 or 4), which most likely includes children aged 5–9 years. This age group is more likely to be positive than children aged under 5 years, and therefore represents a more conservative sample.

[3] No definitive cut-off exists. < 2 Ov serology positives per site is the minimum criterion; however, programmes may opt for a lower, more conservative cut-off.

Fig. 5a. *continued*

[4] Use the iTAS critical cut-off table in Annex 3. The sample size for the iTAS is based on the original transmission assessment survey for LF (WHO, 2025b). The survey is designed to measure whether the mean prevalence of Ov serology in the target age group is < 2%. The critical cut-off and sample size are based on testing the null hypothesis (H0) that the prevalence in the population is > 2% with a Type 1 error (alpha) of < 5% and to maintain the power of the test greater than or equal to 75% under the alternative hypothesis (H1) that the true prevalence in the population is < 1%.

[5] The critical cutoff for the LF results from an iTAS is nine antigen positive results, out of a sample size of 3000 children aged 5–9 years. The critical cut-off is designed to measure a threshold of < 1% antigenaemia in the population using a hypothesis testing framework with < 5% chance of Type 1 error (alpha), which refers to the likelihood of falsely concluding that the prevalence is < 1% when it is truly > 1%. Similarly, the critical cut-off and sample size have at least 75% power to correctly identify areas that are below the target threshold when the true prevalence is 0.5%. The critical cut-off takes into consideration the fact that cluster sampling is used by applying a design effect of 2.0.

[6] Programmes that fail pre-stop after completing 12 years of MDA with IVM: Consider further evaluation of the causes of a signal of active transmission to determine the best action (e.g. improving coverage, implementing twice-annual IVM MDA).

* Pre-stop activities can be coordinated with EMS activities if one or more OV first-line villages are considered to be high-risk for LF.

About pre-Stop surveys

The full Stop MDA survey can be time-consuming and costly, whereas a pre-Stop MDA survey is a low-burden, cost–effective assessment that should be conducted before the full Stop MDA survey. The pre-Stop MDA sentinel site survey may help determine if a full Stop MDA survey is likely to succeed. The pre-Stop sentinel site survey involves testing 100 children aged 5–9 years using RDT on DBS or ELISA in 3–5 first-line villages with the highest baseline prevalence, also known as onchocerciasis sentinel sites (Boakye et al., 2023; WHO, 2019). The pre-Stop sentinel sites are chosen based on their close proximity to breeding sites (i.e. sites that have a likelihood of higher onchocerciasis endemicity) or if they have demonstrated insufficient coverage during MDA (i.e. sites that are less likely to have interrupted onchocerciasis transmission).

1. Determine the number of years of MDA for onchocerciasis that have been completed: at least 12–15 years of MDA are needed

- **If less than 12 years of MDA have been completed:**
  - Conduct iTAS for monitoring survey. Select 30 clusters (SSB-dependent). Test 800–1700 children aged 5–9 years for onchocerciasis and LF. iTAS serves as a monitoring survey to assess progress (i.e. has transmission suppression been reached? Are more intensive efforts required?)
    - If the onchocerciasis results are above the critical cut-off (Annex 3), conduct twice a year ivermectin MDA to reach at least 12 years.
    - Then conduct the pre-Stop survey in 3–5 first-line villages/sentinel sites and test 100 children aged 5–9 in each. Follow the instructions below for **2. Determine if the area has passed a pre-Stop sentinel site survey for onchocerciasis**.
- **If at least 12 years of MDA have been conducted:** iTAS becomes an opportunity to assess if MDA can be stopped.
  - Conduct the pre-Stop survey in 3–5 first-line villages/sentinel sites and test 100 children aged 5–9 years in each. Follow the instructions below for **2. Determine if the area has passed a pre-Stop MDA sentinel site survey for onchocerciasis**.

2. Determine if the area has passed a pre-Stop sentinel site survey for onchocerciasis

- In areas that have passed the pre-Stop survey in sentinel sites, proceed to the iTAS.
- Programmes that fail pre-Stop after completing 12 years of MDA with ivermectin should consider further evaluation of the causes of a signal of active transmission to determine the best action (e.g. improving coverage, implementing twice-annual MDA with ivermectin.)

3. Conduct iTAS for the Stop MDA survey

- The cluster selection follows the LF TAS methodology. The same children are tested for both LF and onchocerciasis. Sample 30 clusters of 800–1700 children aged 5–9 years.

4. Evaluate the results of iTAS for onchocerciasis

- If Ov serology prevalence is above the Stop MDA threshold (≥ 0.1%), continue MDA with ivermectin. Subsequent iTAS can be conducted if additional LF TAS rounds are planned. If all LF TAS rounds are complete, onchocerciasis programmes should continue MDA and plan to conduct pre-Stop and Stop MDA surveys.
- If Ov serology prevalence is below the Stop MDA threshold (< 0.1%), proceed with an entomological assessment (WHO, 2025a):
  - The entomological indicator of transmission is the prevalence of O-150 PCR Poolscreen positivity, although annual transmission potential can be used in certain circumstances (when annual biting rates have been calculated and the number of L3 larvae per fly has been measured). The upper bound of the 95% confidence interval must be less than 0.1% in parous flies or 0.05% in all flies (WHO, 2025a).

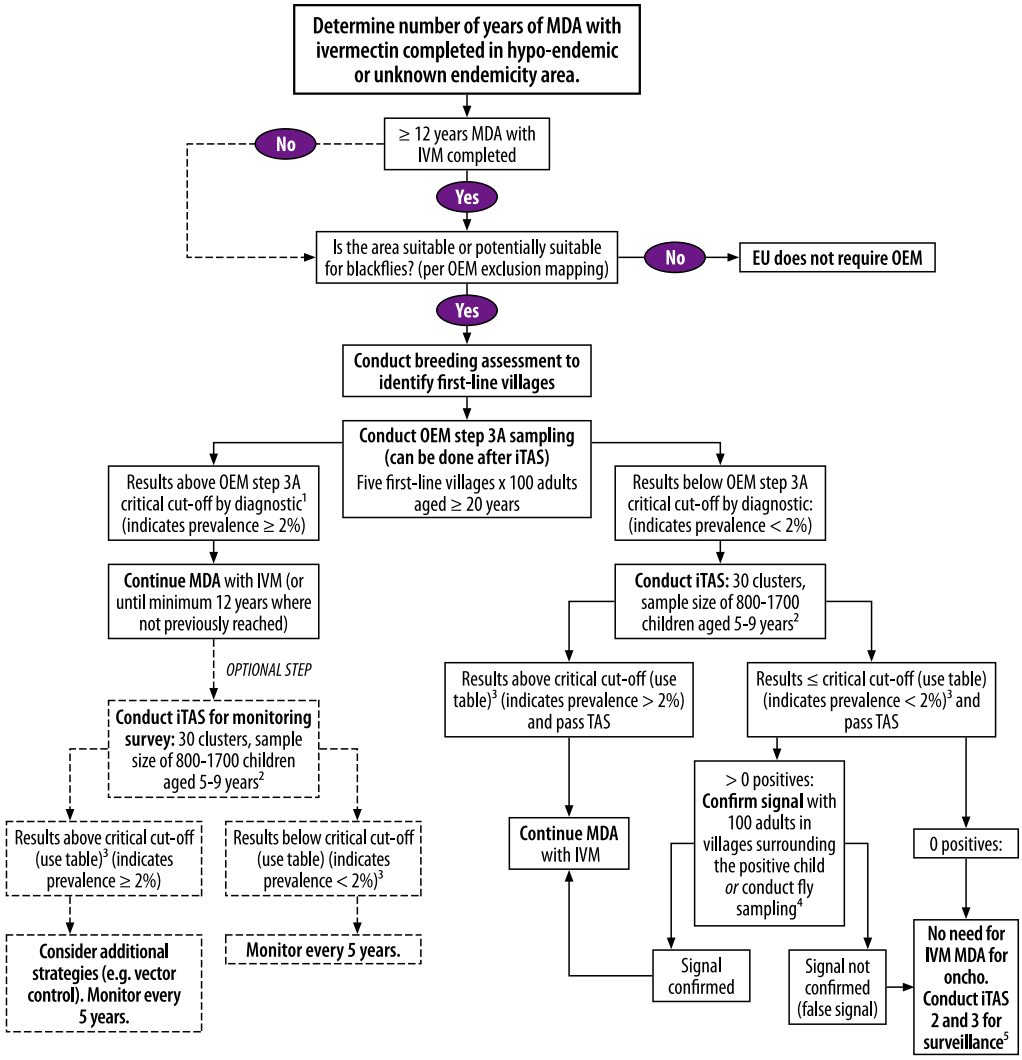
5. Evaluate the results of iTAS for LF

If the number of children who test positive for LF (by FTS or another WHO-approved RDT) is ≤ 10, the LF programme can conclude that it has passed the iTAS. If > 10 then it is considered a TAS failure.

- If LF positives are above the critical cut-off thresholds, continue MDA with ivermectin and albendazole.
- If LF positives are equal to or below the critical cut-off thresholds, stop MDA for LF and plan to conduct TAS2 in 2–3 years (WHO, 2024b).

3.2 Conducting iTAS in onchocerciasis hypo-endemic or unknown endemicity areas

Fig. 5b. **Procedure for conducting iTAS and interpreting onchocerciasis results in hypo-endemic or unknown onchocerciasis endemicity areas**



[1] OEM step 3A critical cut-off by diagnostic (number of test results in a single village): Ov serology with DBS: 4. OEPA ELISA: 1. AP ELISA: 2.

[2] Children aged 6–7 years are sampled during an LF TAS (WHO, 2025b). The WHO guidelines for stopping MDA and verifying elimination of human onchocerciasis recommend sampling children aged under 10 years for the Stop MDA survey (WHO, 2016). In order to integrate onchocerciasis with TAS, the WHO recommends sampling children in the lowest primary-school grades (grades 1–3 or 4), which most likely includes children aged 5–9 years. This age group is more likely to be positive than children aged under 5 years and therefore represents a more conservative sample.

[3] Use the critical cut-off table in Annex 3. The sample size for the iTAS is based on the original TAS for LF (WHO, 2025b). The survey is designed to measure whether the mean prevalence of Ov serology in the target age group is < 2%. The critical cut-off and sample size are based on testing the null hypothesis (H0) that the prevalence in the population is ≥ 2% with a Type 1 error (alpha) of < 5% and to maintain the power of the test greater than or equal to 75% under the alternative hypothesis (H1) that the true prevalence in the population is < 1%.

[4] WHO recommends that if the mapping exercise provides a result > 0 to use the OEM 3A critical cut-off by diagnostic to confirm if this is a true signal of active transmission or a spurious signal.

Fig. 5b. *continued*

[5] Very low onchocerciasis prevalences may not be captured by this mapping exercise in children, for example, when we fail to correctly identify first-line villages. In this scenario, sampling in adults may produce negative results and children would also be found negative, but an unknown small area that is not included in the survey may have a prevalence of 2% in adults. Because of this possibility it is recommended that when no adults and no children are found positive during the OEM integrated in iTAS, surveillance continues by conducting iTAS2 and 3 when the LF TAS2 and 3 is scheduled to happen. By stopping MDA and conducting TAS2 and 3 a few years later, any potential remaining transmission would result in a more intense signal (more positives) that would be easier to capture during those subsequent iTAS2 and iTAS 3 surveys.

Procedure for conducting iTAS in hypo-endemic or unknown endemicity areas

1. Determine the number of years of MDA with ivermectin that have been completed in a hypo-endemic or unknown endemicity area

If at least 12 years of MDA with ivermectin have been completed:

- **Determine if any areas in the EU are suitable for black fly vectors, which is a proxy for endemicity**. Refer to the OEM handbook (WHO, 2025a) for the methodology (OEM step 1 desk review and step 2 exclusion mapping).
  Areas neighbouring onchocerciasis meso- or hyper-endemic settings should be considered eligible for OEM even if they cannot host breeding sites. Black flies can fly long distances and infect sufficient people to warrant treatment.
  - If the EU is suitable or potentially suitable for black flies, conduct a breeding site assessment to identify first-line villages. This assessment involves visiting preselected locations on rivers for evidence of and/or suitable conditions for black fly breeding. If larvae or adult flies are found, nearby villages are classified as first-line villages for subsequent epidemiological assessments (WHO, 2024a).
    Then proceed to **2. Conduct OEM Step 3A sampling**.
  - If the habitat is not suitable for black fly vectors, OEM should not be conducted in the EU. Breeding sites may be found with presence of immature stages (larvae, pupae) that are not those of *Simulium* vectors of onchocerciasis (e.g. other Simuliidae species, not anthropophagic or not competent vectors for *O. volvulus*). Therefore, species identification will be required.

If less than 12 years of MDA have been completed:

- **Determine if any areas in the EU are suitable for black fly vectors, which is a proxy for endemicity**. See the OEM handbook (WHO, 2025a) for the methodology (OEM step 1 desk review and step 2 exclusion mapping).
  - If the evaluation unit is suitable or potentially suitable for black flies, conduct a breeding site assessment to identify first-line villages. If larvae or adult flies are found proceed to **2. Conduct OEM Step 3A sampling**.
  - If the habitat is not suitable for black fly vectors, OEM should not be conducted.

2. Conduct OEM Step 3A sampling

- Test 100 community-resident adults aged ≥ 20 years for onchocerciasis in five first-line villages.
  The programme may choose to integrate Step 3A OEM with an EMS survey if one is planned; however, this is not required.

  OEM step 3A critical cut-off by diagnostic. Number of test results in a single village. Ov serology with DBS: 4. OEPA ELISA: 1. AP ELISA: 2.
- If Stage 3A OEM results are above the critical cut-off by diagnostic, continue ivermectin MDA for onchocerciasis (or until 12 years of MDA are reached, where this was previously not the case).
  - *OPTIONAL*: Conduct iTAS for monitoring and evaluation purposes. Survey 30 clusters of 800–1700 children aged 5–9 years.
    - If the results are above the critical cut-off (see Annex 3 for critical cut-off table) countries should consider additional strategies (e.g. vector control) and monitor every 5 years.
    - If the results are below the critical cutoff (see Annex 3), monitor every 5 years.
- If Stage 3A OEM results are below the critical cut-off by diagnostic, proceed to **3. Conduct iTAS**.

3. Conduct iTAS

- The cluster selection follows the LF TAS methodology. The same children are tested for both LF and onchocerciasis. Sample 30 clusters of 800–1700 children ages 5–9 years.
- For onchocerciasis, if the prevalence in children is above the critical cut-off (see Annex 3) and TAS is passed, continue MDA with ivermectin.
- If the results are below the critical cut-off (see Annex 3) and TAS is passed:
  - If there are more than zero positives: WHO recommends, if the mapping exercise provides a result greater than zero, to use the OEM 3A critical cut-off by diagnostic to confirm if this is a true signal of active transmission or a spurious signal. Confirm the signal with 100 adults in villages surrounding the positive child, OR conduct fly sampling.
    - If the signal is confirmed, continue MDA with ivermectin.
  - If there are zero positives:
    - There is no need for MDA with ivermectin for onchocerciasis.
    - However, very low onchocerciasis prevalences may not be captured by this mapping exercise in children, for instance when first-line villages are incorrectly identified. In this scenario, sampling in adults may produce negative results and children would also be found negative, but an unknown small area that is not included in the survey may have a prevalence of 2% in adults. Because of this possibility, it is recommended that when no adults and no children are found positive during the OEM integrated in iTAS, surveillance continues by conducting iTAS2 and 3 when the LF TAS2 and 3 is scheduled to happen. By stopping MDA and conducting TAS2 and 3 a few years later, any potential remaining transmission would result in a more intense signal (more positives) that would be easier to capture during those subsequent iTAS2 and iTAS3 surveys.

***Note*: Following up on positive cases**

For treatment of LF, follow the specific guidance in the MDA manual (WHO, 2025b) on how to address clusters where positive cases are identified during a TAS.

Adult Ov serology positive cases should be treated with doxycycline (100 mg or 200 mg) once daily for 6 weeks and ivermectin (150 mcg/kg) given once or twice. Ivermectin should be started at least 1 week before doxycycline for optimal benefits. Doxycycline can sterilize up to 90% of adult female worms and kill at least 60% of adult female worms 20 months after treatment, while ivermectin will clear the microfilaria. Children are excluded from doxycycline treatment and should only be treated with ivermectin (150 mcg/kg) given once or twice a year for 10–15 years.

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Annex 1
Approach to development of this manual

This manual was developed through a global consultative process involving experts from all regions of the World Health Organization (WHO) in which lymphatic filariasis (LF) and onchocerciasis are endemic.

Integrated impact assessments for onchocerciasis and LF were implemented in programmatic and operational research settings in multiple countries. The benefits of integration reported by national programmes include coordinated decision-making regarding MDA and effective use of budgets and resources. The lessons learnt from these initial country experiences informed the development of the guidance included in this manual.

A draft iTAS algorithm was developed and presented at the seventh meeting of the WHO Onchocerciasis Technical Advisory Subgroup (OTS7) in Senegal in 2023. WHO convened an expert group to review the lessons learnt from the initial country experiences and refine the algorithm. Inputs were received from the health ministries of Burkina Faso, Cameroon, Equatorial Guinea, Nigeria, Sierra Leone Senegal, and the United Republic of Tanzania; Act|East at RTI International, Act|West at FHI360, The Carter Center, the United States Centers for Disease Control and Prevention, The END Fund, Helen Keller International, the NTD Support Center at the Task Force for Global Health, Sightsavers and the United States Agency for International Development (USAID). In 2024, a consultant was hired to lead the review and drafting of the manual. The expert group met through virtual meetings throughout the year to develop an outline and review the progress of the manual's development. As changes were made, several meetings were convened to discuss the algorithms for integration and the needed changes. The consultant prepared updates after each review and drafted the different sections of the manual.

The draft manual was sent to technical experts and members of the OTS for review, through direct input to the document provided online and virtual meetings to discuss the suggested changes. All meetings were led by the consultant and the WHO Technical Officer for onchocerciasis.

The OTS reviewed the first complete draft of the document, both online and during its eighth meeting (OTS8) in Spain in December 2024. The OTS8 recommended a review of the manual by country programmes to determine the acceptability of the proposed algorithms.

The document was shared with country programme managers through the Global Onchocerciasis Network for Elimination (GONE) platform in March 2025. The comments received were addressed, and an updated draft was provided for review by WHO.

Annex 2
Declarations of interest and their management

In accordance with the policy of the World Health Organization (WHO), all external experts submitted to the Organization the completed "Declarations of interest for WHO experts" form, disclosing any potential conflicts of interest that might affect, or might reasonably be perceived to affect, their objectivity and independence in relation to the subject matter of this manual. WHO reviewed each of the declarations and concluded that none could give rise to a potential or reasonably perceived conflict of interest related to the subjects discussed at the meeting or covered by the guidance.

Annex 3

Critical cut-off thresholds for integrated transmission assessment surveys for lymphatic filariasis and onchocerciasis

Table. **Critical cut-offs for iTAS integration with OEM survey (standard TAS table)**

Target population size (children aged 5–9 years)	Systematic sampling design			Cluster sampling design			
	LQAS sample size (n)	LF critical cut-off value	Onchocerciasis critical cut-off value	Sample size for cluster design	No. of clusters	LF critical cut-off value	Onchocerciasis critical cut-off value
399	Census	0.01*n	0.02*n	Cluster sampling is not recommended; use systematic sampling.			
400	284	1	3				
600	365	1	4				
800	438	1	5				
1000	506	1	6	759	Divide the sample size for a cluster survey by the average number of target-aged children per school/EA and round up to the nearest integer. If this integer is < 30, then the number of clusters is 30.	1	9
1200	520	1	6	780		1	9
1400	530	2	6	795		3	9
1600	594	2	7	891		3	11
2000	606	2	7	909		3	11
2400	614	2	7	1228		4	14
2800	678	2	8	1356		4	16
3200	684	2	8	1368		4	16
3600	688	2	8	1376		4	16
4000	690	2	8	1380		4	16
5000	696	2	8	1392		4	16
6000	762	3	9	1524		6	18
8000	766	3	9	1532		6	18
10000	770	3	9	1540		6	18
14000	774	3	9	1548		6	18
18000	776	3	9	1552		6	18
24000	778	3	9	1556		6	18
30000	778	3	9	1556		6	18
40000	842	3	10	1684		6	20
49999	842	3	10	1684		6	20
≥ 50 000	846	3	10	1692		6	20

Table. *continued*

LF: lymphatic filariasis; LQAS: lot quality-assurance sampling.
iTAS critical cut-off for LF when conducting the Stop MDA survey for onchocerciasis: 9
Target population: children aged 5–9 years
Sample size: 3000
Critical cut-off value: 9

Annex 4

Integrated epidemiological monitoring survey for lymphatic filariasis and onchocerciasis

Table A2.1 provides examples of how to integrate the epidemiological monitoring survey (EMS) with either a pre-Stop MDA survey or a Stage 3A survey from onchocerciasis elimination mapping (OEM). Fig. A2.1a and A2.b illustrate the decision algorithms for integrated EMS.

Table A2.1. **Survey design comparison: integrated EMS**[a]

	EMS	Integrated EMS: onchocerciasis pre-Stop survey needed in hyper- or meso-endemic areas	Integrated EMS: onchocerciasis elimination mapping needed (OEM Step 3A)
Diseases assessed	LF	LF and OV	LF and OV
Site selection	1 sentinel site, 1 spot-check site at high risk for LF. In pre-TAS/EMS, both sites may be spot-check sites	LF: 1 sentinel site OV: 3–5 first-line villages (at least one of which may serve as a spot-check site for LF if it is deemed to be high-risk; if not, a separate LF spot-check site will be required)	LF: 1 sentinel site OV: 5 first-line villages (at least one of which may serve as a spot-check site for LF if it is deemed to be high-risk; if not, a separate LF spot-check site will be required)
Target sample size	≥ 300 adults (aged > 20 years) per site	LF: 300 adults per site (sentinel site and ≥ 1 onchocerciasis first-line village) OV: 100 children per site	LF: 300 adults per site (sentinel site and ≥ 1 onchocerciasis first-line village) OV: 100 adults per site
Target population	Adults aged ≥ 20 years	LF: adults aged ≥ 20 years OV: children aged 5–9 years	LF: adults aged ≥ 20 years OV: community-resident adults aged ≥ 20 years
Sampling	Random household sampling	Random household sampling	Random household sampling
Diagnostics	CFA RDT (or Mf via microscopy)	LF: CFA RDT (or Mf via microscopy) OV: DBS for RDT or ELISA[b]	LF: CFA RDT (or Mf via microscopy) OV: DBS for RDT or ELISA

Table A2.1. *continued*

	EMS	Integrated EMS: onchocerciasis pre-Stop survey needed in hyper- or meso-endemic areas	Integrated EMS: onchocerciasis elimination mapping needed (OEM Step 3A)
Passing criteria	CFA prevalence < 2% (or Mf prevalence < 1%)	LF: CFA prevalence < 2% (or Mf prevalence < 1%) OV: no definitive cut-off exists. < 2 Ov serology positives per site is the minimum criterion to pass and proceed to a Stop MDA survey; however, programmes may opt for a lower, more conservative cut-off.	LF: CFA prevalence < 2% (or Mf prevalence < 1%) OV: Step 3A critical cut-off by diagnostic (number of positive test results in a single village) (WHO, 2025a) • Ov serology with DBS: 4 • OEPA ELISA: 1 • AP ELISA: 2

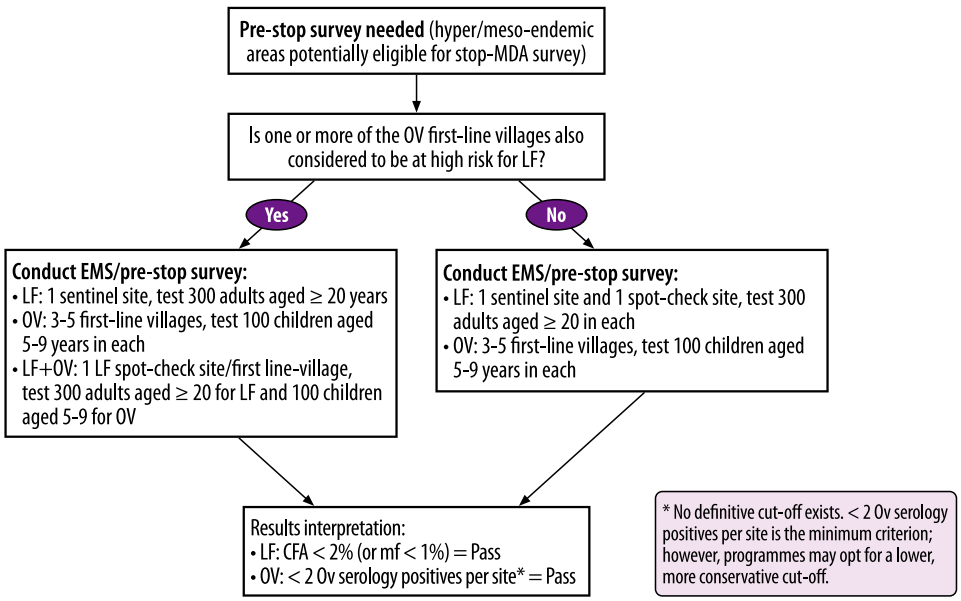
AP: alkaline phosphatase; CFA: circulating filarial antigen; DBS: dried blood spot or sample; ELISA: enzyme-linked immunosorbent assay; EMS: epidemiological monitoring survey; LF: lymphatic filariasis; Mf: microfilaria/e; OEPA: Onchocerciasis Elimination Program for the Americas; OV: *Onchocerca volvulus*; RDT: rapid diagnostic test; TAS: transmission assessment survey.

[a] See section 2.6 for explanations of age group selections, sample size and critical cut-off calculations.

[b] See section 2.7 on Diagnostics.

Procedure for integrating the EMS for LF and onchocerciasis

Fig. A2.1b. **Procedure for integrating onchocerciasis into EMS: sentinel site monitoring or pre-Stop sentinel survey needed in hyper- or meso-endemic areas**



CFA: circulating filarial antigen; LF: lymphatic filariasis; MDA: mass drug administration; Mf: microfilaria/e; OEM: onchocerciasis elimination mapping; OV: *Onchocerca volvulus*.

1. Determine the type of survey needed for onchocerciasis: Sentinel site monitoring/Pre-Stop sentinel site or Step 3A OEM.

a. In areas where a Sentinel site monitoring/pre-Stop survey for onchocerciasis is needed (i.e. in hyper/meso-endemic areas that are being monitored for progress or are potentially eligible for the Stop MDA survey):

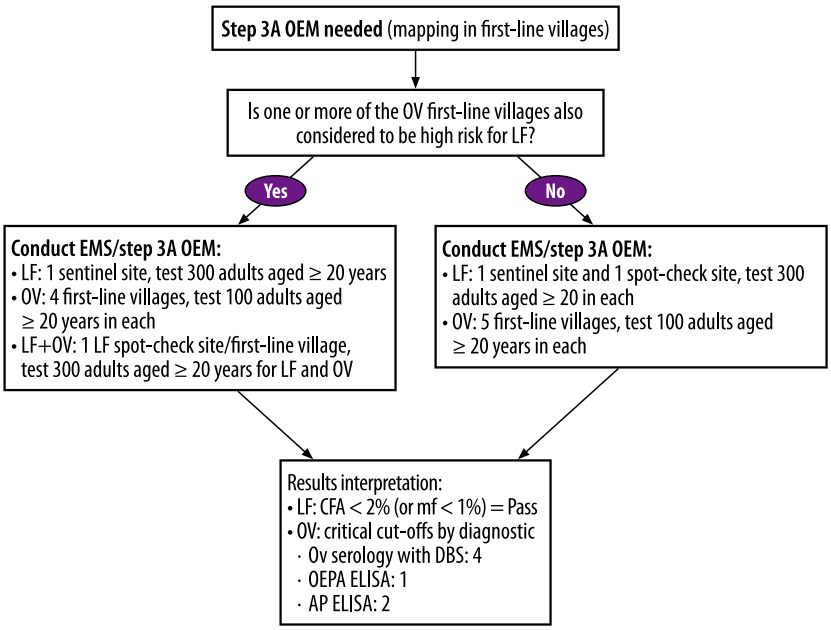
i. If <u>one or more</u> OV first-line villages are also high-risk for LF, conduct the EMS/ pre-Stop Survey as follows:

- For LF, identify one sentinel or spot-check site expected to be at highest risk for LF transmission. Using random household sampling, test 300 adults aged ≥ 20 years using CFA RDT or Mf examination via microscopy. Passing criteria: CFA prevalence < 2% (or Mf prevalence < 1%).
- For onchocerciasis, identify 3–5 first-line villages. At least one of the first-line villages may serve as a spot-check site for LF if it is deemed to be high-risk; if not, a separate LF spot-check site will be required. Using random household sampling, test 100 children aged 5–9 years in each using DBS for Ov serology. Passing criterion: no definitive cut-off exists. < 2 Ov serology positives per site is the minimum criterion; however, programmes may opt for a lower, more conservative cutoff.
- For both LF and onchocerciasis, identify one site considered high-risk for both diseases (e.g. first-line village that can also serve as an LF spot-check site). Using random household sampling, test 300 adults for LF and 100 children for OV using the respective diagnostic techniques for each disease listed above. Passing criterion: as above.

ii. If <u>none</u> of the OV first-line villages are also considered high-risk for LF, conduct the EMS as follows:

- For LF, identify one sentinel site and one spot-check site. Using random household sampling, test 300 adults aged ≥ 20 years using CFA RDT or Mf examination via microscopy. Passing criteria: CFA prevalence < 2% (or Mf prevalence < 1%).
- For onchocerciasis, identify 3–5 first-line villages. Using random household sampling, test 100 children aged 5–9 years in each using DBS for Ov serology. Passing criterion: no definitive cut-off exists. Less than two Ov serology positives per site is the minimum criterion; however, programmes may opt for a more conservative cut-off.

Fig. A2.1b. **Procedure for integrating onchocerciasis into EMS: OEM needed (Step 3A)**



DBS: dried blood spot or sample; ELISA: enzyme-linked immunosorbent assay; EMS: epidemiological monitoring survey; LF: lymphatic filariasis; MDA: mass drug administration; Mf: microfilaria/e; OEM: onchocerciasis elimination mapping; OEPA: Onchocerciasis Elimination Program for the Americas; OV: *Onchocerca volvulus*.

b. In areas where Stage 3A OEM survey is required (i.e. in hypo-endemic or unknown endemicity areas), mapping in first-line villages should be integrated with EMS:

i. If <u>one or more</u> OV first-line villages are also high-risk for LF, conduct EMS/ Stage 3A OEM as follows:

- For LF, identify one sentinel site. Using random household sampling, test 300 adults aged ≥ 20 years using CFA RDT or Mf examination via microscopy. Passing criteria: CFA prevalence < 2% (or Mf prevalence <1%).
- For onchocerciasis, identify five first-line villages. At least one of the first-line villages may serve as a spot-check site for LF if it is deemed to be high-risk; if not, a separate LF spot-check site will be required. Using random household sampling, test 100 adults aged ≥ 20 years using DBS for RDT or ELISA. Note that the adults must be community residents. Passing criteria for OEM Step 3A critical cut-off by diagnostic (number of positive test results in a single village):
  - Ov serology with DBS: 4
  - OEPA ELISA: 1
  - AP ELISA: 2 (WHO, 2025a).
- For both LF and onchocerciasis, identify one site considered high-risk for both diseases (e.g. first-line village that can also serve as LF spot-check site). Using random household sampling, test 300 adults aged ≥ 20 years for LF and 100 community members aged ≥ 20 years for OV using the respective diagnostic techniques for each disease listed above. Passing criteria: as above.

ii. If <u>none</u> of the OV first-line villages are also considered high-risk for LF: Conduct EMS/Stage 3A OEM as follows:

- For LF, identify one sentinel site and one spot-check site. Using random household sampling, test 300 adults aged ≥ 20 years using CFA RDT or Mf examination via microscopy. Passing criteria: CFA prevalence < 2% (or Mf prevalence < 1%).
- For onchocerciasis, identify five first-line villages. Using random household sampling, test 100 adults aged ≥ 20 years using DBS for RDT or ELISA. For passing criterion, refer to the critical cut-off table, depending on the test used, in the OEM manual (WHO, 2025a).

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