Federal Democratic Republic of Ethiopia
Ministry of Health

National Malaria Elimination Roadmap

February 2017
Addis Ababa

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National Malaria Prevention, Control and Elimination Program
Disease Prevention and Control Directorate

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Foreword

The National Malaria Elimination Roadmap has been developed with the aim of helping to further reduce the human suffering due to malaria and eliminate the disease from the country. In the past decade, the government of Ethiopia has given a high priority to the prevention and control of malaria. The commitment of the government, coupled with support from development partners, has enabled the scale-up of key antimalarial interventions including: distribution of long-lasting insecticide-treated nets (LLINs) through mass campaigns targeting the entire population at risk, indoor residual spraying (IRS) in designated epidemic-prone areas, and expanded diagnostic testing and effective antimalarial treatment.

As a result of the unprecedented government commitment and the support of partners, 100% of the population at risk of malaria has been reached with preventive interventions (LLINs and IRS). In addition to health centre and hospital-based services, malaria diagnosis and treatment has also been extended to peripheral (community) levels, where trained health extension workers (HEWs) are diagnosing and managing malaria cases effectively. The country has achieved malaria related Millennium Development Goal targets as evidenced by reduced prevalence and death rates associated with malaria as well as an increase in the proportion of the population in malaria-prone areas using effective malaria prevention and treatment measures.

Encouraged by this progress, the government adopted a bold and ambitious target: starting at the sub-national level in low transmission areas and gradually expanding to the entire country, Ethiopia aims to achieve nationwide malaria elimination by 2030. To achieve this goal, the collaboration and concerted effort of all stakeholders and development partners is crucial; hence, we all should act with determination and remain focused.

This document was developed to provide guidance on the phased approaches and recommendations to be followed during malaria elimination. It is intended to be used by health workers, policymakers, programme managers at different levels of the health system, and development partners in the health sector as a reference and guiding document in the planning, monitoring, and implementation of anti-malarial interventions in the context of malaria elimination. I remain confident that if we act with urgency and determination, we can make malaria a thing of the past.

Dr. Kebede Worku
State Minister of Health
Federal Democratic Republic of Ethiopia

List of Abbreviations

ACD	Active Case Detection
ACSM	Advocacy, Communication and Social Mobilization
ACT	Artemisinin Combination Therapy
AMS	African Malaria Strategy
API	Annual Parasite Incidence
BCC	Behavioral Change Communication
CHAI	Clinton Health Access Initiative
DHO	District Health Office
EQA	External Quality Assessment
FMOH	Federal Ministry of Health
FTAT	Focused Test and Treat
G6PD	Glucose-6-Phosphate Dehydrogenase
GTP	Growth and Transformation Plan
GTS	Global Technical Strategy
HDA	Health Development Army
HEW	Health Extension Worker
HIV/AIDS	Human Immuno-deficiency Virus/Acquired Immuno-deficiency Syndrome
HMIS	Health Management Information System
HSDP	Health Sector Development Program
HSTP	Health Sector Transformation Plan
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
IRT	Integrated Refresher Training
ITN	Insecticide Treated Net
LLIN	Long Lasting Insecticide-treated Net
LSM	Larval Source Management
M&E	Monitoring and Evaluation
MACEPA	Malaria Control and Elimination Partnership in Africa

MASL	Meter Above Sea Level
MDG	Millennium Development Goal
MET	Malaria Elimination Taskforce
MOU	Memorandum of Understanding
MTAT	Mass Test and Treat
NGO	Non-Governmental Organization
NSP	National Strategic Plan
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PATH	Partnership for Appropriate Technology in Health
PCD	Passive Case Detection
PCR	Polymerase Chain Reaction
PHCU	Primary Health Care Unit
PHEM	Public Health Emergency Management
PMI	President's Malaria Initiative
RACD	Reactive Case Detection
RDT	Rapid Diagnostic Test
RHB	Regional Health Bureau
SBCC	Sustained Behavioral Change Communication
SDPQ	Single Dose Primaquine
SUFI	Scale Up For Impact
T3	Test, Treat and Track
TLSM	Targeted Larval Source Management
TMDA	Targeted Mass Drug Administration
TOR	Terms of Reference
TPR	Test Positivity Rate
TWG	Technical Working Group
USAID	United States Agency for International Development
WHO	World Health Organization
WHO/AFRO	World Health Organization/African Regional Office

1. Background

1.1 Introduction

In the past decade, the government of Ethiopia has made malaria prevention and control a high priority. Accordingly, malaria control has been one of the major components of the Plan for Accelerated and Sustainable Development to End Poverty (PASDEP), Health Sector Development Program I-IV (HSDP)/Health Sector Transformation Plan (HSTP), and Growth and Transformation Plan (GTP). Since 2005, the government has scaled up key antimalarial interventions, including: distribution of long-lasting insecticide-treated nets (LLINs) through mass campaigns targeting the entire population at risk, indoor residual spraying (IRS) in designated epidemic-prone areas, and expanded diagnostic testing and effective antimalarial treatment to people at risk. Malaria control has also benefited from overall health sector development, particularly from the health extension programme, which deployed more than 30,000 health extension workers (HEWs) nationwide to provide integrated health promotion and treatment at peripheral health posts and at community level. This was possible through the government's strong political commitment as well as financing and technical support from programme partners.

1.2 Achievements and prospects

As a result of unprecedented investment on antimalarial interventions, all at-risk communities currently have access to preventive interventions (LLINs/IRS), and all health facilities in the public sector use confirmatory test and treat cases with appropriate anti-malarial drugs. Sustained high coverage of such interventions has led to marked reduction of hospital malaria morbidity and mortality by more than 50% and more than 60%, respectively, between 2001 and 2011[1]. The frequency and magnitude of malaria epidemics has also decreased substantially due to the expanded deployment and use of appropriate interventions. According to surveillance data from Public Health Emergency Management (PHEM), many malaria-endemic districts recorded annual malaria incidence of less than 5%. Malaria Indicator Survey findings in 2007, 2011, and 2015 also show low levels of malaria prevalence in the country. This reduction in malaria is particularly true in the central and north-eastern part of the country. Thus, encouraged by the significant progress following Scale Up for Impact (SUFI) and sustained control, the Federal Ministry of Health (FMOH) has committed to the elimination of malaria from the whole country with the goal of nationwide elimination by 2030[2]. It is to be noted, however, that as the decrease in malaria burden has not been uniform, a sub-national elimination must be attempted before nationwide elimination can be attained.

The national roadmap is aligned with the WHO Global Technical Strategy (GTS)[3], which aims to reduce malaria incidence and mortality by at least 90% by 2030, and the African Malaria Strategy (AMS)[4], which targets elimination of malaria from all African countries by 2030[2] . Furthermore, the planned reorientation of the malaria programme toward elimination is aligned with healthy and well-nourished citizens', which is the third goal of Agenda 2063[5], that endorsed by the African heads of state in 2013.

In order to be successful in the national elimination endeavour, the capacity of the country's health system in terms of availability of trained human resources, adequate finance, and logistics needs to be ensured. The existing surveillance system has to be reoriented in order to detect every infection, treat cases promptly, and submit reports in a timely manner. Monitoring of drugs and insecticides' resistance needs to be done regularly. Furthermore, targeted communities have to be mobilized to own the elimination initiative so they can actively engage in the planning and implementation of appropriate interventions, including proper use of anti-malaria interventions. Additionally, regular operational research needs to be conducted, and new tools and technologies need to be introduced as appropriate.

[1] Maru Aregawi et al, **Time Series Analysis of Trends in Malaria Cases and Deaths at Hospitals and the Effect of Antimalarial Interventions, 2001–2011, Ethiopia**.PLOS ONE, 2014, 9 (11)

[2] FMOH (2016). National Malaria Strategy 2017-2020

[3] World Health Organization. **Global Technical Strategy for malaria 2016-2030**. 2015. ISBN 978 92 4 156499 1.

2. Stratification of malaria in Ethiopia

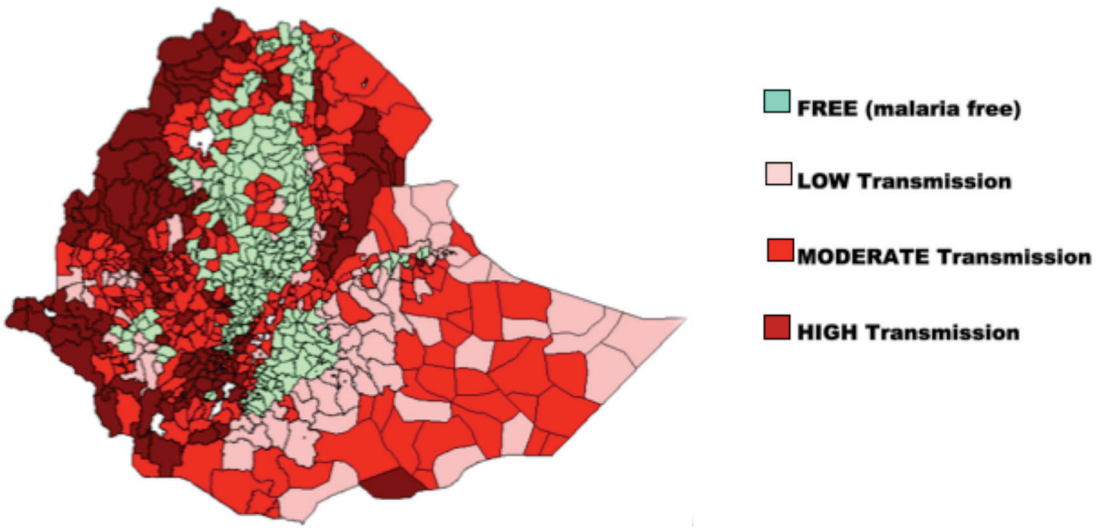


Figure 1. Map of Malaria Strata in Ethiopia (©2014)

Malaria is highly seasonal with varying intensity of transmission owing to altitudinal and climatic variations. Around 60% of the country's population is at risk of the disease. Generally, areas that lie below 2000 metres above sea level are considered malarious; moreover, several pockets with micro-epidemiological conditions supporting malaria transmission occur in areas above this altitude. Figure 1. Map of Malaria Strata in Ethiopia (©2014)

Plasmodium falciparum accounts for nearly 70% of all malaria cases in Ethiopia while the remaining cases are due to P. vivax. The contribution of the other Plasmodium species in the country is negligible. Malaria transmission manifests in two seasons where the high-transmission season coincides with the cultivation months; hence, malaria has a deleterious socioeconomic effect on productivity and development in the country.

The current malaria National Strategic Plan (NSP 2017–2020) has stratified the country's malaria situation on the basis of annual parasite incidence [API] per 1000 population based on data from HMIS and complemented by PHEM data. API-based classification was supported by information on altitude—which is a proxy measure of temperature and rainfall—and experts' opinion (local knowledge). Accordingly, four broad strata have been identified. They are: malaria-free, low-, moderate-, and high-transmission strata (Table 1).

[4] Regional Office for African, WHO. **African Malaria Strategy (AMS): Accelerating towards malaria elimination in Africa**. 2015. (Unpublished draft).

[5] Agenda 2063: The Africa we want. African Union 2015. ISBN: 978-92-95104-23-5

Table 1: Malaria strata with target antimalarial interventions, February 2017

Malaria Strata	API	Elevation (m)	Population (2016)	% Population	No. of Woreda	% Woreda	Interventions					
							LLIN	IRS	Larval Control	Case Mx	Surveillance	IEC/ BCC
FREE	0	>= 2000 asl	37,083,083	40.3%	280	33.1%	-	-	-	X	X	X
LOW	>0 & <5	< 2000 asl	17,115,269	18.6%	146	17.3%	X	X*	WA	X	X	X
MODERATE	>=5 & <100		34,782,644	37.8%	365	43.2%	X	X**	WA	X	X	X
HIGH	>=100		3036,,580	3.3%	54	6,4%	X	X	WA	X	X	X
Total			**92,017,576**	**100%**	**845**	**100%**						

*Only 32% of at risk population in highland fringe/epidemic-prone areas will be covered by IRS

**Only 14.8% of at risk population from moderate stratum will be covered by IRS

WA: where applicable; asl: above sea level

Based on the most latest epidemiological data of Table 1, the country's malaria stratification map has been updated (see Figure 2).

Districts/woredas below 5 cases per 1000 people per year are designated as low-transmission and are primarily targeted for pre-elimination and elimination. For the expansion of malaria-free areas starting with the low transmission stratum, malaria elimination will be driven by epidemiological stratification aimed at regular identification of districts that are eligible to embark on elimination. Given that the impact of the control programme is ongoing, the number of districts leaving moderate stratum to low and high to moderate will keep increasing. Thus, based on regular epidemiological stratification, districts will be regularly included and transitioned into the elimination phase.

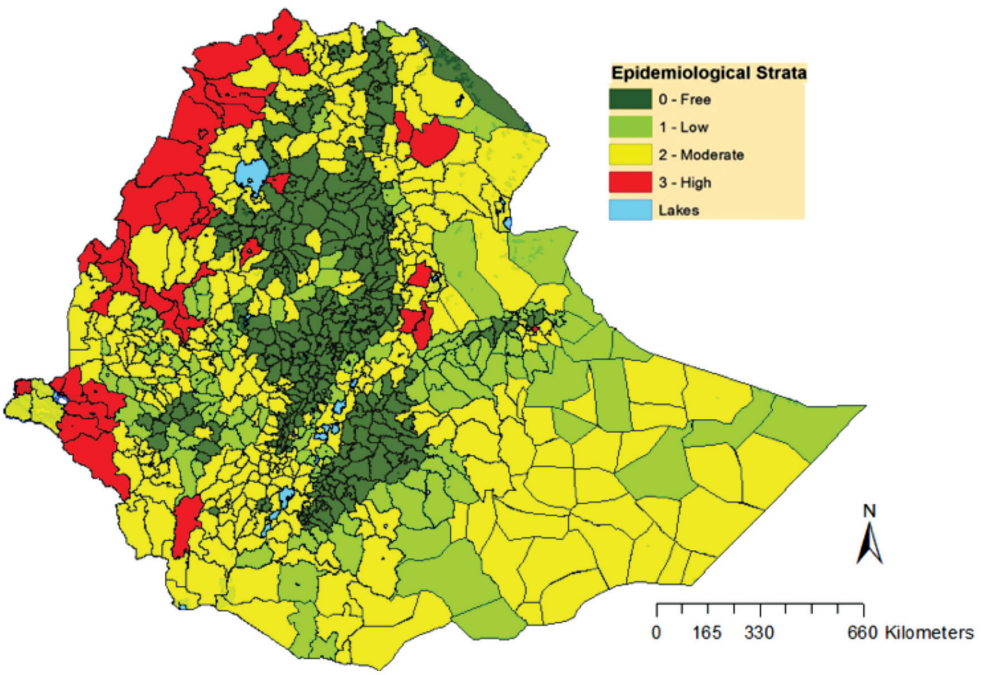


Figure 2. New Map of Malaria Strata in Ethiopia (©2017)

3. Strategic framework for malaria elimination in Ethiopia

3.1 Vision

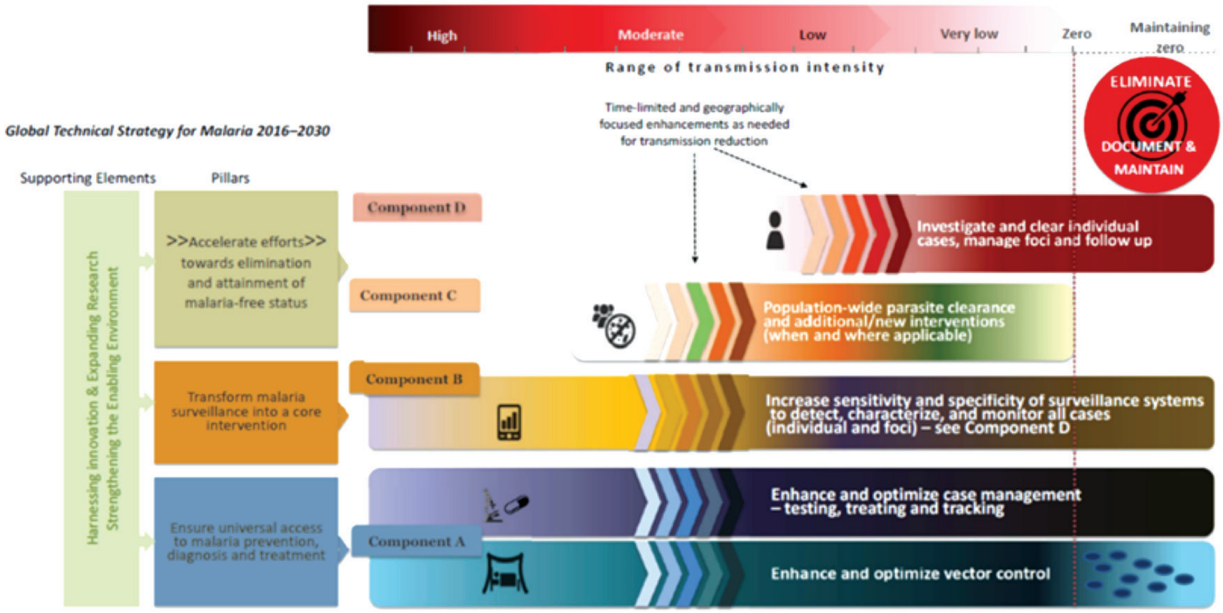
To see a malaria-free Ethiopia.

3.2 Goal

By 2030, to eliminate malaria nationwide.

3.3 Objectives

1. To reduce malaria case incidence to zero by 2030.
2. To reduce malaria mortality rate to zero by 2030.
3. To prevent re-establishment of malaria in all malaria-free districts.



* *Acceleration – as represented by arrows here - relates to time-limited efforts made across all components in order to:*

- *achieve universal/optimal coverage in malaria prevention and case management (**Component A**), and increase sensitivity and specificity of surveillance systems so they are able to detect, characterize and monitor all malaria cases and foci (**Component B**);*
- *bring malaria transmission to sufficiently low levels (with or without population-wide parasite clearance and other strategies, **Component C as an option**) where remaining cases can be investigated/cleared and foci can be managed and followed up (**Component D**).*

3.4 Strategies

Complete interruption of local transmission cannot be achieved by simply applying 'more of the same' approach. Malaria elimination requires re-orientation of the programme and more effective implementation of appropriate strategies. In order to achieve the goal and objectives set, the programme will implement the following core strategies with varying degrees of intensity along the elimination path:

- Stratification of districts based on epidemiological and operational parameters.
- Intensification of key antimalarial interventions.
- Implementation of surveillance system as an intervention.
- Stewardship and leadership to ensure sustained political commitment for resource allocation (financing, human resource, infrastructure, logistics).
- Operational research and introduction of new tools.

4. Implementing malaria elimination

Launching the malaria elimination endeavour on a national scale at once is not feasible for epidemiological and operational reasons. It is, however, possible to create malaria-free zones within selected geographical areas in the country.[6] Therefore, as indicated in the NSP 2014–2020, Ethiopia is planning to eliminate malaria through a step-wise approach targeting specific adjacent areas in order to shrink the country's malaria map steadily.

In light with the above scenario, a package of interventions will be implemented throughout the country depending on malaria transmission levels, in accordance with the recently published WHO framework for malaria elimination.[7]

Districts will receive a mix of interventions based on their API (see Table 2). High and moderate transmission districts (API greater than or equal to 100, and those with an API value between 10 and 100) will intensify efforts to ensure universal access to prevention, diagnosis and treatment, in order to reduce transmission levels. Districts in the low transmission category (with an API between 5 and 10) are considered optimization districts and will receive additional interventions to further reduce transmission. Districts with very low transmission (with an API value between 1 and 5) are considered as pre-elimination districts and those with API less than 1 are considered as eliminating districts. When districts achieve zero malaria incidence, interventions will aim at preventing reintroduction. As transmission levels decrease, districts move down the elimination continuum and are targeted with the appropriate package of interventions.

However, districts within each category may not fit perfectly or be contiguous with one another. In some cases, districts having high API within the same zone may be adjacent to the eliminating

districts. Without targeting such districts with high API, the effort of creating malaria-free zones is impractical due to importation of infection from neighbouring districts. Therefore, an entire zone will be targeted in order to implement and achieve better programme management in a cost-effective way. This approach will have the added benefit of joining efforts in stopping transmission in a wider geographic area (zone) rather than in various "islands" across the country.

Phases along the elimination path are as follows:

Phase 1: Optimization è **Phase 2:** Pre-elimination è P**hase 3:** Elimination è **Phase 4:** Prevention of re-introduction.

This corresponds with the typical focus of the intervention unit for each phase, which will be as follows:

Phase 1: Moderate and low-transmission areas è **Phase 2**: Foci è **Phase 3**: Cases è **Phase 4**: Imported cases.

Phasing will be dynamic and regularly reviewed based on: (1) the epidemiological thresholds (mainly API), and (2) proximity to primarily targeted elimination districts. Transitioning of districts across the phases (Table 2) will be done following annual or mid-term reviews on the status and progress of each district. This will be implemented jointly by the FMOH, Regional Health Bureaus (RHBs) and district health offices (DHOs). The selection process will consider the in-depth knowledge of the local epidemiology coupled with objective and tangible criteria.

As indicated above, malaria elimination in Ethiopia will be a step-wise undertaking based on successive sub-national elimination initiatives and expansion of the map of malaria-free zones for nationwide elimination by 2030. The elimination initiative will target districts according to four phases; interventions applicable for each phase are described in Table 2. Some new, elimination-specific interventions are added as required; otherwise the commonly used existing anti-malaria interventions are maintained, but vary in intensity along the path.

[6] WHO (2013). Sub-national malaria elimination. Malaria Policy Advisory Committee Meeting. Session 8.1. Geneva.

[7] **WHO (2017): A framework for malaria elimination. http://www.who.int/malaria/publications/atoz/9789241511988/en/**

Table 2. Malaria interventions across the elimination continuum

Strategies	Interventions/activities	Phases			
		Optimization	Pre-elimination	Elimination	POR
Intensification of key antimalarial interventions	LLINs (all population at risk)	xxx	xx	x	
	Indoor residual spraying	xxx	xx	x	
	Larval source management	x	xxx	x	
	Chemoprophylaxis	x	xxx	xxx	
	Diagnosis with RDT or microscopy	xxx	xxx	xxx	x
	More accurate diagnosis such as PCR		x	xxx	xxx
	Quality assured diagnosis	xx	xxx	xxx	Xxx
	Treatment with ACT	xxx	xxx	xxx	Xxx
	Single dose primaquine treatment (gametocytocidal against *P. falciparum*)	xx	xxx	xxx	
	Radical treatment of *P. vivax*	x	xx	xxx	X
	Malaria commodities supply chain management	xxx	xxx	xxx	Xx
Implementation of surveillance system as intervention	Surveillance database for elimination		xxx	xxx	xxx
	Aggregated outpatients (analysis)	xxx	x		
	Aggregated inpatient cases (analysis)	xxx	x		
	Epidemics monitoring and response	xx	xxx	xxx	x
	Passive case detection	xxx	xxx	xxx	xxx
	Active case detection		xx	xxx	xxx
	Targeted testing and treatment in foci		xxx	xxx	
	Targeted mass drug administration (tMDA)		xx	xxx	
	Database of foci list		xx	xxx	
	Foci detection, classification and response		xx	xxx	xxx
	Case-base surveillance detection		xx	xxx	xxx
	Case detection, investigation, classification and notification		xx	xxx	xxx
	Vigilance of imported cases (including within)			x	xxx
	Private sector engagement		xx	xxx	

Strategies	Interventions/activities	Phases			
		Optimization	Pre-elimination	Elimination	POR
Stewardship and leadership	Political commitment and leadership for elimination	xxx	xxx	xxx	xxx
	Domestic financing	x	x	xxx	xxx
	Community engagement for elimination	xx	xxx	xxx	xxx
	Behavior and practices of health workers:	xx	xxx	xxx	xxx
	Cross-border collaboration (international borders)			xx	xxx
	Human resource for elimination	x	xxx	xxx	Xx
	Training of personnel	x	xxx	xxx	Xx
	Private sector engagement		x	xx	Xx
Operational research and introduction of new tools	Review of evidence on appropriate new tools and technologies for local use	x	xx	xx	
	Monitor efficacy and safety of both anti-malaria drugs and insecticides	x	xx	xx	
	Assess overall programme implementation status	x	xxx	xxx	X
	Assessment of safety of primaquine radical cure for *P. vivax* roll-out	x			
	KAP assessment (health providers and community engagement and behaviors)	x		x	
	Impact assessment	x		x	

Note: 'x' indicates level of intensity. WHO recommends the following:

- *'In areas with recent local malaria transmission, the scale-back of vector control is not recommended. Optimal coverage with effective malaria vector control (including the use of new vector control tools when they become available) of all persons in such areas, should be pursued and maintained.'* As districts graduate from one phase to the next, coverage with LLINs should be maintained.
- *'In areas where transmission has been interrupted, the scale-back of vector control should be based on a detailed analysis that includes assessment of the receptivity and vulnerability, the ongoing capacity of the active disease surveillance and response system.'*

Phase 1: Optimization of anti-malaria interventions

Optimization implies intensification of the existing antimalarial interventions in terms of quality, targeting, and utilization. Quality refers to the quality of malaria commodities and their application, and targeting refers to the focusing of the interventions and making them more granular at lower geographical levels with clusters of malaria infection. On the other hand, utilization of services is focused on attaining the desired behaviour of the target population to ensure maximal uptake and use of an intervention.

Purpose: The purpose of this phase is to intensify the existing interventions, maximize impact, and further reduce the malaria burden in targeted areas. In addition, this phase is aimed at building and sustaining political commitment at all levels, engaging communities, strengthening human resources, improving the supply chain management of malaria commodities so that they are available at all times, and preparing districts for pre-elimination.

Eligibility criteria: Districts will be classified as eligible for optimization when they exhibit either of the following: (1) they reach an API of 5–10, (2) they have low test positivity rates (TPRs) of 5–10% for all ages, and (3) an API greater than 5 but are located within a cluster of districts with an API of 5–10 within the same administrative zone.

Strategic actions: Programmatically, optimization will require implementation of the following measures:

- Targeted application of IRS and larval source management and universal coverage with LLINs of all populations at risk of malaria.
- Access to diagnosis and effective treatment in all health facilities.
- Effective advocacy, communication, and social mobilization (ACSM) to optimize uptake of interventions and enhance care-seeking behaviour.
- Strengthening of existing surveillance to assess progress and impact.
- Political commitment and community engagement.
- Strengthening of programme management (human resource and supply).

Intensification of anti-malaria interventions

Vector control

During the optimization phase, when intensity of malaria is relatively high, vector control interventions will target all populations at risk of malaria (refer to the malaria elimination vector control manual) in the following ways.

- Distribution of LLINs will aim to reach universal coverage of the population at risk of malaria transmission. During the optimization, ownership and utilization of nets will be monitored at *village* and *household* level instead of district level using HEWs and HDA.
- Insecticide resistance and the quality of LLINs will be routinely monitored to ensure effectiveness of the intervention.
- Targeted IRS (tIRS) will be implemented targeting relatively high intensity of malaria transmission areas; not necessary to cover the entire district. The quality of IRS should be maintained in terms of the right insecticide, the right dosage, the right place, the right timing, and with maximum coverage in the targeted area.
- Targeted larval source management (tLSM), which includes environmental management (source reduction) and larviciding, will be applied in locations where larval habitats are located within the vector flight range of the community to be protected especially within the immediate vicinity of housing, covering a very high proportion of the breeding sites. Priority should preferably be given to environmental management. Habitats that cannot be managed through environmental management will be targeted for larviciding when the target areas are few, findable, and geographically fixed.[8] tLSM will only be complementary to the other core vector control measures (LLIN and IRS) in the context of integrated vector management and will not be a standalone intervention.

Case management

In the elimination context, including the optimization phase, a malaria case is defined as a parasitologically confirmed case of malaria (all instances of detected parasitaemia including gametocytaemia) with either a rapid diagnostic test (RDT) or by microscopy regardless of presence or absence of clinical symptoms of malaria.[9] Additionally, the recently published WHO terminology document defines a case as: 'occurrence of malaria infection in a person in whom the presence of malaria parasites in the blood has been confirmed by a diagnostic test.'[10] During elimination, all malaria infections are important, as they may lead to onward transmission.

In optimization phases, when the intensity of malaria is relatively high, attention will focus on ensuring universal diagnosis and effective treatment, and using gametocytocidal/transmission-blocking drugs to reduce transmission from infected people to mosquitoes.

Diagnosis

Diagnosis with either RDT or microscopy will be mandatory in all health facilities. Other sensitive tests may be introduced as they become endorsed for use by the WHO and available in the country. In health centres, diagnosis under microscopy will include species identification, staging including gametocytes, and quantification. At health posts, RDTs that detect both P. falciparum and P. vivax (not P. falciparum and pan) will be used.

A quality management system for diagnosis will be put in place to ensure deployment of quality assured products relevant to the malaria epidemiology, including ensuring availability of trained and competent personnel, internal quality control and external quality assurance (EQA), and accurate data management (refer to the malaria diagnosis quality assurance manual).

Treatment

Early and effective species-specific treatment with antimalarial medicines will be implemented in public health facilities in the following ways:

- P. falciparum cases will be treated with artemisinin-based combination therapy (ACT) and a gametocytocidal single-dose primaquine (sdPQ) on the first day of treatment immediately after confirmation.
- P. vivax will be treated with chloroquine. Primaquine for radical cure will be provided for 14 days but with special care to contraindicated populations.
- Dosage: The national treatment guidelines will be followed to ensure proper dosage of all recommended medicines.
- Quality of services: For all ages, only confirmed cases of malaria will be eligible for treatment with antimalarial medicines. Training, mentoring, and supportive supervision of health workers will be put in place with emphasis on strict adherence to the treatment of confirmed cases only and the national guidelines.
- Chemoprophylaxis: In the context of optimization, occupational and seasonal travellers (e.g., seasonal workers, mining, etc.) facilitate importation of malaria into malaria-free areas. Inhabitants of the elimination areas travelling to high-transmission areas will be targeted for prophylaxis.

Strengthening surveillance, monitoring, and evaluation

1. *Surveillance system:* The current national Health Management Information System (HMIS) captures all diseases and health conditions but provides only limited data for each. In addition, the HMIS is not adequate for timely response. For select notifiable diseases, including key malaria indicators, the Public Health Emergency Management (PHEM) is currently used for tracking weekly aggregated surveillance data from health facilities. The system is timelier, making it a temporarily suitable surveillance platform for the optimization phases of elimination efforts.

[8] World Health Organization (2013). **Larval Source Management: a supplementary measure malaria vector control.** An operational manual...ISBN 978 92 4 150560 4.

[9] World Health Organization (2012). **Disease surveillance for malaria elimination: an operational manual.** Geneva.

[10] http://apps.who.int/iris/bitstream/10665/208815/1/WHO_HTM_GMP_2016.6_eng.pdf

2. The PHEM, however, lacks disaggregated data by type of diagnostic test used although these data elements are available at the lower levels. Thus, there is a need to revise the malaria component of the PHEM tool to accommodate key data elements for elimination. Note that the later elimination phases require an advanced surveillance system (see pre-elimination phase below).

3. *Data elements:* The minimum malaria-related data elements to be collected through PHEM for tracking trends, progress, and stratification for the optimization phase are indicated below, but not limited to these. These indicators are critical for the interpretation of trends of malaria cases, deaths, and positivity rate, and effort will be made to incorporate them in the revised tool used for channelling upward.

- Suspected malaria cases
- Tested cases with microscopy
- Microscopy-positive cases in species (P. falciparum, P. vivax, mixed)
- Tested cases with RDT
- RDT-positive cases in species (P. falciparum, P. vivax, mixed)
- Inpatient malaria cases
- Malaria deaths
- Reporting completeness for malaria outpatient, malaria inpatient, deaths, laboratory-tested, and microscopy- and RDT-positives.

In addition, the following data are obtained from the HIMS for comparison and trend analysis

- All-cause outpatient cases
- All-cause inpatient cases
- All-cause deaths

1. *Data quality:* Data inconsistency remains a challenge. The PHEM assesses timeliness and completeness by health facility, but not by disease-specific indicators. During the optimization, systematic training and supervision on recording, record keeping, and data management will be undertaken. Data quality reviews including reviews of record management and availability of standard data registers and reporting forms with the standard set of data elements will be intensified (refer to the malaria elimination surveillance and monitoring and evaluation [M&E] manual).

2. *Stratification and mapping:* During the optimization, annual surveillance data (mainly API and TPR) will be used to monitor progress over time and to stratify localities*/kebeles* for better targeting and intensification of interventions in areas with relatively high transmission.

3. *Monitoring epidemics:* As malaria intensity reduces significantly, malaria epidemics may become a threat. Therefore, more sensitive epidemic monitoring tools will be introduced. As a baseline, the last three years (75% median or c-sum) of confirmed malaria cases and test positivity rates will be used as an epidemic threshold.

4. *Programme monitoring:* To monitor access and operational coverage of interventions and capacity of the programmes at all levels, the key programme indicators indicated below will be monitored to inform the optimization and required programme adaptations:

- Proportion of population at risk protected by ITNs
- Proportion of population at risk targeted for IRS
- Proportion of population at risk protected by IRS
- Proportion of health facilities with no stock out of key commodities for diagnosis and treatment (RDT, Giemsa, ACT, chloroquine, etc.)
- Proportion of suspected malaria cases that have had a diagnostic test
- Proportion of confirmed malaria cases that receive first-line antimalarial treatment according to national policy
- Completeness and timeliness of health facility reporting
- Availability of trained health personnel on malaria elimination

Additional indicators for quality of services will also be used as necessary (refer to the malaria elimination surveillance and M&E manual).

5. *Household surveys: Household surveys may be used only to assess coverage of interventions, knowledge, attitude, and practices.*

6. *Analysis: Currently very little data analysis is conducted at all levels and focus is limited to trends of aggregated data. During the optimization, spatial and temporal analysis of the core indicators will be systematically and regularly undertaken at a lower level. The results of the analysis will be used to guide adjustments of interventions and stratification. The trends of the core indicators listed below will be regularly analysed and interpreted.*

In addition, standard graphs reflecting the core indicators and complemented with stratification and mapping will be developed and interpreted routinely at all levels. These indicators and graphs will also be used as a checklist for supervision (refer to the surveillance and M&E manual).

Stewardship and leadership

Political commitment and domestic financing

High level political commitment and increased domestic financing for malaria will be critical to attaining and sustaining elimination in the medium to long run. The government's investment in malaria as part of the integrated health system in terms of human resource and infrastructure is significant. However, to create and maintain malaria-free zones it is essential that high level political commitment and leadership be assured at all levels. Top-level advocacy mechanisms will be developed to engage political leaders and partners to re-orient their roles from a control focus to an elimination focus. This will be implemented through official political discussions cascaded from national to the *kebele* level. The concept of malaria elimination and the rationale behind the commitment will be introduced to political authorities and lawmakers. Accountability mechanisms related to malaria elimination will be incorporated into the existing performance assessment of the leadership at each administrative level. The following are some of the key indicators that will be monitored using a standard bulletin:

- Per capita allocation specifically for malaria by the local authorities (excluding human resources).
- Percentage of case incidence reduced compared to the baseline.
- Percentage of death rates reduced compared to the baseline.
- Percentages of administration levels that have reduced case incidence to zero.

Community engagement

The existing community-based approaches will be used to ensure that communities are empowered to achieve malaria-free status. Specifically:

- Health extension workers (HEWs) and the health development army (HDA) will be equipped with the concepts and benefits of malaria elimination through an integrated refresher training (IRT).
- The IRT package will be revised to incorporate malaria elimination components; HEWs and HDAs will engage communities with standard messages (refer to the malaria elimination ACSM standard operating procedures).
- School antimalarial clubs, school mini-media, the media—including community radio and regional and national media—will also be used to reach different segments of the population.

Improving health workers' behaviour and practice

Currently, adherence of some health workers at health facilities to the national guidelines—particularly to results of diagnostic tests and provision of proper instruction to patients on use of medications—is suboptimal. In addition, recording and reporting of confirmed cases is inadequate. In order to address these challenges, the following will be implemented:

- A job aid on malaria quality of care monitoring and improvement based on the WHO/AFRO manual will be prepared and distributed.[11]
- Adequate in-service training will be provided.
- Supportive supervision using standard checklist will be practiced.

Strengthening partnership and establishing malaria elimination taskforce

The following actions will be conducted to ensure partners re-orient their contribution and roles toward malaria elimination:

[11] AFRO's draft document on malaria quality of care monitoring and improvement

- Aligning the strategies and resources of the partners with the national elimination roadmap.
- Mapping of the partners and their comparative advantages in the elimination districts.
- The signing of a memorandum of understanding (MOU) with key partners to ensure long-term commitment and mobilization of predictable resources.
- The inclusion of non-health sectors in the malaria coordination mechanism and the conducting of regular partnership meetings.

A national malaria elimination taskforce (MET) will be established at all levels and will serve at all elimination phases. At the national level, the Minister of Health will chair and coordinate a malaria elimination taskforce (MET) in a multisectoral approach to ensure that key stakeholders fulfil their commitments and add value to the elimination efforts. The taskforce will constitute main domestic stakeholders such ministers of offices and representatives of relevant international agencies and NGOs. The MET may set up a temporary technical working group (TWG) tasked with supporting implementation, monitoring progress, evaluating impact, and providing technical recommendations to resolve challenges. Both the MET and TWG will have their own terms of reference (TOR).

Capacity building and enabling environment

As an initial step in the preparation for elimination, optimization phases will focus on strengthening existing programme capacities, especially staffing and expertise at all levels.

1. *Human resources:* The minimum staffing requirement for each of the elimination steps at each level will be developed and endorsed. Meanwhile, for the optimization phase at least *one person per district will be* assigned as malaria elimination and surveillance officer from existing district health team. At regional and zonal levels, either new staffs or existing staffs will be *specifically assigned for malaria elimination (at least one for epidemiology and surveillance and one for vector control)*. At national level, at least three high-profiled officers are required *(two public health/ epidemiologists and one entomologist).*

2. For the later steps of elimination, re-structuring of programme management will be required to successfully implement the required malaria elimination interventions.

3. *Training:* Cascaded and on-job training of health workers will be conducted focusing on malaria elimination, programme management, diagnosis and treatment, vector control, surveillance and M&E, epidemic preparedness and response, and advocacy and communication and social mobilization (ACSM). The private sector will be trained on diagnosis, treatment, and reporting. Enforcement mechanisms will be put in place to ensure that the private sector is trained and motivated to comply with national roadmap.

4. *Supply chain management of malaria commodities:* Concrete efforts will be made in strengthening systems to ensure maintenance and improvement of existing procurement, supply, and management of anti-malarial medicines and commodities. This includes *procurement* to ensure that the products procured comply with the epidemiological and operational needs of the country; the national programme will be involved in the development of product specifications as well as the *evaluation of products* procured.

Operational research and introduction of new tools

The current antimalarial interventions and tools may not be optimal to guarantee elimination. The increasing development of resistance to insecticides and drugs, the change in biting/resting behaviour of mosquitos, socio-economic changes, population movement (internal and external), and climatic changes will be among the key challenges that will be considered for operational research and adaptation locally. The government will put provisions for operational research in the local context. Furthermore, implementation of new tools and products such as a new generation of insecticides, diagnostic tools, and transmission-blocking medicines will be considered as they are developed and approved for use.

Phase 2: Malaria pre-elimination

In contrast to the optimization phase, in which the objective is to maximize existing interventions and reduce the burden of malaria to low levels, the pre-elimination phase focuses on (1) institutionalizing surveillance as a core intervention through the establishment of an enhanced elimination health information system to identify high-transmission areas (transmission foci) and guide targeting of interventions, (2) undertaking active case detection (ACD) to guide case and foci identification and investigation followed by response, and (3) implementing quality assured diagnosis including external quality assurance and enhancing health system and capacity-building.

Purpose: The purpose of this phase is to further reduce transmission and introduce additional approaches and tools to the optimization interventions.

Eligibility criteria: Districts will be classified as eligible for pre-elimination when they exhibit either of the following: (1) they have an API of 1–5 or lower, (2) they have a low TPR of 1–5% for all ages, and (3) they have built systems and programme capacity through the optimization step and they are located within a zone designated for subnational elimination.

Strategic actions: While maintaining the prevention and treatment interventions attained in the optimization step, the districts in the pre-elimination phase will need to introduce and implement the following additional measures:

1. Institutionalizing surveillance as a core intervention through:
    - Establishment of an enhanced elimination health information system/database (system requirement is given below).
    - Recording and immediate notification of cases.
    - Linking surveillance with response (deployment of interventions).
    - Identifying active transmission areas (foci) using passive case detection (PCD) and guiding targeting of interventions.
    - Undertaking active case detection (ACD) to guide case and foci identification and investigation followed by response.
2. Targeting vector control interventions in all active transmission foci.
3. Implementing quality assured diagnosis including external quality assurance.
4. Increasing domestic financing.
5. Enhancing health system and capacity-building.

Institutionalizing surveillance as a core intervention

At the stage of pre-elimination and onward, the surveillance system will play a critical role in guiding the response systems and the decision to implement an intervention or a combination of interventions.

Building on the achievements of the strengthening of surveillance during the optimization phase, in the pre-elimination phase a new surveillance system will be introduced and enhanced. This will involve the establishment of much-strengthened surveillance systems that can transform malaria surveillance into a core intervention by (1) providing high-quality, real-time information on case and foci detection, (2) immediately noting, investigating, classifying, and responding to cases, (3) implementing laboratory quality control, (4) training staff, (5) educating the public, and (6) maintaining malaria supply chain management.

Requirements of elimination information system

An elimination health system will be developed and rolled out in all elimination districts that:

- Is compatible with national health information systems.
- Is simple and feasible for local application and sustainable
- Provides targeted and timely response by managers who are guided by the analysis at the implementation level (district, primary health care unit and health post, household).
- Monitors and assesses progress and challenges—feeding back to the surveillance system—using district level staff supervision at village level.

- Performs geo-positioning (mapping) with spatial analysis of clusters of cases (ranging from households to foci) and mosquito breeding sites.
- Provides easy access to data for key and relevant members of the health system at all levels for immediate analysis, interpretation, and response while ensuring the integrity of the database.
- Has import and export features for easy information sharing as needed.
- Has an open-source database, secured for internal use with enough capacity for data storage and analysis at all levels.
- Has customized output and feedback with automated reports at different levels of the health system. Outputs will include: standard graphs, tables, geo-referencing (mapping) for ease of interpretation, work task lists, and periodic reports for internal use.
- Has internal capacity; software/system owned and run by the government requiring little external maintenance and easily modifiable with local expertise.

At the start of the pre-elimination phase, the elimination health information system may not fulfil all the above elements but should have the design and features to be fully enhanced in the elimination phase.

Passive case detection and response

Passive case detection (PCD) is the detection of malaria cases among patients who on their own initiative visit health facilities, usually for febrile disease. Spatial analysis of the PCD data will be conducted and clustering of cases will guide identification of foci in a district, which in return will help in tailoring response or interventions. Given the fact that malaria transmission is highly seasonal and lasts a few months, foci identification will be done well in advance before the transmission season. PCD is an important part of the following key activities:

- Annual review and analysis of the surveillance data to identify the foci (including temporal analysis to rule out epidemics).
- Foci investigation using on-site entomological assessment to identify and record breeding sites.
- Assessment of other risk factors such as population movement, particularly from high-transmission areas.
- Weekly analysis for identification of clustering of cases and epidemic-monitoring.
- Response to foci confirmed with PCD
- Upon confirmation of foci with PCD, the following preventive and treatment interventions are triggered (single or combined) as appropriate:
- Focal testing and treatment (FTAT) (to ensure that new foci are also taken care of) based on defined criteria for FTAT.
- Focal or tIRS, tLSM (if breeding site is permanent), and ACSM at community and household level.
- Targeted mass drug administration (tMDA) in the foci (mainly for P. falciparum) if it is believed that parasite reservoirs (asymptomatic, gametocyte carriers) is a risk.

Active case detection and response

As the result of the optimization phase, malaria transmission often becomes increasingly focal where a considerable proportion of the population may remain malaria-free while others experience multiple episodes/infections. These infections are related to variations in malaria infection suitability for transmission tend to cluster into foci.

At this phase of malaria elimination, programmes, through a strategy of surveillance and response, must be vigilant and seek to rapidly find every malaria infection (case-based surveillance) to prevent them from spreading. In these settings, additional aggressive strategies to identify and target all people carrying parasites (symptomatic, asymptomatic, and gametocyte carriers) are required to clear the 'parasite reservoirs' from the community and ensure that they become non-infectious. The most widely adopted surveillance and response approach is called active case detection (ACD). ACD takes advantage of the fact that infections are clustered spatially and temporally within transmission foci or hotspots. ACD may be conducted in two ways:

Reactive active case detection

Reactive active case detection (RACD) is triggered whenever a case or a cluster of cases are identified by passive case detection (PCD) to identify additional infections by testing household members, neighbours, and others living in close proximity (within a pre-determined radius) to the passively detected case (index case) or with shared risk factors.[12,13,14] This will be used to fill gaps of PCD in detection of malaria infections as early as possible and to clear the parasite reservoir. ACD will be implemented at the later stage of pre-elimination and will be targeted at foci with very few cases. This is an approach to systematically clear parasites from people using the T3 approach (Test. Treat. Track.) (i.e., every suspected malaria case should be tested, every confirmed case should be treated, and the disease should be tracked through a timely and accurate surveillance system).[15]

Pro-active active case detection

Pro-active active case detection (PACD) is triggered by experts' opinions or local authorities instead of by passively detected cases targeting certain segments of a population. PACD is done to search for infections/cases in population groups that are underserved by existing health services and that are considered to be at high risk, such as migrant workers and tribal populations, and in areas where breeding sites are well known or defined and clusters of cases are reported. PACD in new or existing foci will involve the following:

- Case notification to the next level (using a case notification form).
- Testing of all individuals with or without fever residing within a 1km radius based on a defined criteria for parasitological testing.

Foci investigation includes:

- Breeding sites using entomological assessment.
- History of transmission in the foci to determine new or old foci.
- Vulnerability and receptivity.
- Resources available in the foci for response.

Response to foci confirmed with either RACD or PACD

Upon confirmation of foci with ongoing transmission, the response should include implementation of the following:

- FTAT or tIRS, tLSM (if breeding site is permanent), ACSM at household and community level.
- tMDA in the foci (mainly for *P. falciparum*) if parasite reservoirs (asymptomatic, gametocyte carriers are believed to be a risk.
- For successful tMDA and FTAT, the following warrants attention and consideration:[16, 17]
- Insufficient coverage will fail to reduce transmission because of untreated infections and foci.
    - Visits should be thoroughly planned and prepared for, and the targeted population should be informed of the dates and times they will be visited to ensure high community acceptance and involvement.
    - There should be complete coverage of the target population and therefore tMDA and FTAT should be conducted when family members are most likely to be at home (before or after work or school).
- tMDA targets P. falciparum (and potentially P. vivax) coupling ACTs with sdPQ with the first dose as directly observed therapy.
- tMDA and FTAT are conducted during the dry season (spring), when mosquito densities are lowest and infections are most clustered. MDA/ FTAT during periods of higher transmission facilitate quick recovery of parasite prevalence levels.
- Every effort should be made to visit the houses that had been missed, or were locked. An attempt should be made to contact people who were absent during the visit, even if there was

[12] Lindblade K, Steinhardt L, Samuels A, Kachur SP, Slutsker L: **The silent threat: asymptomatic parasitemia and malaria transmission.** Expert Rev Anti Infect Ther 2013, 11:623–639.

[13] Moonen B, Cohen JM, Snow RW, et al. **Operational strategies to achieve and maintain malaria elimination.** Lancet 2010, 376:592–603.

[14] WHO(2012) Disease surveillance for malaria elimination: an operational manual. Geneva

[15] Smith Gueye C, Sanders KC, Galappaththy GN, et al. Active case detection for malaria elimination: a survey among Asia Pacific countries, Malar J. 2013

somebody in the house. This may necessitate revisiting the village.

- Foci/hotspots should be targeted at approximately the same time and this needs to be repeated several times at regular intervals/ rounds to maximize impact.
- Care must be taken to identify contraindicated population groups.

Both implementation of case or foci investigation and classification conducted through RACD or PACD will be conducted following the instruction provided in the malaria elimination surveillance and M&E manual.

Programme management for pre-elimination

In the pre-elimination phase, the programme will be required to re-orient its management and staffing arrangements. Additional expertise dedicated to elimination will need to be deployed. A distinct elimination team will need to be set up at each level from national to the district level. This will be guided by a programme management policy briefing document.

National level: The national level is responsible for policy-and decision-making, preparation of guidelines and standards, establishing a malaria elimination information system, facilitating malaria supply chain management, resource mobilization, harmonization of partner's effort, coordination, supervision, and monitoring and evaluation of programme management and progress. At minimum, staffing should include public health/ epidemiologists, medical officers, parasitologists, entomologists, and IT/data managers. The national reference laboratory provides support to the Ministry of Health in establishing quality management systems for diagnostic testing. Malaria elimination programme management requires a briefing document for all levels from national to health post with terms of reference.

Regional level: A team of public health specialists, medical officers, parasitologists, laboratory technologists, entomologists, and data managers with the following generic terms of reference, but not limited to is responsible for:

- Malaria surveillance and response, including data collection and analysis, monitoring and early recognition of outbreak, or changes in disease trends.
- Detection and investigation of case and foci applying to either RACD or PACD.
- Entomological surveillance and vector control activities.
- Quality application of all targeted interventions (tIRS, tLSM, tMDA).
- Quality assurance of diagnostic testing.
- Establishing new public sector malaria testing and treatment posts in active foci.
- Preparing and implementing ACSM in the local context.
- Ensuring private sector engagement.

Re-orientation of health workforce in the elimination districts

Cascaded/on-site training and supervision will be put in place to ensure that the health workforce—consisting of both public and private health care professionals—at health facilities will become responsible for the passive case detection and reporting.

Laboratory support for surveillance and quality assurance

A national laboratory quality management system will be put in place and all laboratories will be part of a quality management network. The national and regional/referral laboratories will run the quality management system. Laboratory diagnostic services will be free of charge to the patients at public facilities and, if possible, also in the private facilities. The quality management system should (1) reconfirm positive tests; (2) retest a sample of positive and negative specimens, and (3) organize testing panels for all participating laboratories (refer to malaria diagnosis and quality assurance manual).

Involvement of the private sector

This will involve policy revision with requirements to be met by the private service providers to ensure

[16] Gosling RD, Okell L, Mosha J, Chandramohan D, 2011. **The role of antimalarial treatment in the elimination of malaria.** Clin Microbiol Infect, 17: 1617-1623.

[17] Okell LC, Griffin JT, Kleinschmit I, Hollingsworth TD, Churcher TS, White MJ, Bousema T, Drakeley CJ, Ghani AC, 2011. **The potential contribution of mass treatment to the control of Plasmodium falciparum malaria.** PLoS One, 6(5): e20179.

that, at minimum, every suspected case of malaria is tested before treatment, reported immediately, and that case investigation and follow-up are facilitated. All private sector laboratories must report the number of patients tested weekly to the district, in addition to immediate notification of people with a positive malaria test. Private pharmacies should refer all suspected malaria cases to laboratories certified to test for malaria and should not dispense antimalarial medicines without a prescription.

Phase 3: Malaria elimination

The elimination phase focuses on the interruption of local transmission or ending local transmission. This is achieved by detecting every infection and managing each case properly.

Purpose: The purpose of this step is to attain zero local cases. It is a step meant to further and intensify the surveillance system that has, with targeted interventions, become a core intervention aimed at achieving interruption of local transmission.

Eligibility criteria: Districts will be classified as eligible for elimination when (1) they have an API less than one, (2) they have been successfully transforming surveillance systems into core interventions through the pre-elimination phase, (3) they are located within a cluster of districts designated for the elimination phase that share boundaries.

Strategic actions

The programme at this step will implement the following:

- Case-based surveillance systems with case-based registers and database (including geo-coded case-based mapping).
- Targeted vector control interventions in active foci.
- Continued parasite control (using gametocytocidal anti-malarial drugs).
- Case and hotspot/foci investigation, investigation, and classification.
- Quality-assured diagnosis including external quality assurance and genotyping slide-banking capacity.
- Introduction of more sensitive diagnostic tools (e.g. polymerase chain reaction [PCR])
- Cross-border collaboration to reduce the threat of re-establishment of malaria from imported cases.
- Community-based surveillance systems using the HEWs and HDAs will also be introduced.

Strengthening the elimination surveillance system is additive and will build on what has been established in the pre-elimination step. At this stage, a case-based register and register of foci will be introduced into the system (refer to malaria elimination surveillance and M&E manual). In the elimination step, cases occur sporadically or in distinct foci. The size of foci also diminishes and the last localities with limited transmission will be called hotspots ('a geographically discrete household or group of households that maintain higher malaria transmission than their surrounding') (Annex 1). Imported cases may comprise a significant portion of all cases and may pose a risk for re-establishment of transmission in areas where transmission has been interrupted.

In a hotspot, malaria transmission intensity exceeds the average level. It consists of a single household or groups of households maintaining a reservoir of parasites that fuel transmission in the high-transmission seasons. Several hotspots of malaria transmission may be present in a single focus of malaria transmission.[18] The difference between a hotspot and foci with regard to malaria transmission is that a hotspot is the source of infection within transmission foci, whereas foci form independent malarious areas that may contain hotspots.

A case or a cluster of cases detected through PCD or ACD, as described above in the pre-elimination step, will be notified immediately and will trigger a thorough case investigation and classification.

Cases will be classified as local (indigenous, introduced, relapsed, and induced) or imported. Such classification of cases will then lead to detection of possible hotspot(s) to be followed with classification of the foci as active and inactive foci and will be updated regularly into the established database of foci.

[18] Sturrock HJ, Hsiang MS, Cohen JM, Smith DL, Greenhouse B, et al. (2013) **Targeting Asymptomatic Malaria Infections: Active Surveillance in Control and Elimination.** PLoS Med 10(6).

Table 3. Classification of foci (simplified from the WHO elimination manual[19])

Type	Definition	Operational criteria
Active	A focus with ongoing transmission	Locally acquired case(s) have been detected within the current transmission season.
Non-active residual	Transmission interrupted recently (1–3 years ago)	The last locally acquired case(s) was detected in the previous transmission season/calendar year or up to 3 years earlier.
Cleared	A focus with previous cases, but no current transmission or within the last three years.	Only imported, induced, or relapsing/old cases detected in current calendar year or transmission season. No locally-acquired case(s) detected up to 3 years earlier.

Active foci can be further divided into two categories:

- *Endemic foci:* Transmission is occurring and is not effectively controlled. All cases are classified as local.
- *New foci:* Transmission is occurring in an area that has had transmission for less than two years; and in foci that had no history of transmission.

Response: On active foci/hotspot

Upon confirmation of active foci, a response will be triggered with preventive and treatment interventions:

- tIRS, tLSM (if breeding site is permanent) in hotspots.
- Sustained behavioural change communication (SBCC) at household and community level.
- Regular monitoring in the hotspots (using community-based surveillance system)
- tMDA in the foci (mainly for *P. falciparum*) if parasite reservoirs (asymptomatic, gametocyte carriers, and low health seeking behaviour) are believed to be a risk.
- Radical treatment of *P. vivax* (entire population except those contraindicated).

In a low-transmission/elimination setting where malaria transmission is becoming patchy and clustered into foci/hotspots, there is no reason to assume universal coverage of vector control interventions, especially IRS. During elimination, IRS can have a major role in clearing the last residual foci/hotspots of transmission. Therefore, IRS is used more selectively based on malaria surveillance, and is targeted toward (1) locations where there are residual malaria foci/hotspots to protect the resumption of transmission and to contain local outbreaks (receptivity), (2) areas exposed to frequent importation (vulnerability) of malaria parasites, or (3) areas with a high risk of re-establishment or a resurgence of transmission.[20]

Response: On imported cases

When subnational malaria-free zones have expanded, leading to nationwide elimination, and the interruption of local transmission in all areas, imported cases will be major concern. Therefore, in addition to the above interventions, at this stage the following efforts will be intensified:

Cross-border collaboration and control with neighbouring countries.

Fever screening and tracking of imported case (when local cases are very few).

Programme management

The programme management and staffing arrangements described for the pre-elimination step will be the same except that these efforts will be further elaborated upon and intensified in the elimination step.

[19] Disease surveillance for malaria elimination: an operational manual. WHO. 2012. ISBN 978 92 4 150333 4

[20] WHO (2013). Indoor residual spraying: **An operational manual for indoor residual spraying (IRS) for malaria transmission control and elimination.** Geneva

Phase 4: Prevention of re-introduction

Once elimination of malaria is achieved in a given area, the focus will then be on the prevention of re-introduction of cases to maintain malaria-free status.

Purpose: The purpose of the prevention of re-introduction is to sustain zero local transmission or malaria-free status attained through years of elimination efforts.

Criteria: All territories or districts that have interrupted local transmission for the previous three years. This will be applicable to districts that have eliminated malaria and had no local malaria cases for three consecutive years.

Strategic actions: Given the fact that Ethiopia is bordered by malaria-endemic countries (Eritrea, Djibouti, Kenya, South Sudan, Sudan, and Somalia), some of which are also highly endemic, imported cases from any of these countries inevitably poses to Ethiopia the threat malaria re-establishment. Therefore, the critical operational activity will be to ensure that imported cases do not lead to local secondary cases and re-establishment of focus. When the country achieves elimination nationwide and is at the prevention of re-introduction stage, vigilance will become the sole dependable intervention. This will also apply to districts who have achieved malaria elimination through subnational elimination as these districts will face the threat of internal importation from bordering districts within the country. Vigilance will involve ensuring that both the public and private health service is sensitive and attentive to any occurrence of malaria in areas where either malaria never existed or from which it had been eliminated due to control efforts. Vigilance should focus particularly in areas where epidemiological risks are high due to:

- Vulnerability (where the re-introduction of malaria parasites into malaria-free areas is likely).
- Receptivity (likelihood that malaria infections will result in secondary cases).

This will be undertaken based on analyses of entomological surveillance data collected during the pre-elimination period and comparing with the post-elimination period.

Prevention of malaria importation

Activities to prevent malaria importation are aimed at preventing infection and disease among people travelling to or arriving/returning from malaria-endemic areas within the country or other countries. These could include refugees, international travellers, seasonal labourers, and internally displaced persons. In some cases, adequate and efficient surveillance of such groups is possible. For example, effective monitoring of organized groups of specialists, students, workers, and tourists can be carried out by health centres/clinics that provide care to these segments of population and by extending and clarifying the health care obligations of bodies such as tour operators and employers.

Prevention of malaria importation will include:

- Detailed epidemiological investigation of malaria cases among immigrants, students, travellers, and similar groups—both local residents returning home and residents of malaria-endemic areas.
- Prevention of malaria importation as a result of active mosquito migration from endemic districts or countries.
- Prevention of passive malaria importation into the country (malaria parasites brought into an area by infected mosquitoes that are passively transported, usually by aircraft). Key activities will be on airports and land border crossing points (quarantine stations and transport control centres may be considered).

At this stage the following will be the focus of surveillance activities:

- Early detection of imported malaria cases that pose a risk for renewed transmission.
- Vigilance to ensure that imported cases do not lead to re-introduction of transmission.
- Maintaining capacity for immediate notification, case investigation, and radical cure of all cases.
- Monitoring changes in the levels of receptivity and vulnerability.
- Cross-border surveillance and collaboration.

When malaria re-establishment is confirmed with local transmission in a focus or foci, the following measures will be taken:

- Focal IRS, LSM (if breeding site is permanent) in hotspots.
- SBCC at household and community level.
- Rigorous monitoring and follow-up of the individual cases and hotspots.
- tMDA (mainly for P. falciparum).
- In cases of P. vivax, radical treatment and tracking of the individual cases for a certain number of months to ensure that relapses are radically cured and do not lead to re-establishment.
- Generally all the necessary documentation and activities that need to happen to get WHO certification should be undertaken.

5. M&E of the implementation of the elimination roadmap

5.1 Monitoring the implementation of elimination

Mechanisms will be put in place for monitoring the performance of the programme. Monthly, quarterly, biannual, and annual reviews will aim to monitor availability of services, supply of commodities, disease trends including epidemics monitoring. Reviews will also guide the tailoring of resources and response. The impact indicators are projected based on expected annual decrease at a constant rate to reach zero malaria cases by 2030. Data for progress monitoring will come from multiple sources including routine systems, household and health facility surveys, research institutions, and other relevant sources. Data for progress monitoring will come from multiple sources including routine systems, household and health facility surveys, research institutions, and other relevant sources.

Table 4. Performance framework for malaria elimination in Ethiopia[21]

Categories	Indicators	Programme phases				Progress tracking			
						Baseline/milestones/ target			
		1	2	3	4	2015	2020	2025	2030
Impact									
Morbidity	Annual parasite incidence	x	x	x	-	<20	<10	<1	0
Mortality	Malaria death rate	x	x	x	-	<0.5	<0.3	<0.05	0
Interruption of transmission	Number of districts where local malaria transmission has been interrupted	0	0	x	x	0	100	439	565
Outcome									
Core intervention	Proportion of population who slept under LLIN (among targeted population)	x	x	x	-	65%	80%	90%	NA
	Proportion of districts applying high quality and targeted IRS (tIRS)	x	xx	xxx	-	50%	85%	95%	NA
	Proportion of suspected cases tested	x	x	x	x	90%	100%	100%	100%
Routine Surveillance	Percentage of health facility including private facilities reporting complete, timely and quality data (with core indicators)[22]	x	xx	xxx	xxxx	65%	80%	100%	100%
Surveillance as intervention	Number of districts with established foci database	x	x	x			239	439	565
	Proportion of foci detected, investigated and responded with within appropriate time (1-3-7 days) using intervention.	x	xx	xxx	xxx	0	30%	70%	100%
	Number of districts with analyzed incidence of malaria at village level	x	xx	xxx	xxxx	0	239	439	565
	Number of districts with case-based surveillance	x	xx	xxx	xxxx		239	439	565
	Proportion of cases investigated, classified, and responded with appropriate intervention	x	xx	xxx	xxxx		30%	70%	100%

[21] This M&E framework indicates a national achievement where the success in the elimination task improves the impact and outcome indicators at national level.

[22] With outpatient malaria cases, inpatients and deaths received at national level

5.2 Evaluation of the implementation of elimination

While evaluation of the elimination programme will be a combination of the indicators in Table 4, the main indicator for the evaluation will be the attainment of zero local cases (interruption of transmission) by a district in a given periodic review. Periodic reviews will aim to assess the status of each of the four phases, progress, and impact using five-year milestones (2020, 2025, and 2030).

This will ensure that progress is on track and corrective actions are taken. For this, the progression of districts along the four elimination phases will be evaluated using the milestones indicated in Table 4. The districts in each step in certain periods of time will be reviewed and updated every year based on progress made using the epidemiological and operational criteria.

Table 5. Number of districts in each phase at given period in the path toward 2030

Total number of districts in the country*				845			
Malarious districts*				565			
Malaria-free districts*				280			
Years	2017-18	2019-20	2021-22	2023-24	2025-27	2028-30	Post 2030
Percentage** of districts at each phase	42%	42%	78%	100%	100%	100%	100%
# districts in Optimization	239	-	200	126	-	-	-
# of districts in Pre-elimination	-	239	-	200	126	-	-
# of districts in Elimination	-	-	239	-	200	126	-
# of districts in prevention of reintroduction***	-	-	-	239	239	439	565 +280

*NSP, 2017-2020

**Calculated by dividing the number of *woredas* targeted for one phase by the total number of malarious *woredas* in the country

***Includes malaria-free

[22] With outpatient malaria cases, inpatients and deaths received at national level

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