Kingdom of Cambodia

Nation Religion King

Ministry of Health

Surveillance for Malaria Elimination

Operational Manual

CAMBODIA

2017 Edition

National Center for Parasitology, Entomology, and Malaria Control

Foreword

The Surveillance Operational manual has been developed in line with the Government's Malaria Elimination Action Framework (MEAF) 2016-2020 and GMS Regional Strategy for Malaria Elimination 2015-2030 with an overall goal to achieve falciparum elimination by 2020.

This manual is a product of extensive consultations and collaboration between CNM stakeholders, WHO and technical partners. It provides the strategic framework for the combined set of interventions required for malaria elimination. It is also designed as a practical guide for implementation of field operations at all levels including annexed standard operating procedures.

I am confident that this manual provides the necessary guidance for surveillance as an intervention to achieve malaria elimination and I therefore urge all stakeholders to put all effort into its implementation to enable the country move towards the vision of malaria-free Cambodia.

Phnom Penh, August 31st, 2017

Professor ENG HUOT

Secretary of State

PREFACE

DR HUY REKOL
Director, CNM

The Surveillance Operational manual has been developed in line with the Government's Malaria Elimination Action Framework (MEAF) 2016-2020 and GMS Regional Strategy for Malaria Elimination 2015-2030 with an overall goal to achieve falciparum elimination by 2020. The strategic objective related to surveillance is to detect, immediately notify, investigate, classify and respond to all cases and foci.

The intention of this document is to provide Cambodia with a framework for malaria elimination. It gives guidance on the tools, activities, and dynamic strategies required to achieve interruption of transmission and to prevent re-establishment of malaria. The manual is designed as a practical guide to standardize implementation of surveillance strategies at the central, peripheral, and community level. It gives detailed guidance for field operation to be conducted by district health staff, health center officers, village malaria workers and other points of care.

Sections of this manual will be the basis for building capacity of district level and peripheral staff based on OD's stratification and related surveillance intervention package. It outlines all surveillance standard operating procedures (SOPs) that each level health staff is expected to follow.

This manual will be revised every year based on results produced and the availability of new evidence or tools and the set of interventions be gradually expanded.

Dr. HUY REKOL

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ABBREVIATIONS

ACD	Active Case Detection
ACT	Artemisinin-based Combination Therapy
API	Annual Parasite Index
AS-MQ	Artesunate-Mefloquine
BCC	Behaviour Change Communication
CBNC	Cattle Baited Net Collection
CNM	National Center for Parasitology, Entomology and Malaria Control
DHA	Dihydroartemisinin-Piperaquine
D0	Day zero
FDH	Former District Hospital
GMS	Greater Mekong Subregion
GIS	Geographic Information System
G6PD	Glucose-6-Phosphate Dehydrogenase
HC	Health Center
HMIS	Health Management Information System
HLC	Human Landing Collection
HP	Health Post
IEC	Information Education Communication
LAMP	Loop-Mediated isothermal Amplification
LLIN	Long-Lasting Insecticide Net
LLIHN	Long-Lasting Hammock Insecticide Net
M&E	Monitoring and Evaluation
MEAF	Malaria Elimination Action Framework
MDR	Multidrug resistance
MIS	Malaria Information System
MMW	Mobile Malaria Workers
MMP	Mobile and Migrant Populations
MOH	Ministry Of Health
NTG	National Treatment Guidelines
NRL	National Reference Laboratory
OD	Operational District
PCD	Passive Case Detection
PCR	Polymerase Chain Reaction
P.f.	Plasmodium falciparum
P.v.	Plasmodium vivax
PHD	Provincial Health Department
PMW	Plantation Malaria Workers
PPM	Public-Private Mix
QA	Quality assurance
RCAF	Royal Cambodian Armed Forces
RCD	Reactive Case Detection
RDT	Rapid Diagnostic Test
RH	Referral Hospital
TES	Therapeutic Efficacy Study
VMW	Village Malaria Workers
WHO	World Health Organization

GLOSSARY OF TERMS

Active case detection:

The detection of malaria infections at community and household level among population groups that are considered to be at high risk. Active case detection can consist of screening for fever followed by parasitological examination of all febrile patients or as parasitological examination of the target population without prior screening for fever. Active case detection can be used to fill gaps in the passive case detection system and to detect malaria infections as early as possible in populations that may have a high risk of infection.

Annual blood examination rate:

The number of people receiving a parasitological test for malaria per 100 population per year.
Case-based surveillance: Every case is reported and investigated immediately.

Case definitions:

- Confirmed malaria: Any case in which, regardless of the presence or absence of clinical symptoms, malaria parasites have been demonstrated in a patient's blood by microscopy, a rapid diagnostic test or a molecular diagnostic test.
- Suspected malaria: Patient illness suspected by a health worker to be due to malaria. The criteria usually include fever. All patients with suspected malaria should receive a diagnostic test for malaria, by microscopy or a rapid diagnostic test.

Case classification:

- Imported: A case in which the origin of infection can be traced to a known malarious area outside the country where the case was diagnosed.
- Indigenous: A case contracted locally with no evidence of importation and no direct link to transmission from an imported case.
- Induced: A case in which the origin of infection can be traced to a blood transfusion or other form of parenteral inoculation but not by a natural mosquito-borne inoculation.
- Introduced: A case contracted locally, with strong epidemiological evidence linking it directly to a known imported case (first generation from an imported case, i.e. the mosquito was infected from a case classified as imported).
- Locally transmitted: A case acquired locally by mosquito-borne transmission. Locally acquired cases can be indigenous, introduced or relapsing; the term "autochthonous" is not commonly used.

Case, index:

A case in which the epidemiological characteristics trigger additional active case or infection detection. The term is also used to designate the case identified as the origin of infection of one or a number of introduced cases.

Case investigation:

Collection of information to allow classification of a malaria case by origin of infection. Case investigation includes administration of a standardized questionnaire to a person in whom a malaria infection is diagnosed.

Case follow-up:

Periodic re-examination of patients with malaria. It may involve blood examination and treatment if the patient did not respond to previous medicines. Case follow-up is part of surveillance.

Case management:

Diagnosis, treatment, clinical care and follow-up of malaria cases.

Case notification:

Compulsory reporting of detected cases of malaria by all medical units and medical practitioners, to either the health department or the malaria elimination service (as per law or regulation).

GLOSSARY OF TERMS

Case, relapsing:

Malaria case attributed to activation of hypnozoites of P. vivax or P. ovale acquired previously.

Certification of malaria-free status:

Granted by WHO after proof beyond reasonable doubt that the chain of local human malaria transmission by Anopheles mosquitoes has been fully interrupted in an entire country for at least 3 consecutive years.

Elimination:

Reduction to zero of the incidence of infection by human malaria parasites in a defined geographical area as a result of deliberate efforts. Continued measures to prevent re-establishment of transmission are required.

Endemic:

Applied to malaria when there is an ongoing, measurable incidence of cases and mosquito-borne transmission in an area over a succession of years.
Epidemic: Occurrence of cases in excess of the number expected in a given place and time.

Eradication:

Permanent reduction to zero of the worldwide incidence of infection caused by human malaria parasites as a result of deliberate efforts. Intervention measures are no longer needed once eradication has been achieved.

Evaluation:

Attempts to determine as systematically and objectively as possible the relevance, effectiveness and impact of activities in relation to their objectives.

External quality assessment:

A system by which a laboratory's performance is checked objectively by an external agency or facility or a reference laboratory.

False negative (or false positive):

A negative (or positive) result in a test when the opposite is true.

Focus:

A defined, circumscribed locality situated in a currently or former malarious area containing the continuous or intermittent epidemiological factors necessary for malaria transmission.

Gametocyte:

The sexual reproductive stage of the malaria parasite present in the host's red blood cells.

Incubation period:

The time between infection (by inoculation or otherwise) and the first appearance of clinical signs, of which fever is the commonest.

Line list:

Information on cases recorded in rows and columns, with data for each case in columns across one row. The information may include case identification number; demographic factors (patient's name, address, age, sex); clinical factors (date of attendance, type of test, test result, treatment received); intervention factors (house sprayed, insecticide-treated net ownership, preventive therapy).

Local mosquito-borne malaria transmission:

Occurrence of human malaria cases acquired in a given area through the bite of infected Anopheles mosquitoes.

Malaria case:

Any individual with malaria parasites demonstrated in the blood. The term is equivalent to malaria infection. In settings where malaria is actively being eliminated, a "case" is the occurrence of any confirmed malaria infection, regardless of the presence or absence of clinical symptoms. Parasite can be detected by microscopy or a rapid diagnostic test. Sub-microscopic infections can be detected by nucleic acid-based amplification (e.g. polymerase chain reaction assays to detect parasite DNA or RNA).

Malaria-free:
An area in which there is no continuing local mosquito-borne malaria transmission and the risk for acquiring malaria is limited to introduced cases.

Malaria incidence:
The number of newly diagnosed malaria cases during a specified time in a specified population.

Malaria prevalence:
The number of malaria cases at any given time in a specified population, measured as positive laboratory test results.

Mass drug administration:
Administration of antimalarial treatment to every member of a defined population or every person living in a defined geographical area (except those for whom the medicine is contraindicated) at approximately the same time and often at repeated intervals. It is usually performed in order to reduce the parasite reservoir of infection radically and thus reduce transmission in a population.

Mass screening, testing and treatment:
Screening of an entire population for risk factors, testing individuals at risk and treating those with a positive test result.

Mass testing and focal drug administration:
Testing a population and treating groups of individuals or entire households in which one or more infections are detected.

Mass testing and treatment:
Testing an entire population and treating individuals with a positive test result.

Monitoring (of programmes):
Periodic review of the implementation of an activity, seeking to ensure that inputs, deliveries, work schedules, targeted outputs and other required actions are proceeding according to plan.

National focus register:
Centralized computerized database of all malaria foci in a country.

National malaria case register:
Centralized computerized database of all malaria cases registered in a country, irrespective of where and how they were diagnosed and treated.

National reference laboratory:
This may be part of the central public health laboratory, the NMCP or a government institution in academia. It plays an essential role in the preparation of guidelines for standardizing methods, maintaining slide banks, producing locally adapted training materials, providing basic and refresher training, overseeing training activities, assuring the quality of testing and supporting external quality assurance in collaboration with the NMCP.

Outpatient register:
List of patients seen in consultation in a health facility, which may include the date of the consultation, patient's age, place of residence, presenting health complaint, test performed and diagnosis.

Parasite prevalence:
Proportion of the population in whom Plasmodium infection is detected at a particular time with a diagnostic test (usually microscopy or a rapid diagnostic test).

Passive case detection:
Detection of malaria cases among patients who on their own initiative, visit health services for diagnosis and treatment, usually for febrile disease.

Population at risk:
Population living in a geographical area in which locally acquired malaria cases occurred in the current and/or previous years.

Pro-active case detection:
A type of active case detection conducted that is not triggered by a malaria case. Typically involves screen-

GLOSSARY OF TERMS

ing and treatment in communities and among specific high risk groups.

Proficiency testing:

A system in which a reference laboratory sends blood films to a laboratory for examination, and the laboratory receiving the slides is not informed of the correct results until it has reported its findings back to the reference laboratory.

Quality assurance (QA):

The maintenance and monitoring of the accuracy, reliability and efficiency of laboratory services. QA addresses all the factors that affect laboratory performance, including test performance (internal and external quality control), the quality of equipment and reagents, workload, workplace conditions, training and supervision of laboratory staff and continuous quality improvement. It includes procedures put in place to ensure accurate testing and reporting of results.

Quality control (QC):

Assessment of the quality of a test or a reagent. QC also encompasses external QC and reagent QC. External QC is a system in which routine blood slides are cross-checked for accuracy by a supervisor or the regional or national laboratory. Reagent QC is a system for formal monitoring of the quality of the reagents used in a laboratory.

Rapid diagnostic test:

An antigen-based stick, cassette or card test for malaria in which a coloured line indicates that plasmodial antigens have been detected.

Rapid diagnostic test positivity rate:

Proportion of positive results in rapid diagnostic tests among all the tests performed.

Re-active case detection:

A type of active case detection conducted in response to a confirmed case or cluster of cases, in which a population potentially linked to such cases is screened and tested.

Receptivity:

Sufficient presence of anopheline vectors and existence of other ecological and climatic factors favouring malaria transmission.

Relapse:

Recurrence of asexual parasitaemia in P. vivax or P. ovale infections arising from hypnozoites. It occurs when the blood-stage infection has been eliminated but hypnozoites persist in the liver and mature to form hepatic schizonts. After an interval, generally from 3 weeks to 1 year, the hepatic schizonts rupture and liberate merozoites into the bloodstream.

Sensitivity (of a test):

Proportion of people with malaria infection (true positives) who have a positive test result.

Slide positivity rate:

Proportion of slides found positive among the slides examined.

Specificity (of a test):

Proportion of people without malaria infection (true negatives) who have a negative test result.

Sub-microscopic infection:

Low-density blood-stage malaria infections that are not detected by conventional microscopy.

Surveillance:

A part of the programme designed for the identification, investigation and elimination of continuing transmission, the prevention and cure of infections and final substantiation of claimed elimination.

Transmission intensity:

Rate at which people in a given area are inoculated with malaria parasites by mosquitoes. This is expressed as the "annual entomological inoculation rate", which is the number of inoculations with malaria parasites received by one person in one year.

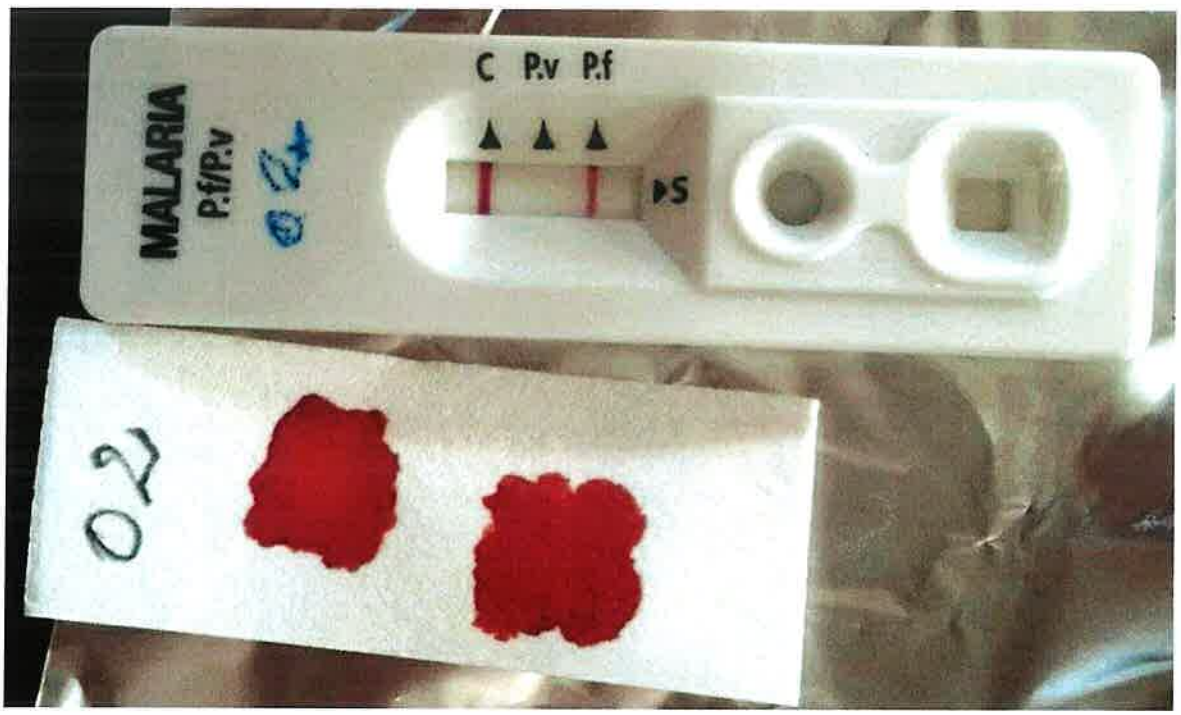
Transmission season:
Period of the year during which mosquito-borne transmission of malaria infection usually occurs.

Vector control:
Measures of any kind against malaria-transmitting mosquitoes intended to limit their ability to transmit the disease.

Vector efficiency:
Ability of a mosquito species, in comparison with another species in a similar climatic environment, to transmit malaria in nature.

Vectorial capacity:
Number of new infections that the population of a given vector would induce per case per day at a given place and time, assuming conditions of non-immunity. Factors affecting vectorial capacity include: (i) the density of female anophelines relative to humans; (ii) their longevity, frequency of feeding and propensity to bite humans; and (iii) the length of the extrinsic cycle of the parasite.

Vulnerability:
Either proximity to a malarious area or frequent influx of infected individuals or groups and/or infective anophelines.



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PURPOSE OF THE OPERATIONAL MANUAL

The manual is designed as a practical guide to standardize implementation of surveillance strategies at the central, peripheral and community levels.

This operational manual has two combined objectives. It provides the strategic framework for government, NGOs and funding agencies supporting malaria surveillance. In addition, it gives detailed guidance for field operations to be conducted by district health staff, health center officers, village malaria workers and other points of care.

Sections of this manual will be distributed to peripheral staff based on their corresponding Operational District (OD)'s stratification and its accompanying surveillance intervention package. It will outline all surveillance standard operating procedures (SOPs) that each level health staff is expected to follow.

chapter 01 — Overview of surveillance strategy provides an overview of malaria situation and surveillance strategy in the context of the malaria elimination in Cambodia

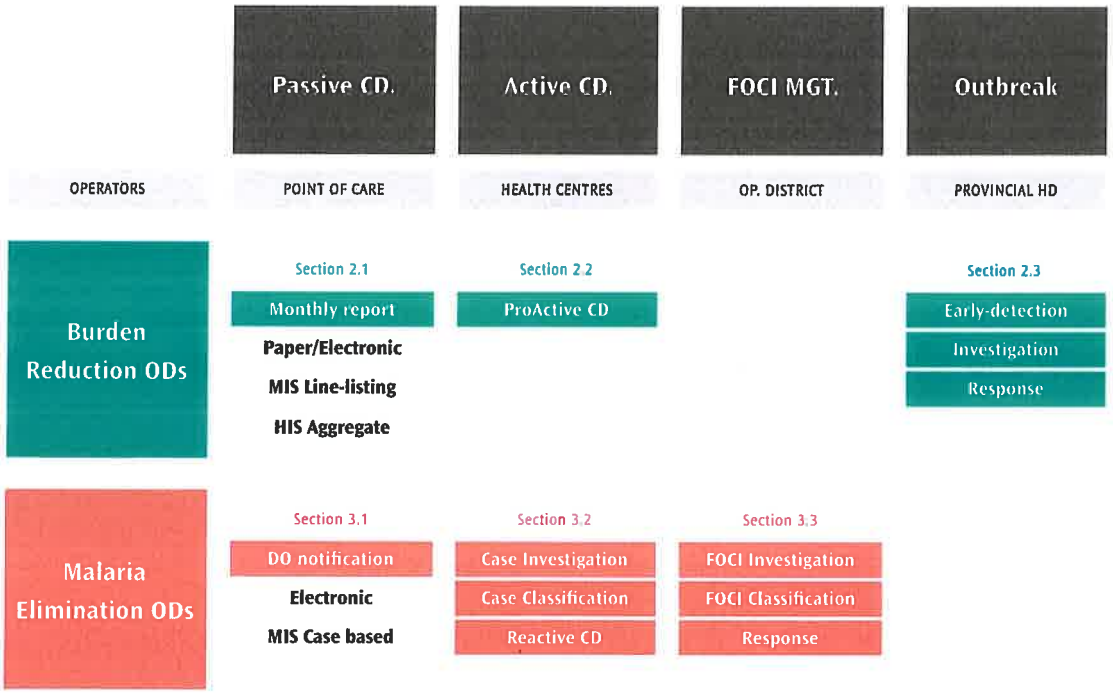
chapter 02 — Surveillance in Burden Reduction ODs serves as a practical guide to implement surveillance activities for staff located in ODs targeted for malaria burden reduction.

chapter 03 — Surveillance in Elimination ODs serves as a practical guide to implement surveillance activities for staff located in ODs targeted for malaria elimination

chapter 04 — Data management and analysis serves as a practical guide for CNM staff on routine management and analysis

Figure 1

Overview of strategic components covered by the Operational manual



This 2017 edition does not cover the whole range of the operations related to passive and active case detection in both Burden Reduction and Elimination ODs (see Figure 1). This manual is revised every year and the set of strategies to be implemented will be gradually expanded.

Revised sections from the previous 2016 edition:

Section 3.1
Passive case detection in Elimination ODs

Section 3.2
Active case detection in Elimination ODs

Additional sections from the previous 2016 edition:

Section 2.2
Active case detection in Burden Reduction ODs

Section 3.3
Foci management in Elimination ODs

Sections to be developed in next editions:

Section 2.3
Outbreak detection and response

Section 3.4
Prevention of re-establishment of transmission

This manual will be revised every year and the set of strategies to be implemented will be gradually expanded.

chapter

01

Overview of the surveillance strategy

OPERATIONAL MANUAL 2017

SURVEILLANCE FOR MALARIA ELIMINATION

chap 01

Overview of the surveillance strategy

"By 2020, Eliminate Plasmodium falciparum"

01.1 MALARIA SITUATION IN CAMBODIA

In Cambodia, malaria transmission is endemic in 21 out of 25 provinces. Transmission occurs primarily in the hot and rainy season between July and November. An estimated 58% of the population, or approximately 8.6 million people, live in malaria at-risk areas. Malaria risk is highest in forest or forest fringe areas in the northeastern part of the country (see Figure 2). Hence, out of a total of 45 Operational Districts (ODs), 8 accounted for 73% of all cases reported in the country in 2014.

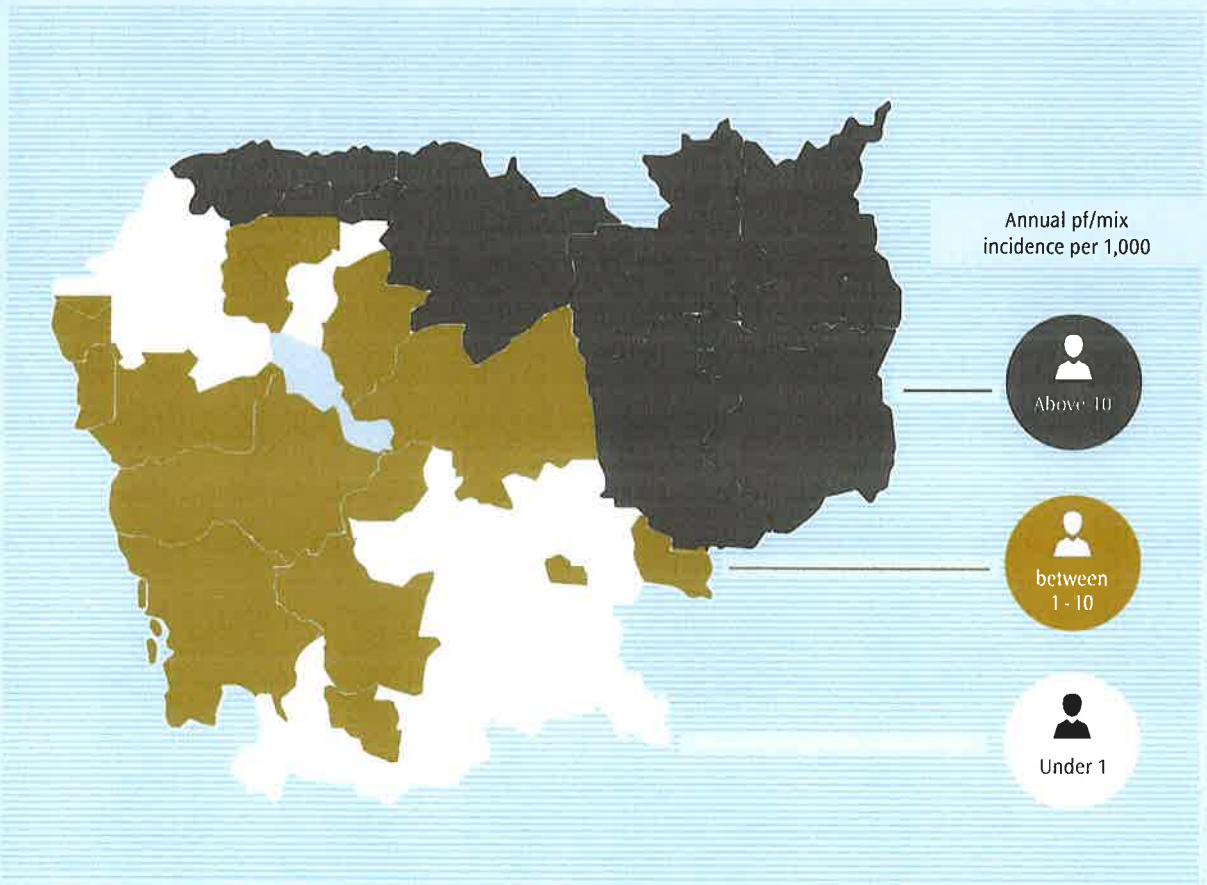
In 2014, Cambodia recorded 56,271 malaria cases in public health sector comprised of public health facilities and Village Malaria Workers (VMWs), a 47% decrease from 2010. VMWs diagnosed and treated more than half of malaria cases recorded in the public sector. This overall case load does not include malaria cases treated by the private sector, which is believed to treat up to two-thirds of patients with febrile illness. There are nearly 1,200 licensed private providers in 34 ODs out of total 45 malaria endemic ODs. These private providers recorded 17,361 confirmed malaria cases in 2014. However the case data from unlicensed health and non-health outlets that also provide malaria services is not captured.

Prevalence of Plasmodium infection has declined in each successive national survey, from a weighted national prevalence (as measured by microscopy) declining from 4.4% in 2004, to 2.6% in 2007, to 0.9% in 2010, and finally to 0.1% in 2013.

Plasmodium falciparum was the predominant species among confirmed malaria cases until 2011. In 2014, P. vivax infections accounted for 47% (26,183) of the reported cases, followed by 23% (12,422) of P. falciparum cases and 30%

FIGURE 2

Annual Parasite incidence Index of P. falciparum and mixed malaria in 2014



(16,540) of mixed infections of both *P. falciparum and P. vivax.*

Artemisinin resistance was first identified in clinical studies in Cambodia in 2006, however retrospective analysis of molecular markers indicates that artemisinin resistance likely emerged as early as 2001. Since the widespread deployment of Artemisinin-based Combination Therapy (ACT) in 2000, rapidly increasing rates of failure of the first-line ACT treatment has been documented. In 2010 artesunate-mefloquine (AS-MQ) had to be replaced by dihydroartemisinin-piperaquine (DHA-PPQ). Over the last five years, failure of DHA-PPQ was quickly identified in therapeutic efficacy studies (TES) in nine provinces in the western and northern part of the country. AS-MQ was re-introduced as first-line treatment in those provinces, since its efficacy has been restored with low prevalence of Pfmdr1 resistance markers.

An.dirus, An.minimus s.l. and An.maculatus s.l. are the main malaria vectors. An.dirus is found in forested mountains and foothills, cultivated forests, and rubber plantations, whereas An.minimus is found outside the forests or in areas where the forests have been cleared. An.maculatus is found in hilly or mountainous areas and breeds in or near permanent or semi-permanent bodies of clean water such as streams or rivers. These vectors bite during all hours of the evening, but peak biting hours are usually found to be between 8:00 in the evening and 12:00 noon. No resistance of the main vectors to common insecticides has been documented to date.

01.2
MEAF SURVEILLANCE STRATEGIES

As outlined in the Malaria Elimination Action Framework (MEAF) 2016-2020, Cambodia aims to reduce the incidence of malaria to less than 1 case per 1000 people at risk in each operational district and eliminate Plasmodium falciparum including multidrug resistant malaria by 2020.

In order to achieve this, one of the five objectives of the MEAF is to "Enhance the surveillance system to detect, immediately notify, investigate, classify and respond to all cases and foci by 2017 to move toward malaria elimination."

The strategies to achieve this objective are to:

01 Define system specifications for the upgraded Malaria Information System (MIS)

02 Strengthen and build capacity to implement the surveillance system for malaria elimination

03 Strengthen passive case detection and routine reporting by all health care providers

04 Strengthen case detection, investigation and reporting system for all malaria infections

05 Strengthen investigation, classification, and appropriate response to all transmission foci

06 Strengthen management and usage of data at all health levels

07 Outbreak preparedness and response

01.3
PHASING OF MEAF SURVEILLANCE STRATEGIES

The malaria situation in Cambodia is heterogeneous due to variance in malaria transmission dynamics by geographic area, growing multidrug resistance (MDR), and mobility of at-risk populations. In response to the country's diverse malaria situation, different approaches will be implemented in different geographical regions to reach the targeted goal of national malaria elimination. This includes strategic targeting of surveillance activities. Over time, as operational districts reduce their malaria burden or gather new information on the dynamics of malaria transmission in a specific area, a shift in activities or new ones may be implemented as local transmission is reduced or halted.

Phasing of elimination

As part of the Malaria Elimination Action Framework (2016-2020), the country planned for a progressive implementation of malaria elimination activities by operational district over a five year period. Operational districts were divided into three sub-strata: (1) Burden Reduction, (2) Elimination-Targeted, and (3) Transitional. The primary value for categorizing the strata is malaria incidence, specifically incidence of P. falciparum and mixed infections as reported by public health facilities, VMWs, and private sector facilities. This is compared against a province level map indicating where there is evidence of multidrug resistance measured through sentinel site surveillance. With the lack of available data on mobile and migrant populations, historical incidence data was analyzed to determine the stability of transmission in ODs bordering high malaria burden areas.

Classification of operational districts between those targeting elimination and those transitioning toward

elimination or focused on burden reduction is especially relevant for surveillance. Surveillance activities are largely determined by the operational capacity of the health system. If the overall health system is weak or faces a high burden of malaria, surveillance activities may be limited to collecting basic information on patients tested and treated for malaria and outbreak preparedness and response activities. In areas with a lower burden of malaria, where cases are few or rare, comprehensive case investigation, community-based case detection, and epidemiological investigations may be implemented because the local health system has the operational capacity to carry out these activities. To reflect this variance in surveillance activities based on phasing, this manual has been divided into two primary sections for implementers: Surveillance in Burden Reduction Operational Districts (Section 2) and Surveillance in Elimination-Targeted Operational Districts (Section 3).

For the 2016-2017 malaria season, the districts depicted in the map below (Figure 3) will be targeted for elimination and therefore will implement relevant surveillance approaches as detailed in Section 3. The remainder of the country will continue to target burden reduction of malaria and implement approaches detailed in Section 2. The change in targeting will be communicated to the relevant ODs and relevant staff will be trained on the additional surveillance activities required based on their new status.

	PROVINCE	OD	Pop 2015
1	Battambang	Thmar Koul	**231,997**
2	Battambang	Maung Russei	**207,275**
3	Battambang	Sampov Luon	**161,713**
4	Battambang	Battambang	**386,435**
*	Battambang	Sangkae	**210,776**
5	Pailin	Pailin	**70,486**
*	Banteay Meanchey	Mongkol Borei	**243,143**
6	Banteay Meanchey	Poipet	**202,568**
7	Banteay Meanchey	Preah Net Preah	**149,584**
8	Banteay Meanchey	Thma Puok	**136,592**
9	Siem Reap	Kralanh	**125,024**
10	Siem Reap	Siem Reap	**365,293**
11	Siem Reap	Sot Nikum	**287,145**
12	Siem Reap	Ankor Chhum	**232,809**

** Sangkae and Mongkol Borei are classified as non-endemic*

FIGURE 3

Cambodia phasing of Elimination.
for 2016-2017 malaria season

Village stratification

Eliminating malaria is very resource intensive and the intervention activities will vary according to the local malaria situation. Additionally, it is necessary to prioritize areas for intervention for the most efficient use of resources. As such, further stratification within ODs is necessary based on the lowest level of operations. In Cambodia, elimination activities (such as foci investigation and response) will take place at the village level, and as such stratification in Cambodia is done at the village level. Given the frequent change in the malaria situation, Cambodia will stratify its villages at least annually.

As stratification aims to prioritize intervention packages at the village level, it considers the surveillance tools that are available to that village (represented by the ODs classification as Burden Reduction vs. Elimination) and the intensity of malaria transmission (reported incidence). Additionally, to address gaps in malaria reporting and availability of care, a village's malaria transmission potential is also calculated. The transmission potential considers the actual epidemiological data collected by a surveillance system (the village incidence values) and risk factors associated with malaria (such as vector control measures, demographic, social, and ecological factors). A village transmission risk value, in addition to considering the OD's elimination phase and reported incidence, allows for effective targeting of interventions. Details of the methodology and the list of villages with the corresponding transmission potential, OD classification, and reported incidence.

01.4
PASSIVE CASE DETECTION

The detection of malaria cases through rigorous testing of symptomatic populations presenting for care at public hospitals, health centers, and clinics, village malaria workers, and private sector providers (of those incorporated within the national Public-Private Mix (PPM) program) is referred to as passive surveillance.

Passive surveillance is the primary approach to disease reporting, monitoring and response in Cambodia. In this context, surveillance is defined by the systematic recording, collation, and analysis of data on patients screened and tested for malaria, the incidence of confirmed malaria cases, and evaluation of the effect of prevention and response activities.

01.4a
TOWARDS UNIVERSAL ACCESS TO DIAGNOSIS AND TREATMENT

Under the MEAF, early diagnosis of malaria must be universally available with all suspected malaria cases receiving parasitological testing. To achieve universal early diagnosis, all efforts will be made to provide access to parasitological diagnosis to the whole population at risk. Strong factors such as geographical and financial access will be addressed through adapted policies. In addition, a comprehensive IEC/BCC strategy including community participation will be implemented to favor prompt treatment seeking for malaria related symptoms.

In Cambodia, malaria diagnosis and treatment services are provided through:

- Public Health Facilities: Referral Hospitals (RH), Former District Hospitals (FDH), health centers (HC), health posts (HP)
- Community Health Workers: Village Malaria Workers (VMW), Plantation Malaria Workers (PMW), mobile migrant workers (MMW)
- Public-Private Mix program: Private providers
- Military and Police health services

The number of points of care by type and category in 2015 is detailed in Table 1 below. The 47 malaria endemic ODs are covered by MIS and HIS. The 35 non-endemic ODs are only covered by HIS.

TABLE 1: **Number of points of care by type and category in 2015**

TYPE	CATEGORY	ENDEMIC ODs (N=47)	NON-ENDEMIC ODs (N=35)
PUBLIC HEALTH FACILITY	Reference Hospital	48	41
	Former District Hospital	62	36
	Health Centre	624	323
	Health Post	47	-
COMMUNITY HEALTH WORKER	Village Malaria Worker	2768 villages	-
	Mobile-Migrant Malaria Worker	276	-
	Plantation Malaria Worker	119 plantations	-
PRIVATE SECTOR	Public-Private Mix private provider	708	-
MILITARY	Military	NA	NA
POLICE	Police	NA	NA

01.4b

IDENTIFICATION OF MALARIA CASES

Identification of suspected case:

Every person presenting to a health facility or community health worker with any of the following symptoms: history of fever, chills, sweat, headache, nausea, vomiting or diarrhea should be carefully assessed to exclude malaria.

The detailed complete protocol to evaluate a suspected malaria case is in the 2014 National Treatment Guidelines (NTG).

Main components of the assessment include:

01 Complete case history with background and symptoms

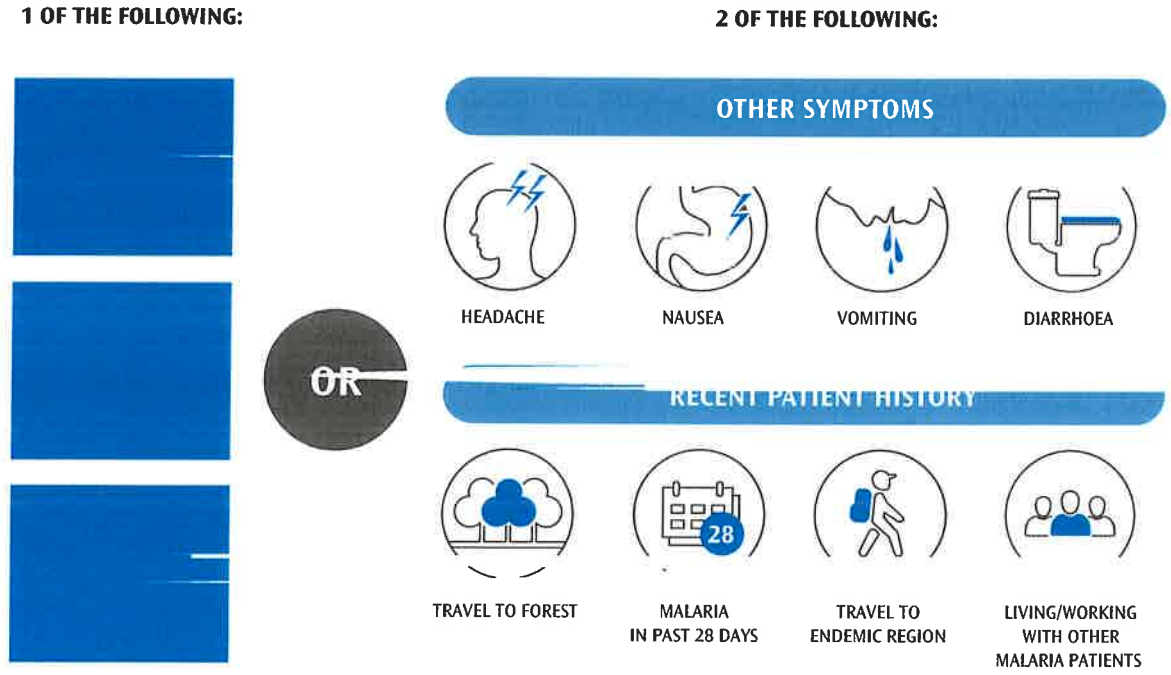
02 Specific inquiry about malaria risk factors including exposure in forest, occupational mobility and history of malaria

03 Specific attention to the detection of drug resistant infection after recent malaria episode

04 Careful clinical examination for alternative causes of fever and specific search for general danger signs and features of severe malaria

The case definition of suspected malaria defines who should be tested (see Figure 4 below).

FIGURE 4
Criteria for malaria diagnostic testing



Parasitological diagnosis

The two main methods in routine use for parasitological confirmation of malaria are microscopy and rapid diagnostic tests (RDTs). For the management of a new fever episode, quality-assured microscopy and RDTs are equivalent in terms of performance for the diagnosis of uncomplicated malaria. Only microscopic examination of thick and thin stained blood films can be used to follow patient treatment response and measure parasite density. Microscopy is also necessary for severe cases for the initial quantification of parasite density and for the follow-up of parasite density until full clearance. Microscopy can also document the presence of gametocytes of P. falciparum. This is an indication that the disease started more than 10–12 days previously suggesting that the care-seeking and diagnosis were not prompt enough.

Classification of confirmed cases

Every case will be checked for general danger signs and features of severe malaria for immediate care if present. Confirmed malaria are reported as either uncomplicated or severe (see details on signs or symptoms of severe malaria in NTG).

1.4.c TREATMENT OF MALARIA CASE

The aim of treatment of malaria in the context of elimination is complete parasitological cure, including killing of the parasites in their sexual stages. The treatment should be fully effective and instituted so early that, not only is severe disease prevented, but also the emergence of gametocytes in P. falciparum is prevented, so that the risk for transmission from the treated case is minimized.

Artesunate-Mefloquine (AS-MQ) as first line ACT treatment

High frequency of DHA-PPQ failures are now documented over the whole country. By contrast recent TES data give evidence of full efficacy of AS-MQ. WHO prequalified AS-MQ is now the first line ACT treatment recommended in all provinces. Since high frequency of mutations associated with AS resistance is now present in Cambodia, it is expected that efficacy of AS-MQ would be affected soon. Its therapeutic efficacy will be monitored every year in 2-3 TES sentinel sites.

Gametocytocidal treatment

Single 0.25mg base/kg dose of primaquine is effective in blocking transmission with no toxicity in G6PD deficient subjects. It should be given to all patients with confirmed P. falciparum or mixed infection on the first day of treatment in addition to an ACT, except for pregnant women and infants <1 year of age.

01.5 BASIC CONCEPTS ABOUT MALARIA ELIMINATION

Definition of malaria elimination

Malaria elimination is the interruption of local mosquito-borne malaria transmission; reduction to zero of the incidence of infection caused by human malaria parasites in a defined geographical area as a result of deliberate efforts; continued measures to prevent re-establishment of transmission are required.

The interruption of local transmission by mosquitoes is achieved despite a continued presence of malaria vectors and importation of parasites from abroad through travel and migration. It does not require the elimination of disease vectors or a complete absence of reported malaria cases: imported malaria cases will continue to be detected, and could, on occasion, lead to the occurrence of introduced cases in which the infection is a first generation of local transmission subsequent to an imported case. In practice, the absence of new cases due to local transmission is an indication of interruption of transmission and cessation of activity of a focus.

Elimination of multi-drug resistant P. falciparum

Since 2008, WHO has coordinated inter-country efforts to contain artemisinin-resistant P. falciparum in the Greater Mekong sub-region, with the intention of preventing the spread of artemisinin-resistant falciparum parasites. It has been found recently, however, that artemisinin-resistant falciparum parasites in the area continue to spread and to emerge de novo, suggesting that the containment approach was not effective. Further, high level resistance to ACT in Cambodia is documented (resistance to both artemisinin and the partner drug). For this reason, malaria elimination of P. falciparum is now the objective for Cambodia by 2020.

Species-specific elimination

P. falciparum is usually eliminated first because it has a longer incubation interval and shorter incubation period than P. vivax. Moreover, P. vivax generates persistent hypnozoites that are difficult to cure with current radical primaquine treatment. A country may well decide to plan elimination of one species first, an achievement that would still be a major milestone. In the past, a number of countries achieved P. falciparum elimination unintentionally while fighting malaria "in general", whereas they failed to interrupt P. vivax transmission or did so years later. However, presently WHO certifies malaria elimination in a country only when all species that cause human malaria have been eliminated.

Certification of malaria elimination

The official recognition of malaria-free status granted by WHO after it has been proven beyond reasonable doubt that the chain of local human malaria transmission by Anopheles mosquitoes has been fully interrupted in an entire country for at least 3 consecutive years and there is evidence that the surveillance system is adequately designed to continuously detect cases.

Prevention of reintroduction

In many countries and areas, it might be possible to interrupt transmission of malaria; however because of high receptivity in some areas, it would be impossible or extremely costly to prevent the occurrence of small outbreaks completely. In this scenario, interruption of trans-

FIGURE 6

Increased heterogeneity of transmission

mission can still be considered a major achievement, as long as the outbreaks are rapidly and effectively controlled so that malaria does not become re-established as an endemic disease.

Criteria of re-establishment of transmission

Re-establishment of transmission is defined by at least three or more introduced and/or indigenous malaria infections in the same geographical focus for 2 consecutive years for P. falciparum and for 3 consecutive years for P. vivax.

Malaria eradication

Malaria eradication is the permanent reduction to zero of the worldwide incidence of infection caused by a particular malaria parasite species. Intervention measures are no longer needed once eradication has been achieved.

01.6
SURVEILLANCE FOR ELIMINATION

The implementation of malaria case-based surveillance based on specific and rigorous standards defines an elimination program. The central concept of surveillance for elimination is that identification and investigation of a malaria case and a malaria focus define the presence of malaria transmission.

During elimination, surveillance is the main intervention, because it aims not only to report morbidity and infections but includes the elimination of malaria infections, case by case and focus by focus. The objective of surveillance for elimination is to shift the focus from just reporting the overall amount of malaria to using the reported data to target the specific drivers of transmission. Surveillance in elimination is a continuous loop of identifying, reporting, analyzing, and responding to malaria cases with the absence of locally acquired cases and disappearance of active foci as a goal.

1.6.a
FROM BURDEN REDUCTION TO ELIMINATION

The objective of a burden reduction program is to decrease malaria case load low enough that the intensive activities to eliminate all local transmission can begin. As transmission decreases, heterogeneity and residual foci will appear as on Figure 6.

During burden reduction, aggregated data are reported monthly as opposed to elimination which requires immediate case notification so that each case can be investigated and classified to prevent secondary transmission, with the aim of stopping local transmission. Table 2 below compares the key characteristics of burden reduction and elimination programs.

1.6b
ACTIVE CASE DETECTION AND FOCAL RESPONSE

The set of active case detection strategies undertaken to achieve elimination include activities:

- To investigate each malaria case to determine whether it was locally acquired or acquired somewhere else and, if so, from where.
- To identify all areas or foci with local transmission of malaria.
- To investigate each focus to document the characteristics of transmission and select appropriate intensified activities to interrupt transmission.
- To proactively find all malaria infections, whether symptomatic or not, and ensure that they are radically cured so early that they do not generate secondary cases.

TABLE 2

Main characteristics of burden reduction and elimination programs

CHARACTERISTICS	BURDEN REDUCTION	ELIMINATION
INCIDENCE	Heterogeneous According to exposure Risk of epidemics	Sporadic and focal
PROGRAM GOAL	Reduce burden of malaria	Halt local transmission
EPIDEMIOLOGICAL OBJECTIVE	Reduce morbidity and mortality compared to baseline Outbreak detection	Reduce number of local case and active foci to zero
TRANSMISSION OBJECTIVE	Reduce transmission intensity	Reduce onward transmission from existing cases
CASE DETECTION	Passive	Passive and active
TREATMENT TARGET	Symptomatic cases	Symptomatic cases Asymptomatic infections
UNIT OF INTERVENTION	Country-wide	Individual cases and foci

Malaria case surveillance for elimination aims to detect and notify all malaria infections, ensuring that they are given prompt, efficacious treatment to prevent secondary cases. Then each malaria case should be investigated (case investigation) to determine risk factors associated with the infection and whether it was locally acquired or imported (case classification).

Once a locally acquired case has been identified, a focus investigation is carried out by trained malaria staff to assess the receptivity and vulnerability of an area and what drives transmission (focus classification) and determine what interventions are necessary to successfully interrupt transmission (Figure 7 below).

Active case detection is the detection of malaria cases at community and household levels, sometimes in population groups that are considered at high risk. Active case detection is used to fill gaps in the passive case detection system and to detect malaria infections as early as possible in populations that may have a high risk of infection.

Active case detection can consist of screening for fever followed by parasitological examination of all febrile patients or as parasitological examination of the target population without prior screening for fever.

1. Reactive case detection may be undertaken in response to a confirmed case or cluster of cases, in which a population potentially linked to such index cases, is screened and tested. The objective is to detect early concomitant infections and to prevent secondary infections.

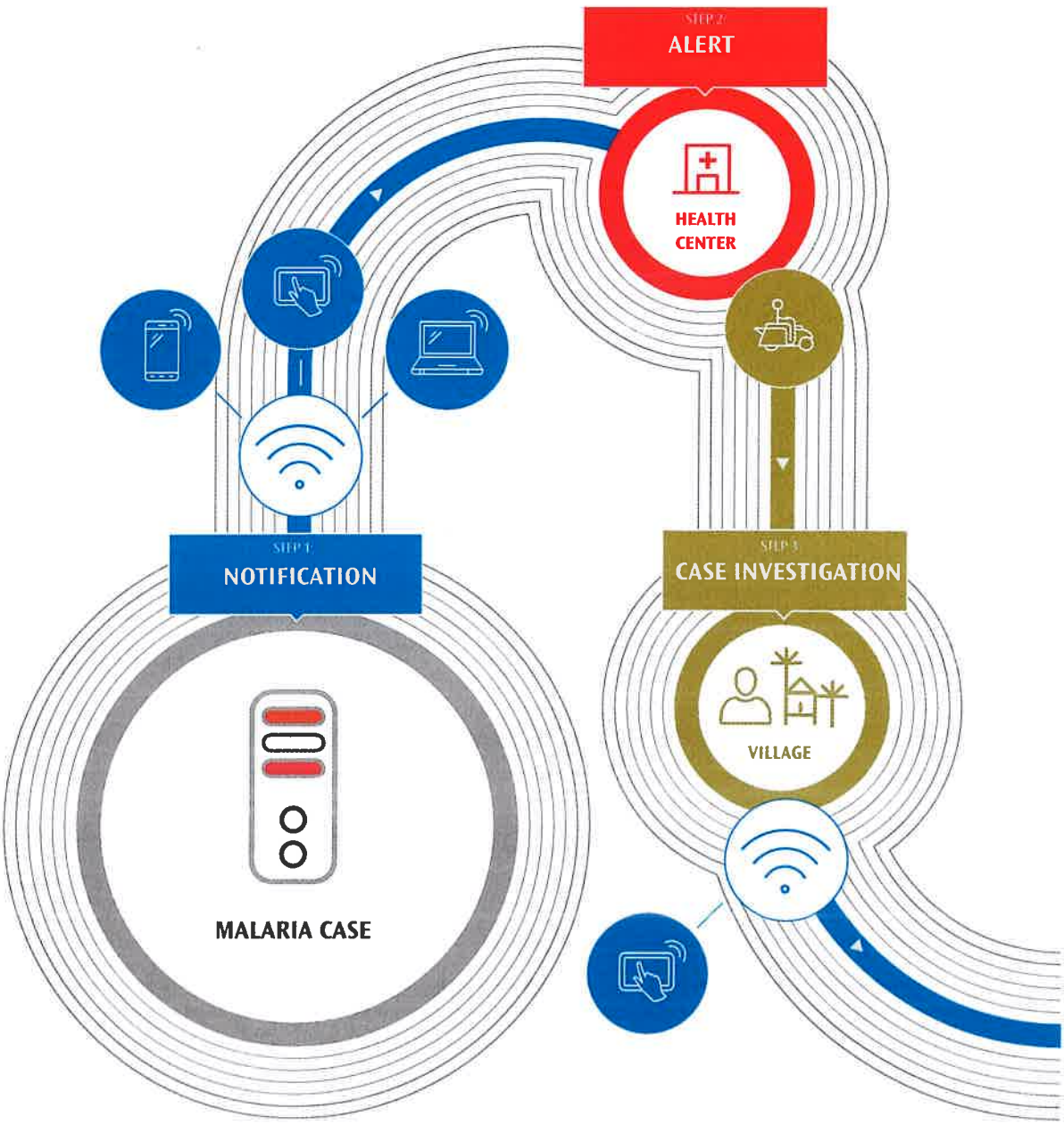
2. Proactive case detection may be conducted in high-risk populations, e.g. mobile-migrant populations at border check points, without being prompted by prior detection of index cases.

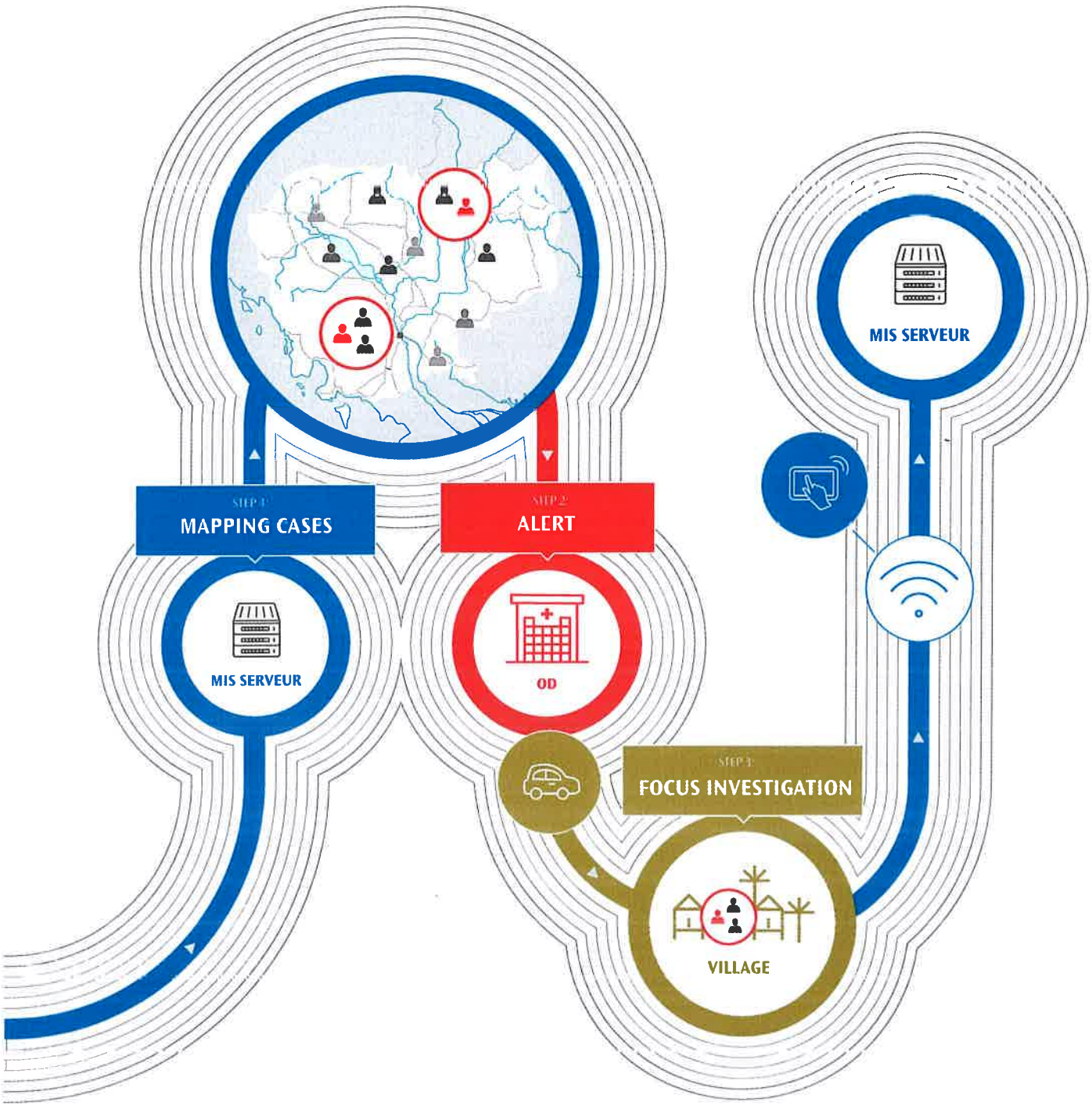
Malaria case definition in elimination settings refers to any individual with malaria parasites demonstrated in the blood. The term is equivalent to malaria infection. In settings where malaria is actively being eliminated, a "case" is the occurrence of any confirmed malaria infection, regardless of the presence or absence of clinical symptoms. In that context, the detection of malaria cases can also identify asymptomatic malaria infections.

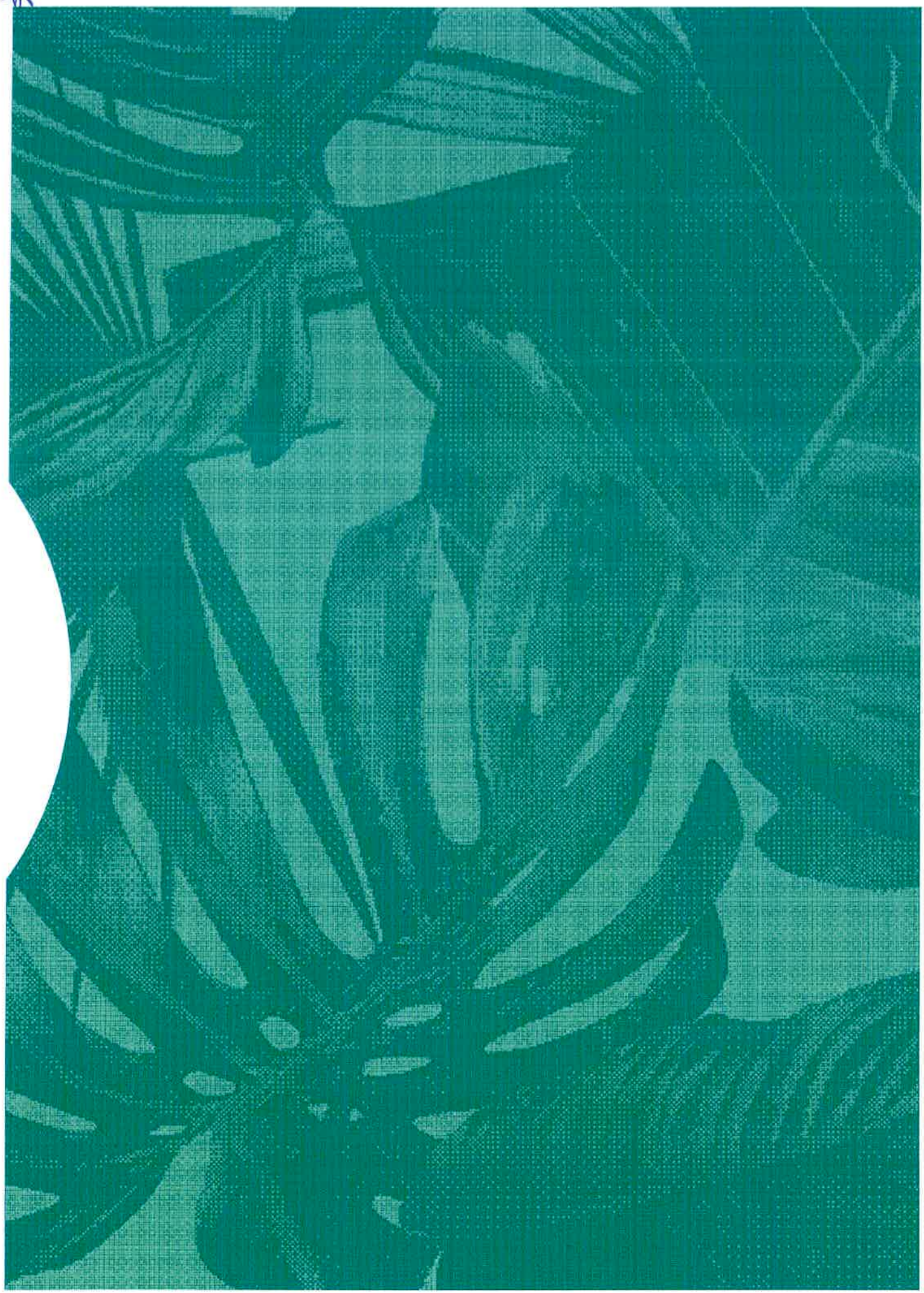
Parasite can be detected routinely by microscopy or a rapid diagnostic test. But some sub-microscopic infections can also be detected by nucleic acid-based amplification (e.g. polymerase chain reaction assays to detect parasite DNA or RNA). Sub-microscopic infections are low-density blood-stage malaria infections that are not detected by conventional microscopy

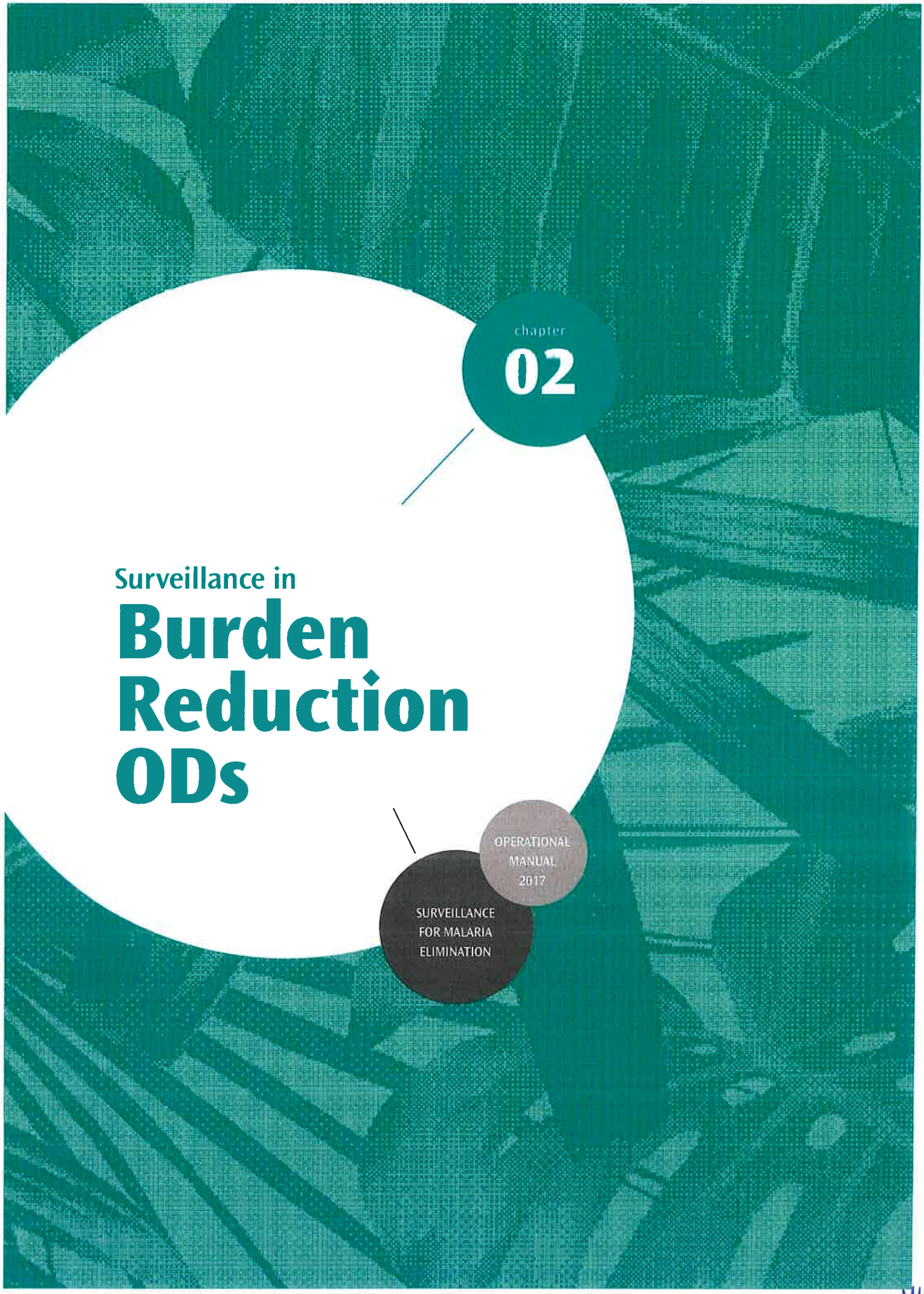
FIGURE 7

Component of active case detection to be conducted in Elimination ODs




STEP 1
MAPPING CASES
MIS SERVEUR
STEP 2
ALERT
OD
MIS SERVEUR
STEP 3
FOCUS INVESTIGATION
VILLAGE




chapter
02
Surveillance in
Burden
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FOR MALARIA
ELIMINATION

chap 02

Surveillance in

Burden reduction ODs

Surveillance in Burden Reduction ODs is defined by the systematic recording, collation, and analysis of data on patients screened and tested for malaria, the incidence of confirmed malaria cases, and evaluation of the effect of prevention and response activities. The objective is to record all cases of malaria, promptly submit monthly reports within the established system, and analyze data to track the changes in the malaria situation. The surveillance system is also used to detect and facilitate rapid response to outbreaks.

02.1 PASSIVE CASE DETECTION IN BURDEN REDUCTION ODS

The identification of malaria cases through rigorous testing of symptomatic populations presenting for care at public hospitals and health facilities, village malaria workers, and private sector providers incorporated within the national Public-Private Mix (PPM) program is referred to as passive case detection.

2.1a ROLES AND RESPONSIBILITIES

In Burden Reduction ODs, the focus is on ensuring that monthly paper-based reports are completed, reported, and submitted to MIS in a timely manner.

2.1b ROLES AND RESPONSIBILITIES

The method of reporting information will differ by point of care (see details in Table 4 below).

Both HIS aggregate reports and MIS line-list are collected and

TABLE 3

Overview of roles and responsibilities for passive case detection in Burden Reduction ODs

TYPE	CATEGORY	RESPONSIBILITIES
PUBLIC HEALTH FACILITY	RH	Submit HIS paper reports monthly to OD
	FDH	Submit MIS and HIS paper reports monthly to OD
	HC	Submit MIS and HIS paper reports monthly to OD
		Conduct VMW, MMW, and PMW monthly meetings to collect their MIS paper reports and submit to OD
	HP	Submit MIS and HIS paper reports monthly to HC
COMMUNITY HEALTH WORKER	VMW	Submit MIS paper reports monthly to HC at monthly meetings
	MMW	
	PMW	
PRIVATE	PPM	Submit MIS paper reports bi-monthly at meetings at OD
MILITARY	Military	Submit report quarterly to CNM
POLICE	Police	
OD		Enter data into MIS monthly for FDH, HC, HP, VMW, MMW, PMW and bi-monthly for PPM
		Enter HIS data monthly for RH, FDH, HC, HP
		Conduct PPM bi-monthly meeting to collect their data
		Conduct supervision visits to FDH, HC, HP, community health workers, and PPM for passive surveillance
PHD		Conduct supervision visits to OD
		Conduct supervision visits to health facilities, community health workers, and PPM for passive surveillance
CNM		Upload military/police data into MIS
		Upload information from HMIS into MIS
		Conduct data management and analysis
		Provide feedback to PHDs and ODs

TABLE 4

Type of points of care and reporting forms required

TYPE	POINT OF CARE	HIS FORM	MIS HF FORM	MIS VMW FORM	MIS PPM FORM	OTHER
PUBLIC HEALTH FACILITY	Reference Hospital	X				
	Former District Hospital	X	X			
	Health Centre	X	X			
	Health Post	X	X			
COMMUNITY HEALTH WORKER	Village Malaria Worker			X		
	Mobile-Migrant Malaria Worker			X		
	Plantation Malaria Worker				X	
PRIVATE SECTOR	Public-Private Mix private provider				X	
MILITARY	Military					X
POLICE	Police					X

reported monthly. Both record on following data elements: Tested patients, Confirmed cases, Sex, Age, RDT/microscopy, Plasmodium specie, Severe/simple, OPD/IPD, Referral, Death.

MIS line-list was designed to collect additional individual details about each confirmed malaria patient regarding their village of residence, personal contact information and the treatment given. There are 3 different MIS line-list forms (HF/VMW/PPM) with some minor differences due to requirements for specific programmatic or clinical monitoring.

The timing for filing in the forms (immediate vs. at the end of the month) will also differ based on whether the point of care is reporting individual line-lists or aggregate figures.

- HIS aggregate reports: Individual patient data is recorded immediately in OPD, IPD and Laboratory registers, but the information reported in HIS reports is compiled at the end of the month as an aggregate figure.
- MIS line-list reports: Individual details of confirmed malaria patients should fill in MIS line-list immediately when the patient leaves the point of care to preserve the integrity of the detailed, patient-level data captured.

Important note about zero reporting:

As malaria burden is reduced, many point of care should be given clear instruction on how to fill their monthly MIS line-list when they have not tested any patient (zero test) or detected any case (zero case). All efforts are required to convince health staff about the necessity to continue MIS reporting and the fundamental distinction between "zero reporting" and "no reporting" at the analysis stage.

The method of compiling information will differ by point of care and whether HIS or MIS report is used.

Referral Hospitals

Referral hospitals (RH) only report malaria information to HIS, which requires aggregate figures. As such, RH should follow the Ministry of Health and DPHI's guidance on data collection and reporting.

Former District Hospital (FDH), Health Center (HC), and Health Post (HP)

At the FDH, HC, and HP, clinical staff from the out-patient department (OPD) enter each patients' record in the OPD patient register book (Format displayed in Annex 1).

The FDH, HC, and HP MIS form with individual line listing should be filled immediately once a patient case of malaria is confirmed. At the end of the month, the aggregated number of tests performed is completed in the corresponding section. The template of FDH, HC, and HP MIS form is displayed in Annex 1 and the corresponding instructions for completion are shown in Annex 2.

Additionally, at the end of each month, the person responsible for data compilation goes through the OPD patient register book to fill in the HIS reporting form with an aggregate number of confirmed malaria cases in OPD and IPD sections. The numbers of RDTs and microscopy tests conducted are reported in a separate laboratory section (Format displayed in Annex 1).

Village Malaria Workers (VMW) and Mobile-Migrant Malaria Workers (MMW)

VMWs and MMWs will use the MIS VMW reporting form as shown in Annex 1. The corresponding instructions for its completion are in Annex 2. They will start a new reporting form each month. The VMW/MMW will fill in the form every time they test a patient for malaria with an RDT. If the patient tests positive, then the VMW/MMW will report individual-level details. For easier follow-up, they will also report the patient's name and if the patient is from the village.

Public-Private Mix (PPM) Private Providers and Plantation Malaria Workers (PMW)

PPM private providers and PMWs will use the PPM reporting form for MIS in Annex 1. The corresponding instructions for its completion are in Annex 2. They will start a new reporting form each month and fill in the form every time they see a patient suspected for malaria. For each suspected malaria case, they will report whether the patient was tested with an RDT and if not, the reasons for not testing. If the patient tests positive for malaria, then they will report individual detail. For easier follow-up, PPM private providers/PMWs will also report the patient's name, address and phone number. All additional details about the compilation of line-lists are provided in related "SOP for the completion of MIS monthly line-list reports in Annex 4.

2.1c DATA SUBMISSION AND FLOW

As per current operational procedures, all VMWs, health facilities and PPM private providers submit data regularly via paper-based forms to their respective OD, which then enter all data electronically into web-based MIS portal (see Figure 8 below).

- VMW, MMW, and PMW: submit the MIS forms to HCs monthly at their monthly meeting. HCs will then submit this to the OD during their monthly meeting with the OD. The OD will enter the data into MIS portal.
- PPM private providers: PPM private providers managed under CNM will submit the MIS forms at meetings with OD staff every 2 months. The OD staff will enter the data into MIS. PPM private providers managed under PSK will submit the forms to PSK staff every other month, who will then submit it within the week to the OD staff. The OD staff will enter the data into MIS portal. In areas with electronic reporting, the data will be automatically uploaded into the MIS.
- FDH, HC, and HP: submit the MIS form to the OD staff during their monthly meeting. The OD staff will enter the data into MIS portal.
- RH: submit the HIS forms as per MoH and DPHI's guidelines.
- Military/police: submit aggregated case information to CNM every quarter.

2.1d DATA ENTRY INTO MIS

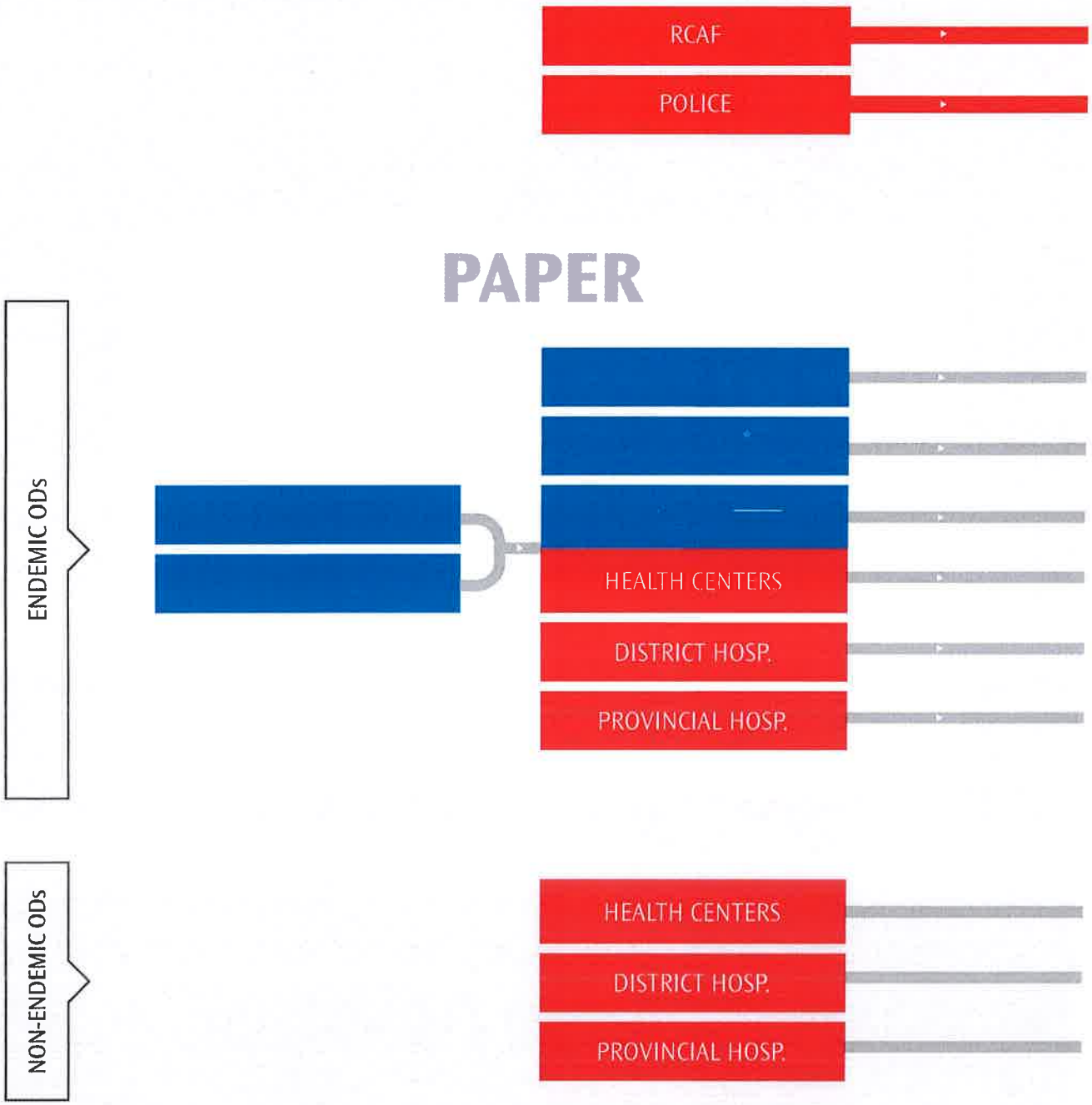
For MIS data entry, representatives from each OD are responsible for entering data electronically from each of the previous three sources into the MIS (see Annex 3: SOP for Data Submission to Web-based Malaria Information System). This can be done via desktops or devices with mobile access. Previous month's data should be completed by the 15th of the following month.

All additional details about data entry at OD level are provided in related "SOP for data submission to web-based MIS" in Annex 5.

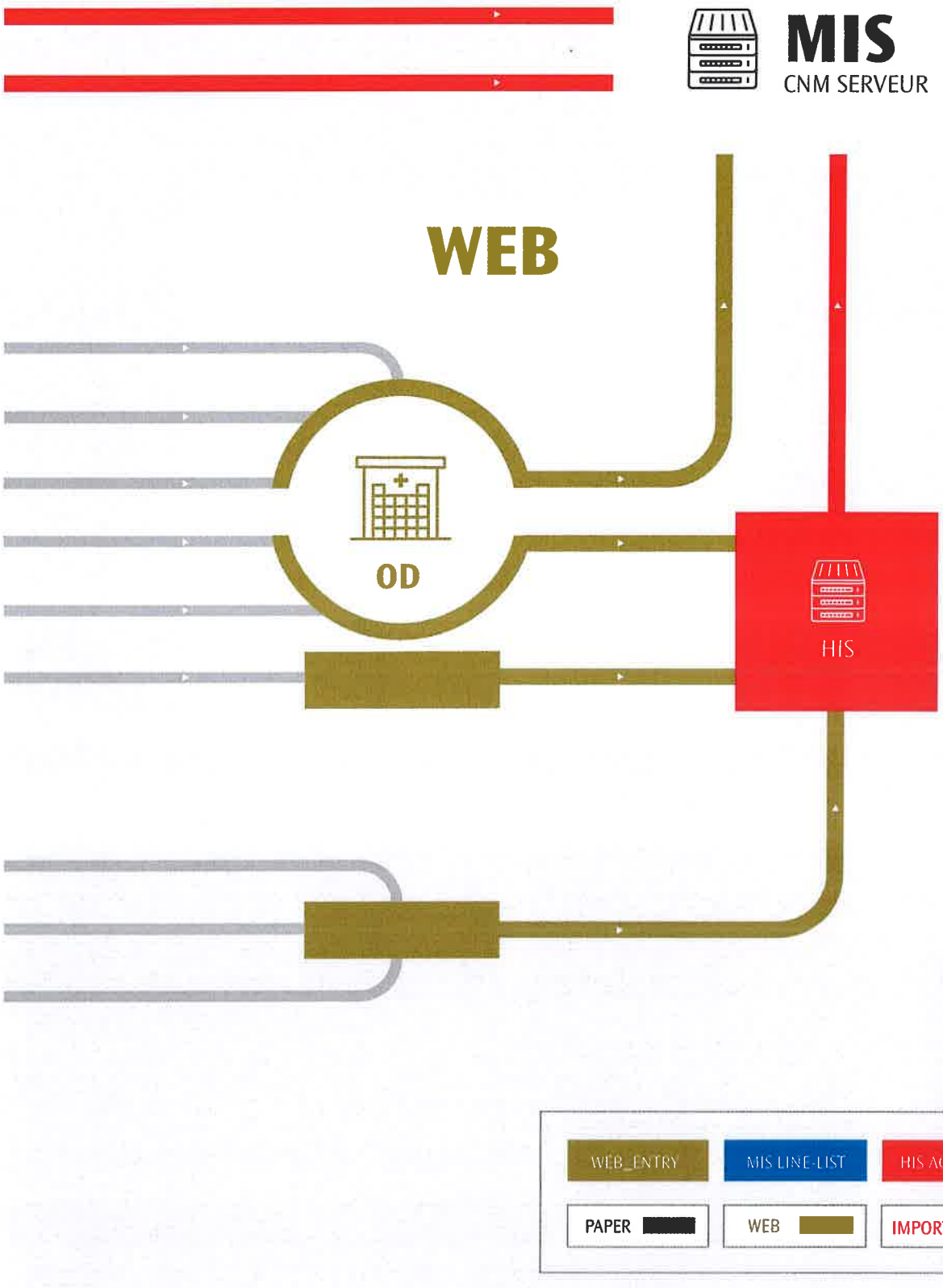
For MIS entry from military/police, CNM is responsible for submitting into MIS.

FIGURE 8

Data Submission and Flow in Burden Reduction ODs



* Worksite includes Forest, Construction site, Minte Site and Plantation


MIS
CNM SERVEUR
WEB
OD
HIS
WEB_ENTRY
MIS LINE-LIST
HIS AGGREGATE
PAPER
WEB
IMPORT

Additionally, CNM is also responsible submitting RH's aggregated case load information from the HMIS into MIS data base.

02.2

ACTIVE CASE DETECTION IN BURDEN REDUCTION ODS

Active case detection is used to fill gaps in the passive case detection system and to detect malaria infections as early as possible in populations that may have a high risk of infection

2.2a
PRO-ACTIVE CASE DETECTION

Pro-active case detection consists of screening and treatment in communities and among specific high risk groups without the trigger of a passively detected index case.

High risk populations

Populations involved in forest activities are at high risk of contracting the disease and their unstable life conditions leading to poor access to health services increasing the risk of receiving late and sub-standard treatments. Mobiles refer to individuals residing in the area for less than 6 months. Migrants are individuals residing in the area more than 6 months and less than one year. Local population includes individuals residing in the area for more than one year (see MMP Operational Manual). All of them might be exposed to malaria in forested areas occasionally (1-2 nights), periodically (up to 1 week) or seasonally (1 week to 6 months).

The following groups of populations have the highest risk score are:

- mobile forest workers/goers
- migrant forest workers/goers
- local forest workers/goers
- mobile construction workers
- mobile security personnel

High risk locations

The mobility of high risk populations requires special strategic approach to localise them in some places where pro-active case detection would be implemented.

Mobile populations could be accessed in temporary living sites installed closed to the worksites:

- Forest camps for forest workers
- Construction, dam and mine sites for construction workers

- Plantations and farms for seasonal workers
- Barracks for security personnel

The last category is the most vulnerable type of mobile populations. They are continuously moving, usually working in non-accessible worksites, often involved in illegal activities and without any connection with a referent living site. The only places where they can be reached are:

- Entry and exit touch points
- Border crossing points

Selective pro-active case detection

Individuals are tested with a RDT if one of 5 documented risk factor of malaria infection is present.

Each individual is asked following questions about risk factors:

- Did you have fever*, chills, sweat over the last 2 weeks?
- Did you sleep in the forest during the last month?
- Did you return from travel during the last month?
- Did you ever get malaria?
- Do you know somebody who got malaria?

*Individuals are asked about recent fever and chills within the last 2 weeks but body temperature is not measured.

Positive individuals receive standard treatment and questioned with a new "case investigation form".

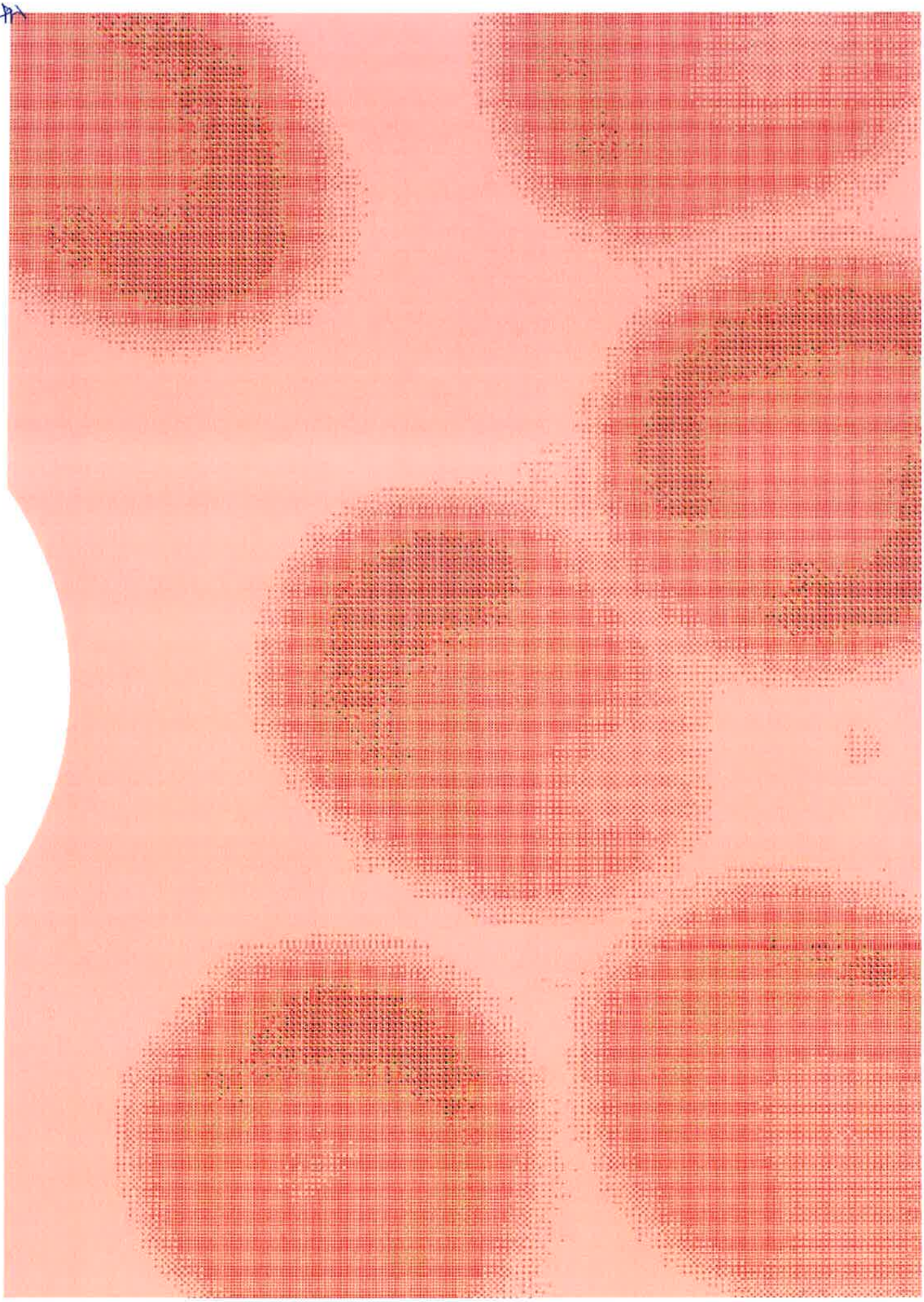
Important note: Pro-active case detection is initially conducted with RDTs as the currently available "point of care" diagnosis tool. However, any possibility to use more sensitive diagnosis tool such as nucleic acid amplification techniques like polymerase chain reaction (PCR) or loop-mediated isothermal amplification (LAMP) should be considered. Effectiveness of reactive case detection is also likely to be significantly increased by the use of high-sensitivity RDTs under development.

All additional details about Pro-active case detection are provided in related "SOP for Pro-active case detection" in Annex 7 and using "Recording form for Pro-active case detection" in Annex 8.

02.3

OUTBREAK DETECTION AND RESPONSE

Operating procedures for outbreak warning and confirmed outbreaks will be developed after the nation-wide upgrade of the malaria information system. Once developed, this section will outline methods for detecting and responding to outbreaks.



chapter

03

Surveillance in Elimination ODs

OPERATIONAL MANUAL 2017

SURVEILLANCE FOR MALARIA ELIMINATION

chap 03

Surveillance in Elimination ODs

Immediate case-based

Elimination surveillance system can be activated as soon as there is a manageable number of cases with adequate resources to characterize, classify and follow up each case individually. Usually cases have become clustered such that it is possible to identify and characterize discrete foci of transmission. Malaria case-based surveillance for elimination aims to detect and notify all malaria infections, ensuring that they are given prompt, efficacious treatment to prevent secondary cases. Then each malaria case should be investigated to determine whether it was locally acquired or imported and to determine risk factors associated with infection. Once a local case of malaria has been detected and notified, active case detection and a focus investigation is carried out by trained malaria staff to assess the receptivity and vulnerability of an area and what drives transmission and determine what interventions are necessary to successfully interrupt transmission. Table 5 below lists additional specific activities to be conducted in elimination ODs after transitioning from burden reduction.

Operational objectives of the surveillance for Elimination ODs are:

- Diagnostic testing should be subject to quality control
- All detected infection be given a fully effective treatment as soon as possible

TABLE 5

Components of surveillance in burden reduction and elimination ODs

COMPONENTS	BURDEN REDUCTION ODs	ELIMINATION ODs
CASE DETECTION	Passive	Passive and active
CASE REPORTING	Monthly MIS/HIS report, Line list, Paper based	Immediate notification, Case based, Electronic
DOT AND FOLLOW UP	No	For Pf/mix cases
PROACTIVE CASE DETECTION	High Risk	High Risk
CASE INVESTIGATION	No	For Pf/mix cases
CASE CLASSIFICATION	No	For Pf/mix cases
REACTIVE CASE DETECTION	No	For Pf/ mix local cases
FOCI INVESTIGATION	No	To be initiated in 2017
FOCI MANAGEMENT	No	To be initiated in 2017

- Reporting should cover all health providers and be timely and complete
- Case based notification should be immediate
- All cases and foci should be fully investigated, classified and with response
- Records should be kept and stored permanently in the electronic MIS, to guide programme implementation, for future reference and to build the evidence base for eventual certification

03.1
PASSIVE CASE DETECTION IN ELIMINATION ODS

In elimination programs, the objective of passive case detection is to provide full clearance of infection as soon as possible to reduce the parasite reservoir and prevent secondary transmission. This implies that all symptomatic malaria-infected individuals should be identified and treated radically, so that all malaria parasites in the body are killed.

3.1a
EXPANSION OF COMMUNITY BASED SERVICES

Village Malaria Workers (VMWs) and Mobile Malaria Workers (MMWs)

VMWs were deployed in priority to cover areas with the highest malaria transmission. The VMW program needs a reorientation for the recruitment of new VMW in ODs targeted for Elimination because they would have a very important role to conduct active surveillance and field operations. Tasks and trainings should integrate new specific tasks related to elimination and their role and responsibilities expanded accordingly. New MMWs also need to be deployed in elimination ODs because higher access to at-risk MMPs (i.e. forest goers or new settlers) would be critical.

Public-Private Mix (PPM) program and Plantation Malaria Worker (PMWs)

PPM will be extended among all licensed private sector providers in each endemic ODs, incorporated into the national malaria surveillance system and supervised by CNM or partners. New PMWs will be recruited to cover additional private plantation companies, which are remotely located out of the reach of health centers or health posts.

RCAF and police health services

Some security forces positioned in endemic areas are exposed to high malaria risk particularly when they operated in forested areas. Their dedicated health services will be supported by CNM to apply adapted preventive measures, provide most efficient diagnosis and treatment protocols and be included into the MIS surveillance network.

3.1b
QUALITY-ASSURANCE (QA) OF MICROSCOPY

In elimination programs, the diagnosis of malaria must be sensitive, species-specific, rapid and equally reliable everywhere. Quality assurance (QA) of microscopy is essential. The QA system is designed to

improve the accuracy of test results continuously and systematically. Microscopists of the National Reference Laboratory (NRL) should be evaluated by standard WHO External Competency Assessment (ECA). In each laboratory, all slides should be properly recorded, labelled, stored and made available for quality control. Regular supervision and periodic refresher trainings for microscopists should be conducted. Finally a system should be set up with all positive slides and a random sample of negatives be shipped regularly to NRL for crosschecking. All details will be found in the National Guidelines for the Quality Assurance of microscopy.

3.1c SPECIFIC TREATMENT AND FOLLOW-UP FOR P. FALCIPARUM OR MIXED INFECTIONS

The following activities can be implemented within limited geographical scope if additional resources and basic operational conditions are available:

Verification of day zero (D0) positive slides by reference laboratory

This activity could be implemented only once a reliable QA system is in place. A slide can be collected for RDT positive cases at VMW, PPM or HC level and sent to reference laboratory for cross-checking. At RH, FDH and HC level where laboratory is in place, positive slides can be sent to reference laboratory for cross-checking. Presence of P. falciparum gametocytes is an indication of late care-seeking.

D0-1-2 Direct-Observed Treatment (DOT)

This activity could be implemented only in villages where a VMW is active. The first dose of ACT is given immediately on D0. All patients with confirmed P. falciparum or mixed infection will intake their subsequent doses at D1 and D2 in the presence of a VMW.

D28 parasitological follow-up

This activity could be implemented only once a reliable QA system is in place. For patients with confirmed P. falciparum or mixed infection, a slide is collected at D28 to ascertain efficacy of treatment with full parasitological clearance. If positive, the patient will receive second-line treatment according to NTG.

3.1d IMMEDIATE CASE BASED NOTIFICATION

Case notification is the compulsory reporting of detected cases of malaria by all medical units and medical practitioners, to either the health department or the malaria elimination service (as laid down by law or regulation).

Objective: Every malaria case is notified on the same day as diagnosis (D0)

In Elimination ODs, all points of care need to report confirmed cases immediately so that a prompt response can be taken. All points of care will migrate from MIS monthly line-list to

TABLE 6

Points of care and reporting applications required

TYPE	POINT OF CARE	HIS FORM	MIS APP
PUBLIC HEALTH FACILITY	Reference Hospital	X	PC/Tablet
	Former District Hospital	X	PC/Tablet
	Health Center	X	PC/Tablet
	Health Post	X	PC/Tablet
COMMUNITY HEALTH WORKER	Village Malaria Worker		Smart Phone
	Mobile-Migrant Malaria Worker		Smart Phone
	Plantation Malaria Worker		Smart Phone
PRIVATE SECTOR	Public-Private Mix private provider		Smart Phone
MILITARY	Military		TBD
POLICE	Police		TBD

case-based immediate notification through dedicated android application installed on smartphone or tablet. RH and HF will continue to report aggregate monthly data to HIS (see Table 6 below).

When a test is negative, a shorter notification is done but no details about the patient are entered. By contrast, when a case is confirmed, the application captures the same information that is on the MIS line list for patients who are tested positive. It includes the current village of residence to be selected from a standard drop-list. In addition, the phone number is required to track the patient for the case investigation.

All additional details about immediate case-based notification are provided in related "SOP for Immediate case-based notification" in Annex 9 with table of required data element.

3.1e
CASE REGISTRATION AND AUTOMATED ALERT

All confirmed cases (regardless of species) which are notified are given a serial unique identification number and stored in the module of MIS data platform dedicated to the national case register.

The notification of a confirmed Pf or mixed case submitted by the point of care generates an alert to the Health Centre to which the patient's village of residence is situated. The objective is to give information to the HC staff undertake a case investigation (see Figure 9 below). The alert includes the patient's a ge, sex, village of residence, and phone number but also includes information on the point of care, including the type (e.g. VMW/HC/HP/PPM) and location. The alert is also directed to the OD malaria supervisor, PHD of the patient's village belongs to and CNM for information.

03.2
ACTIVE CASE DETECTION IN ELIMINATION ODS

The objective of active surveillance in elimination OD is to seek out malaria cases that may be missed through the passive system, evaluate malaria transmission risk factors in a given foci, and respond to malaria risk factors to halt all transmission.

This can be achieved through:
- Case investigation and classification
- Reactive case detection, and
- Foci investigation and management

3.2a
ROLES AND RESPONSIBILITIES

In Elimination ODs, the first priority is ensuring that every case is immediately notified, investigated

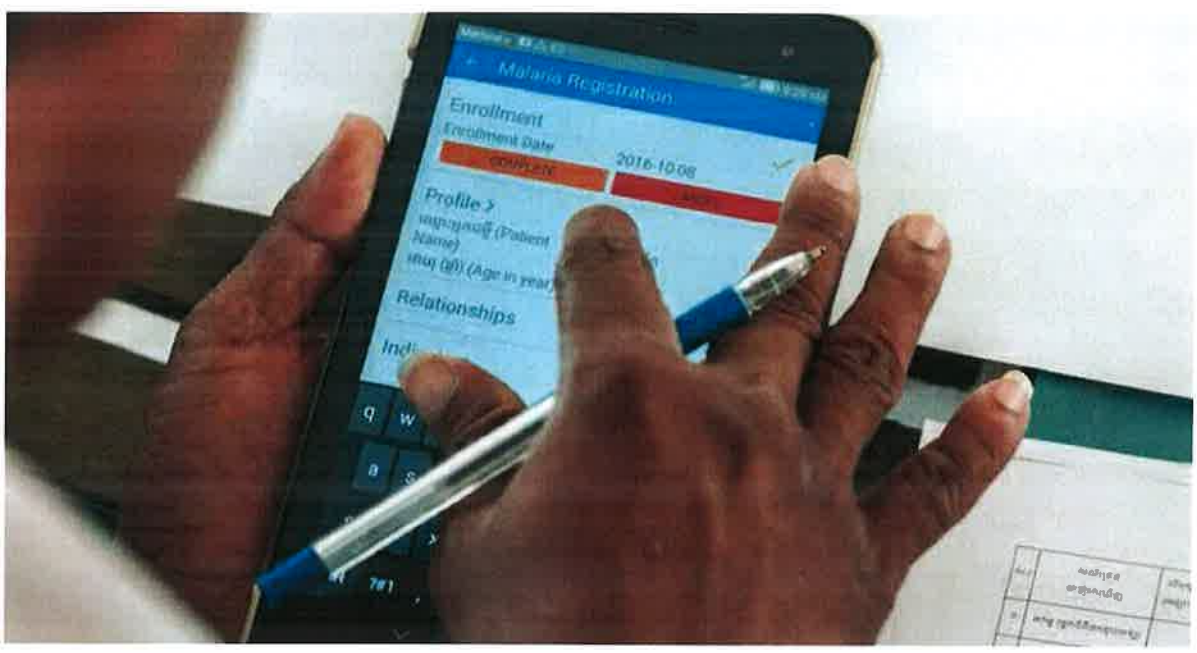
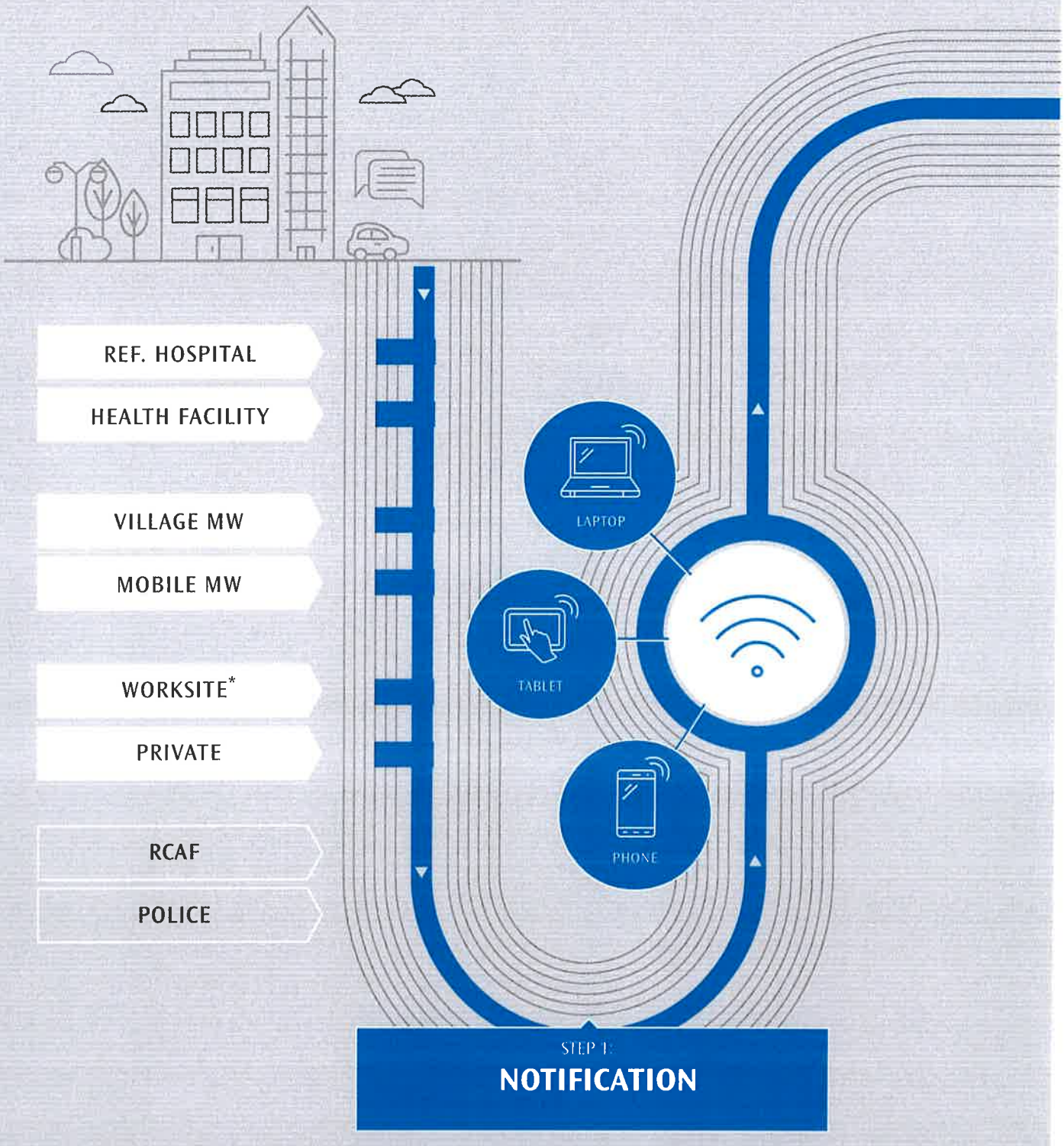


FIGURE 9

Data Submission and Flow in Burden Reduction ODs



* Worksite includes Forest, Construction site, Minte Site and Plantation

* Worksite includes Forest, Construction site, Minte Site and Plantation

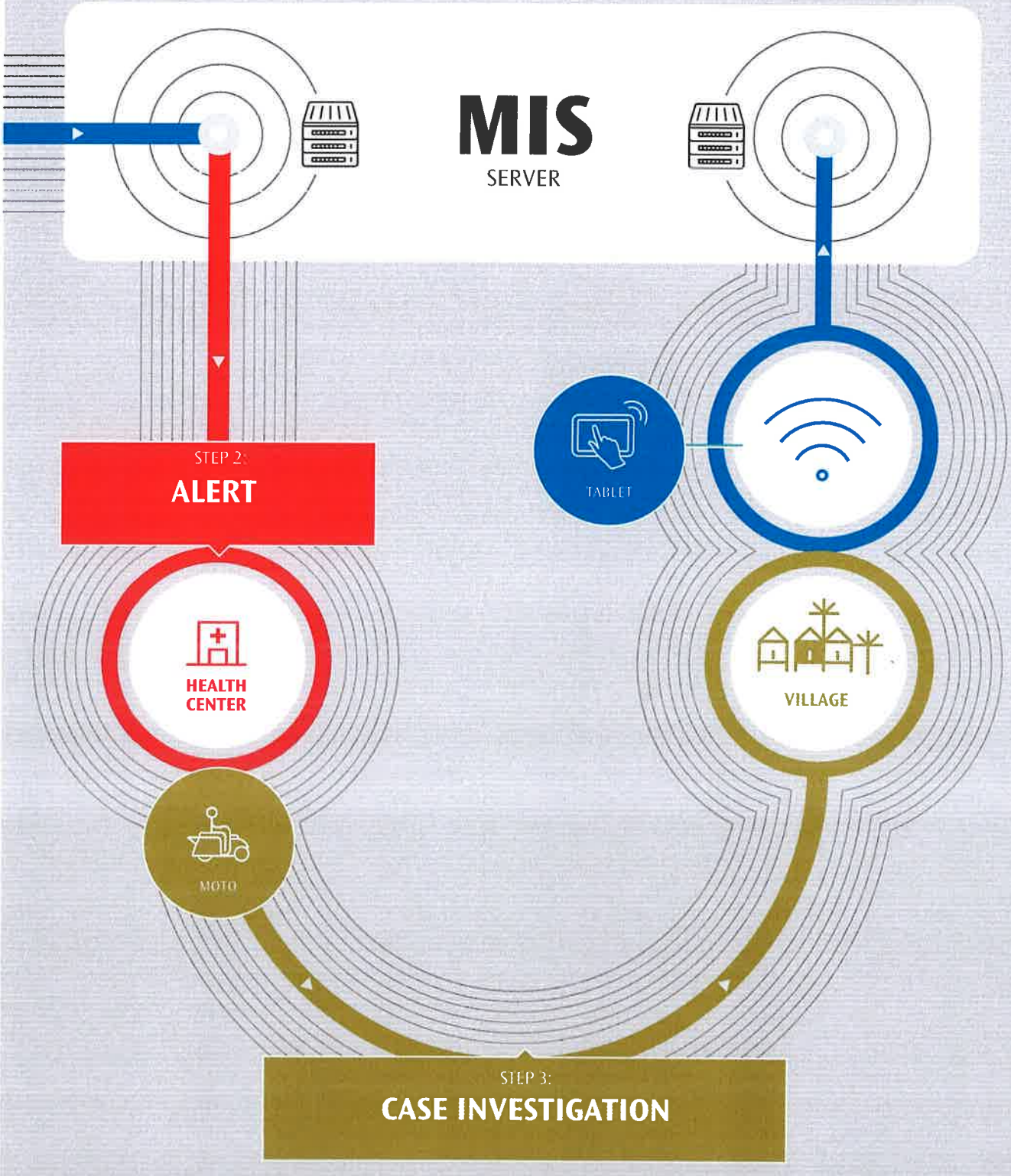

MIS
SERVER
TABLET
STEP 2:
ALERT
HEALTH CENTER
MOTO
VILLAGE
STEP 3:
CASE INVESTIGATION

TABLE 7

Overview of roles and responsibilities for Active case detection in Elimination ODs

TYPE	CATEGORY	RESPONSIBILITIES
PUBLIC HEALTH FACILITY	RH	Case notification
	FDH	
	HC	Case notification
		Organise and manage: - Case investigation and classification - Reactive case detection
	HP	Case notification
COMMUNITY HEALTH WORKER	VMW	Case notification
		Assist HC staff to conduct: - Case investigation and classification - Reactive case detection
	MMW	Case notification
	PMW	Case notification
PRIVATE	PPM	Case notification
MILITARY	Military	Case notification
POLICE	Police	
OD		Supervise HC's case investigation, case classification, and reactive case detection
		Organise and manage: - Foci investigation and classification - Foci management
PHD		Conduct supervision visits to OD
		Supervise HC's case investigation, case classification, and reactive case detection as needed
CNM		Conduct data management and analysis
		Conduct supervision visits to PHD and ODs

and classified. As such, both the HC staff and VMW have an expanded role in Elimination ODs as they are the primary implementers for case investigation, case classification, and reactive case detection.

3.2b
CASE INVESTIGATION AND FOLLOW-UP

The case investigation is the collection of information to allow classification of a malaria case by origin of infection. Case investigation includes administration of a standardized questionnaire to a person in whom a malaria infection is diagnosed.

Due to the long incubation period, it is more difficult to pinpoint where P. vivax was acquired so there is limited utility in conducting case investigation to target a response. Therefore, case classification and investigation will be conducted only for P. falciparum and mixed cases. P. vivax cases will not be investigated at the initial phase of elimination. In the future, case investigations may be reconsidered for P. vivax.

Objective: Every P. falciparum or mixed case is investigated and classified within 3 days (D3)

The case investigation is undertaken by the Health Centres. If possible, human resources and logistics in Health Centers should be reinforced in Elimination ODs to conduct case investigation. In addition, provision of appropriate training, mentoring and supervision is critical. Adapted logistic support and operational cost should also be provided. If a VMW is operative in the case's village of residence, then the VMW will accompany the HC staff on the investigation.

After receiving an alert when a case is notified with case's village

The case investigation has the following objectives:

To confirm initial diagnosis and treatment

To verify completion of treatment

To obtain detailed information about the case in order to:
- Document risk factors for malaria infection
- Assess availability and use of ITN in the household
- Evaluate risk that infection was acquired locally
- Evaluate the risk of ongoing local malaria transmission

A case investigation form is completed for each confirmed *P. falciparum* or mixed malaria case

The team should collect, assemble and review information in 3 phases:

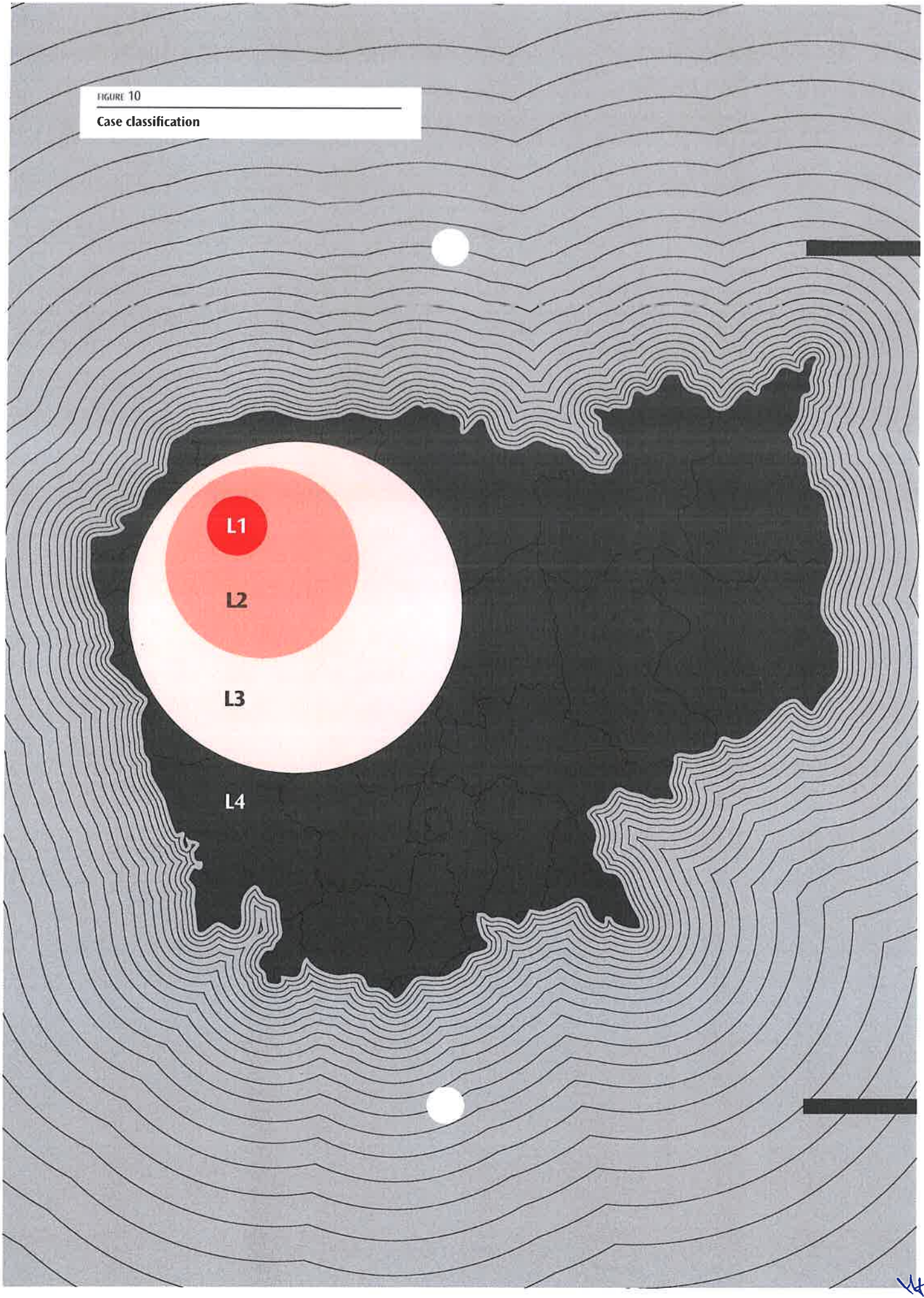
01 The first part of is preferably conducted at the place where the case has been detected to get confirmation of the diagnosis and prescribed treatment.

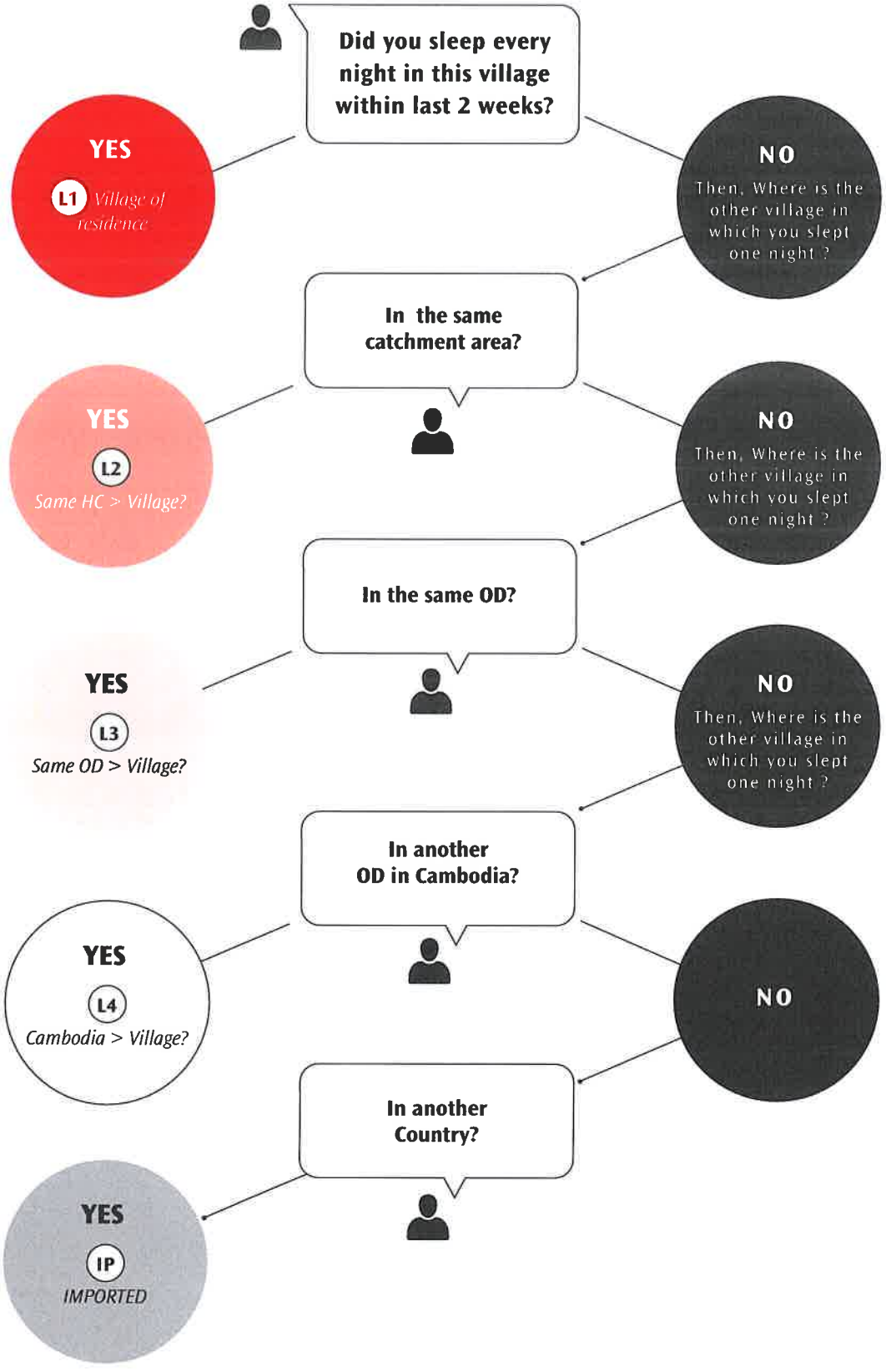
02 The second part compiles information at the place of residence. It includes demographic information and other characteristics, a history of the current illness including diagnostic test results and prescribed treatment. The correct dosing, adherence and completion of treatment is also verified. It also collects information on risk factors, travel history, where, how and from whom the infection might have been acquired and recent contacts to whom malaria could have been transmitted. It is essential to record the dates of all events in the travel and clinical history.

03 Blood slides will also be collected on Day 28 to determine patient's response to treatment. If parasites are not completely cleared by Day 28, then the patient needs to be put on second line treatment. This activity could be implemented only once a reliable QA system is in place.

FIGURE 10

Case classification





The classification will then trigger a reactive case detection or not (see Table 9 below).

of residence located in the Health Centre's catchment area, the staff should conduct the case investigation on the third day after the diagnosis.

The Health Center staff can be assisted by Village Malaria Workers if they are some in activity in the village. The investigation team fills in the case investigation form on a dedicated application on a tablet. The form will be uploaded to the MIS server after completion.

All additional details about case investigation are provided in related in related "SOP for case investigation and classification" in Annex 10 and recorded on Case investigation form in Annex 11.

3.2c CASE CLASSIFICATION

Based on the case's answer to the question: "Did you sleep every night in this village within the last 2 weeks?" the case is classified as one of the four classes of local cases (L1, L2, L3 or L4) or as an imported case (see Figure 10).

3.2d REACTIVE CASE DETECTION

When the P. falciparum or mixed malaria case is classified as "Local from the village of residence" OR "from a village in same HC catchment area", reactive case detection is conducted to detect concomitant or secondary infections that may have occurred but not yet captured through the passive system.

The same team of Health Center staff, and VMWs if available, will undertake the reactive case detection on the same day of investigation.

This involves house-to-house visits with:

01 All members of index case's household receive a presumptive treatment.

02 The 20 neighboring households should be visited and all the index case's co-travelers, if applicable. They should all be tested with an RDT regardless of existing symptoms. Each individual is asked about following risk factors:
- Fever, chills, sweat, nausea?
- Slept in the forest/farm/plantation last month?
- Returned from travel last month?
- Got malaria last 6 months?
- Know somebody with malaria last 6 months?

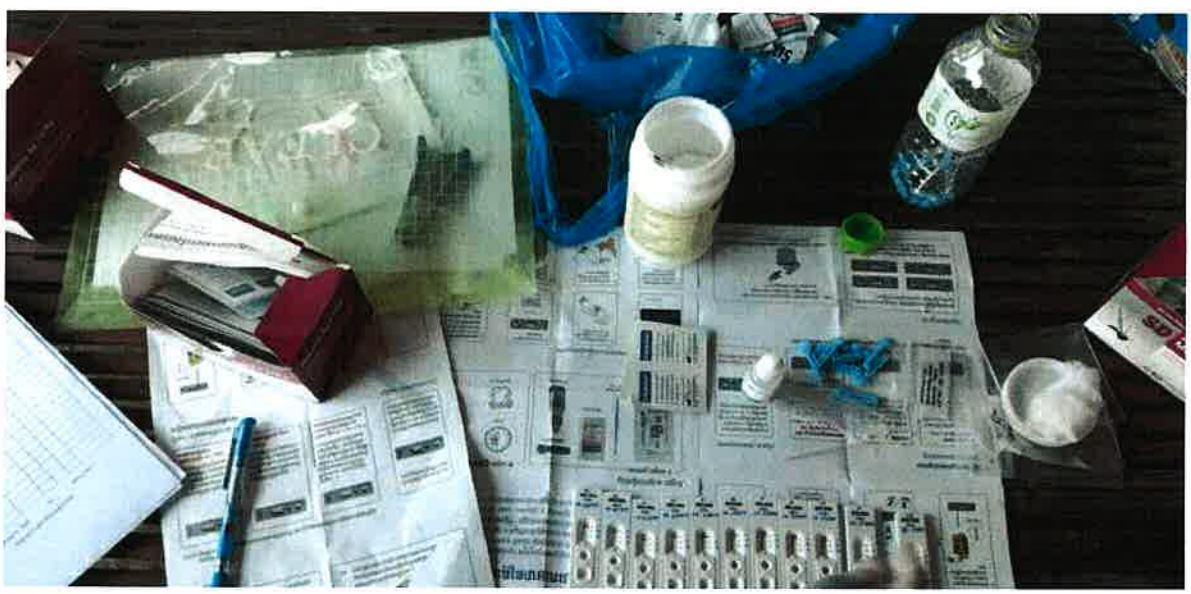


TABLE 8

Case classification and corresponding response

		CASE CLASSIFICATION	SUB-CLASSIFICATION	CRITERIA	ACTION REQUIRED
L1	Local	From the village of residence	Name of village	Slept every night at village of residence within the last 2 weeks	Reactive case detection in the village of residence
L2	Local	From another village in the same HC catchment area	Name of village	Slept at least one night in another village in the same HC catchment area	Reactive case detection in: - the village of residence AND - the other village
L3	Local	From the same OD	Name of village	Slept at least one night in another village outside the HC catchment area but in same OD	None
L4	Local	From another OD in Cambodia	Name of village	Slept at least one night in another village in another OD in Cambodia	None
IP	Imported	From another country	Name of village	Slept at least one night in another country	None

All additional details about case investigation and classification are provided in related "SOP for case investigation and classification" in Annex 10.

Positive individuals receive standard treatment and questioned with a new "case investigation form".

Important note: Reactive case detection is initially conducted with RDTs as the currently available "point of care" diagnosis tool. However, any possibility to use more sensitive diagnosis tool such as nucleic acid amplification techniques like polymerase chain reaction (PCR) or loop mediated isothermal amplification (LAMP) should be considered. Effectiveness of reactive case detection is also likely to be significantly increased by the use of high-sensitivity RDTs under development.

All additional details about Reactive case detection are provided in related "SOP for Reactive case detection" in Annex 12 and recorded on "Recording form for Re-active case detection" in Annex 13.

03.3
FOCI MANAGEMENT IN ELIMINATION ODS

Interventions during pre-elimination and elimination programmes are based on the concept of a malaria focus, assuming that transmission is focalized and no longer homogeneous across the country.

Monitoring the status of foci, with precise identification of their functional status, is a cornerstone for success in interrupting malaria transmission. The objective is to restrict interventions to areas into which the risk of the continuation or resumption of transmission has been once documented and is regularly monitored.

Focus: A defined, circumscribed locality situated in a currently or former malarious area containing the continuous or intermittent epidemiological factors necessary for malaria transmission.

This emphasizes the ecological character of a focus as an integration of physical environment and the three populations required for malaria transmission (humans, mosquito vectors and parasites) as well as other biological determinants especially animals, which may act as alternative sources of blood for local vectors (see Figure 11 below)

3.3a
ROLES AND RESPONSIBILITIES

In Elimination ODs, the first priority is ensuring that every case is immediately notified, investigated and

FIGURE 11

Ecosystem of a focus

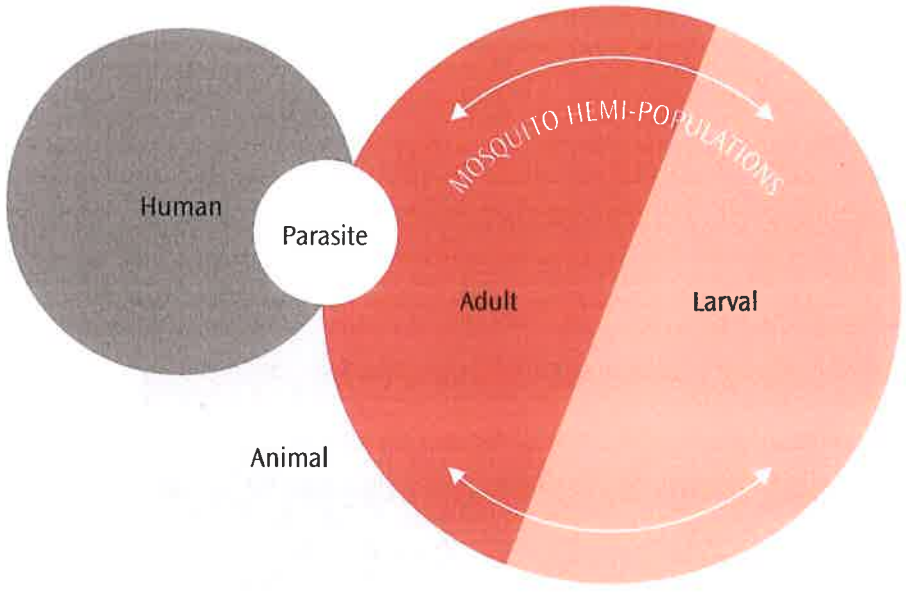


TABLE 9

Overview of roles and responsibilities for foci management

TYPE	CATEGORY	RESPONSIBILITIES
PUBLIC HEALTH FACILITY	RH	
	FDH	
	HC	**Assist OD staff to conduct:** - Foci investigation and classification - Foci interventions
	HP	
COMMUNITY HEALTH WORKER	VMW	**Assist OD staff to conduct:** - Foci investigation and classification - Foci interventions
	MMW	**Assist OD staff to conduct:** - Foci investigation and classification - Foci interventions
	PMW	
PRIVATE	PPM	
MILITARY	Military	**Assist OD staff to conduct:** - Foci investigation and classification - Foci interventions
POLICE	Police	
OD		**Organise and manage:** - Foci investigation and classification - Foci interventions **Data management and analysis**
PHD		Supervise ODs for Foci investigation, classification and interventions Data management and analysis
CNM		Conduct supervision visits to PHD and ODs identification of captured mosquito Analysis of blood spot by PCR Data management and analysis

classified. As such, both the HC staff and VMW have an expanded role in Elimination ODs as they are the primary implementers for case investigation, case classification and reactive case detection.

3.3b
FOCI INVESTIGATION AND CLASSIFICATION

The identification of a focus provides an indication of where to search for cases which may have been:

- The source of infection for a local case whether local (indigenous) or imported (introduced)
- Infected from an index case detected after becoming infective (secondary cases)

A focus defines the area where:

- Full coverage by effective vector control is provided to prevent any forward transmission from mosquitoes
- Surveillance and treatment needs to be prompt and rigorous so that any new case is rapidly detected and treated to prevent transmission from human
- Interventions might be required to limit importation of parasites and/or infective vectors

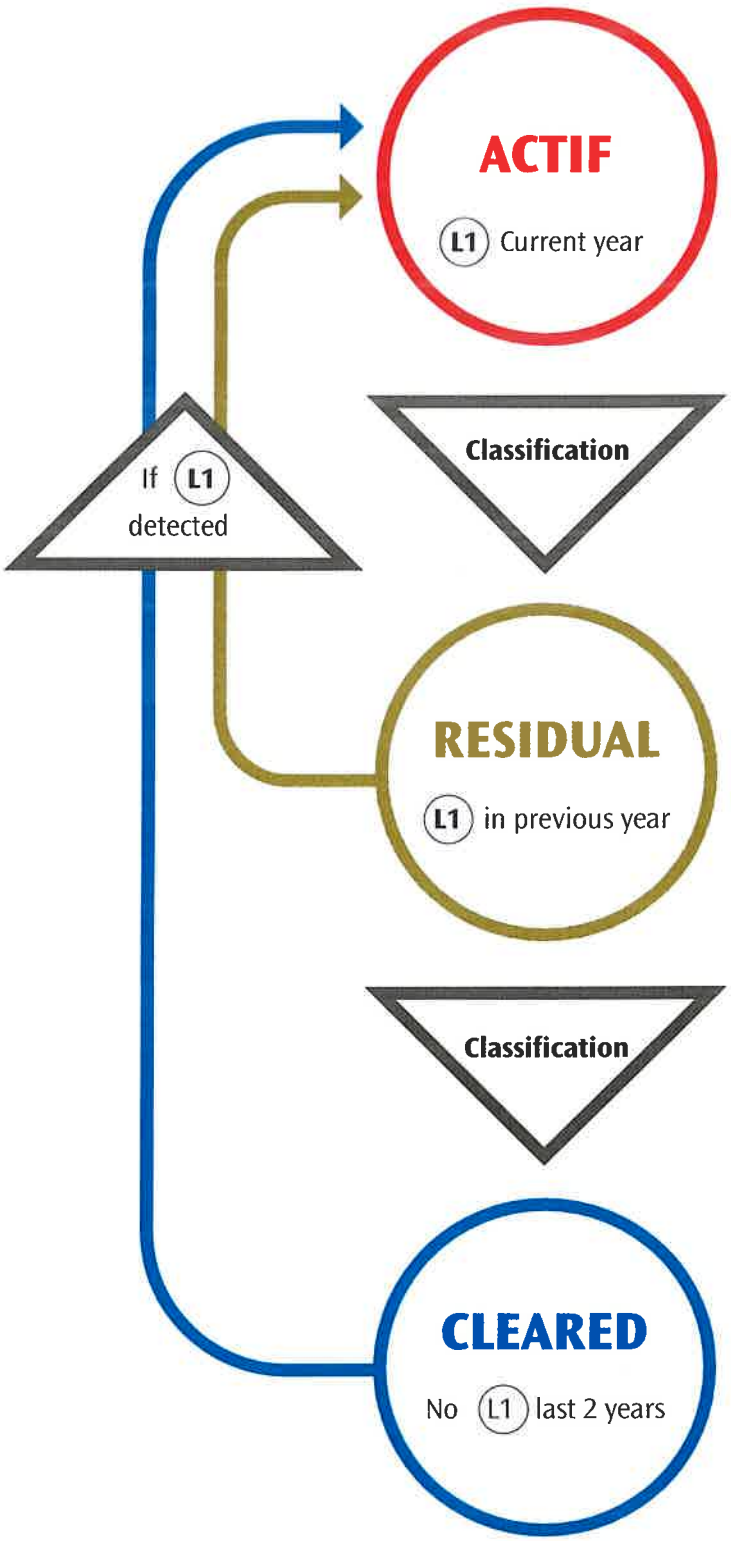
Operational definition of foci

Simplified foci classification is used (e.g. no endemic, no potential and no residual foci). Only 3 kind of focus are considered:

Active focus is a village from which at least one P. falciparum or mixed case has been investigated and classified as L1 during the current calendar year.

Residual focus is a village from which at least one P. falciparum or mixed case has been investigated and classified as L1 during the previous calendar year.

Cleared-up focus is a village formerly defined as an active focus in which no case investigated and classified as L1 has been detected over the last 24 months.



After beginning of the elimination phase and initiation of case investigations, all villages with L1 cases reported are defined as new active foci. Later on, classification of each focus is updated every 12 months based on occurrence of L1 cases.

Investigation of a new active focus
After beginning of the elimination phase and initiation of case investigations, all villages with L1 cases reported are classified as new active foci and are visited for a focus investigation.

Objective: Every new active focus is investigated and classified within 2 weeks (D14)

The objective of the focus investigation is to provide the necessary information to:

- describe the areas where malaria occurred
- delineate the population at risk
- ascertain risk factors
- classify the focus
- select the optimal strategies for interruption of transmission

For the classification of foci, the concepts of receptivity and vulnerability are critical:

- Areas are receptive when the abundant presence of vector anophelines and the prevailing ecological and climatic factors favor malaria transmission. It is a reflection of the vectorial capacity of local anophelines during the season most favorable for malaria transmission.
- Areas are vulnerable when they are in proximity to malarious areas or are prone to the frequent influx of infected individuals or groups and/or infective anophelines.

The investigation is expected to last 4 days and 3 nights. The foci investigation is initiated from the OD level with OD malaria supervisor and a technician. They are assisted if necessary by staff from the closest HC and active VMWs if in place.

The components of foci investigation consists of:

1. **Desk review of past reported cases Monthly case counts** from the village in routine MIS data base over the last 5 years are reviewed. Case investigation reports from the village recorded over the last 12 months are reviewed to assess balance between L1 and other case classes. Seasonal pattern of incidence and average rainfall by month is also assessed.

2. **Night capture of mosquitos**
   The team operates capture of mosquitos over 3 consecutive nights. The objective is to confirm presence and absence of vector. The most sensitive and simple mosquito trapping method will be selected ranging from human landing collection (HLC), cattle baited net collection (CBNC) and human baited net collection (HDNC). Collected mosquitoes will be identified morphologically and stored in ethanol or other suitable preservative and sent to CNM for identification.

3. **Geographical reconnaissance and village mapping**
   If possible, GIS is used to draw detailed map of the village using background geographical features (e.g. roads, rivers, water bodies, forests and elevation). Recent reported and investigated malaria cases are also plotted on the map.

4. **Household enumeration and population census**
   Then every household is visited and geo-referenced during comprehensive population census capturing demographics of all permanent and occasional household members. Additional questions to characterize empty households and absent family members are asked to neighbors or available household members.

5. **PCR screening of children under 10**
   Each child aged less than 10 years (about 20% of the population) that has not slept outside the village over the last month is finger-picked for a blood spot. Blood spots are sent to Phnom Penh for PCR .
   Purpose: The reason for this is that children below ten years old are considered as a stable population.

6. **Mobility assessment of male residents**
   Each male aged more than 15 years is administered a standard questionnaire about their mobility and activity in the forest during the last year. They are classified as mobile, seasonal workers or forest goers and asked how many nights they spent outside the village over the last 4 weeks.

All additional details about Foci investigation are provided in related "SOP for Foci investigation" in Annex 14.

Classification of a new active focus

Outcomes of the focus investigation to assess level of receptivity (potential transmission) and vulnerability (importation of parasite or infected vector) are the 2 parameters used for the classification of the village.

TABLE 10

Indicators of receptivity and vulnerability collected by focus investigation

EVIDENCE OF RECEPTIVITY	INDICATOR
Presence of vector	Number of adult vector captured over 3 nights
Presence of parasite among stable population	Number of children screened with positive PCR
Evidence of vulnerability	**Indicator**
Incidence of imported cases	Number and proportion of the cases investigated over the last year which were infected outside the village (Classified L2-3-4 or IMP)
Mobility of residents	Number and proportion of adult males who slept outside the village over the last 4 weeks

TABLE 11

Criteria for foci classification

	GRADE OF RECEPTIVITY		GRADE OF VULNERABILITY
R0	No vector captured AND No infected children	V0	Less than 90% of cases are imported AND Less than 20% of males are mobile
R1	At least one vector captured OR At least one infected children	V1	More than 90% of cases are imported OR More than 20% of males are mobile
R2	At least one vector captured AND At least one infected children	V2	More than 90% of cases are imported AND More than 20% of males are mobile

Overview of surveillance operations in Elimination ODs is provided in "Decision tree for surveillance in Elimination ODs" in Annex 15.

3.3c
FOCI REGISTRATION AND MONITORING

Each new active focus is recorded in the national foci register and its classification status is then updated every 12 months.

3.3d
INTERVENTION TO INTERRUPT TRANSMISSION IN RECEPTIVE FOCI

After the classification of the focus, the OD malaria focal point, in consultation with PHD and CNM national focal persons, will prepare a response plan, according to the results of the focus investigation. The following interventions will be considered based on the foci classification:

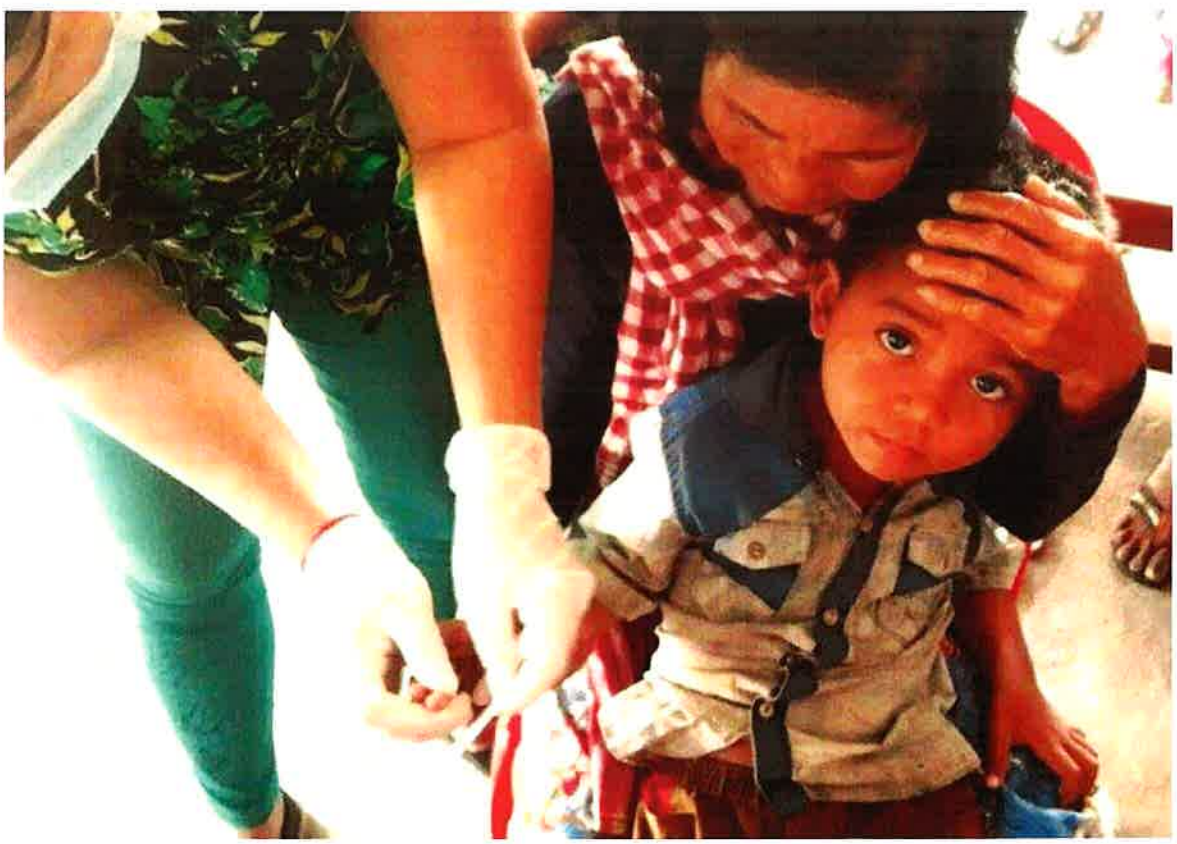
Interventions on receptivity:

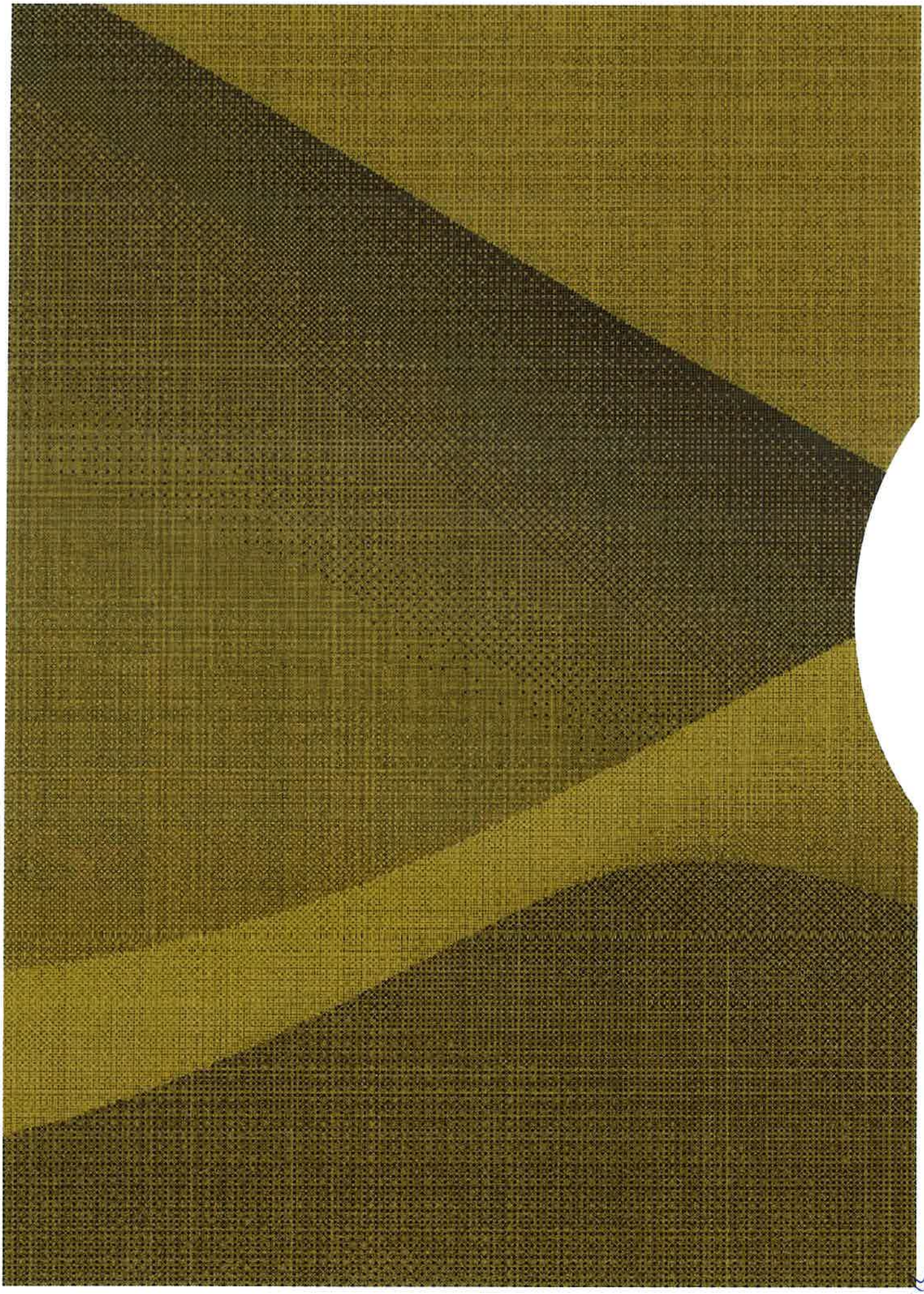
- **01** Comprehensive ITN/LLIN coverage (ITN)
- **02** Passive case detection with village malaria worker (VMW)
- **03** Active case detection with house-to-house fever-screening every week (AFS)
- **04** Active case detection with mass-screening with highly-sensitive RDTs (AMS)
- **05** Mass Drug Administration (MDA)

Interventions on vulnerability:

- **06** Information and prevention for mobiles and forest goers (PMF)
- **07** Treatment on arrival for migrants, mobiles and forest goers (TRT)

	R0	R1	R2
V0	VMW	ITN AFS	ITN AFS AMS/MDA
V1	VMW PMF	**ITN** **AFS** **PMF**	ITN AFS AMS/MDA PMF
V2	VMW PMF	ITN AFS PMF TRT	ITN AFS AMS/MDA PMS TRT





chapter

04

Data Management & Analysis

SURVEILLANCE FOR MALARIA ELIMINATION OPERATIONAL MANUAL

chap 04

Data Management & analysis

04.1 MIS ACCESS AND MAINTENANCE

Periphery-level users will only be able to enter data for their relevant areas of operation. They may also be able to access and view visualisations for data from operational units in near-by geographical areas, as defined by CNM. For example, a HC will only be able to enter data from VMWs and private providers in their catchment area, while ODs will only be able to see data for points of care within their OD and nearby. Central-level CNM will have complete oversight of all data in MIS.

OD staff will be responsible for the regular updating of census-related information for their ODs. This includes data such as names and geographical coordinates of points of care, as well as total population figures of villages. OD staff will coordinate with the relevant stakeholders (e.g. village chiefs, HC staff) to update these figures annually within a time frame to be specified by CNM.

04.2 DATA MANAGEMENT

Validation of completeness and quality of data entry help ensure captured statistics are meaningful. Regular checks are necessary at each step of the reporting process, including for the fully compiled database. Both regular and random assessments should be done in order to evaluate this properly and identify where operational or quality gaps may exist. At the uppermost level of data validation, automated system checks will be available to aid in the process, highlighting data discrepancies or missing values.

Data entry completeness and feedback

On the 15th of every month, CNM data management staff will check for completion of data entry by OD and/or HF / HC staff. Specifically, CNM will assess whether data has been entered for all VMWs, PPM private providers, and HCs under the OD catchment area, as well as perform a system check for the comprehensive

data quality. Non-submission by the point of care and a confirmed submission of zero cases for that reporting period will be denoted separately. CNM data management staff will follow-up with OD data entry staff at an operational level individually if data entry is incomplete or of poor quality. OD/PHD staff will then follow-up with points of care on submitting reports.

Completeness of data entry into MIS is automatically measured through a built-in algorithm. This measures both completeness of reporting by the point of care as well as completeness of OD's data entry into MIS.

- Completeness by field: Measures the percentage of individual line lists that has data entered for the specified field. Regular system-level M&E indicators will be produced by the MIS after each monthly submission deadline to inform completeness (Table 2).
- Completeness by point of care: Measures the percentage of points of care that have data entered for each month. Points of care that did not submit reports will be marked as "incomplete", while points of care that reported zero cases will be marked as complete.

ODs will be able to analyse data entry completeness using the built-in MIS visualizers and follow-up with points of care that are not reporting regularly.

Reporting completeness and feedback

Completeness of the MIS paper-based forms will be assessed in-person through routine mechanisms or supervision visits. In all such cases, verbal feedback will be provided to the point of care to encourage improved reporting completeness

- HC/OD staff will oversee completeness of VMW, MMW, PMW, and PPM private providers reporting routinely at the monthly (VMW, MMW, PMW) or bi-monthly (PPM) meetings. At these meetings, HC/OD staffs will cross-check the number of used RDTs and ACTs against the case data reported on the paper forms.
- Routine visits by OD, PHD, and CNM staff to public health facilities, community health workers, and private providers will include spot-checking for completeness of data reporting. These visits will be informed by the established performance of the points of care and target low performers.

MIS and HMIS cross-validation

The Health Management Information System (HMIS) also captures malaria case data from VMWs, public health facilities, and private providers across the whole country, aggregated at the facility level. HMIS data will either be uploaded manually by CNM or, contingent upon DPHI agreement, directly routed automatically to the MIS for cross-validation, situational analysis, and supplemental data for non-CNM covered areas or reporting sources with zero report to the MIS. On a monthly basis, the MIS will generate a report comparing the number of cases reported to the HMIS and MIS from each type of source. This report can be accessed by CNM to evaluate external validity and identify discrepancies for field-level follow-up. Comparisons can be broken out by facility within and OD and also at the OD-level.

04.3

DATA ANALYSIS

Standard adapted methodology for data analysis is a critical component for an efficient upgraded MIS but is still under development. Once finalized, this section will describe in detail the required operations for computation of all surveillance-based indicators included in the MEAF performance framework. This will guide the programing of MIS platform for automated outputs adapted to users at different level of the system.

04.4

FEEDBACK AND REPORTING

The section will provide standard template for quarterly surveillance bulletin disaggregated by OD allowing tabular and graphical trend analysis of a set of core indicators.

	COUNTRY -WIDE
CM-1a	Annual blood Examination Rate – Passive case detection: Number of parasitological tests carried out per 100 population
CM-1b	Annual blood Examination Rate – Active case detection: Number of parasitological tests carried out per 100 population
IP-3b	Annual Plasmodium falciparum Incidence: Number of confirmed Plasmodium falciparum malaria cases, including mixed per 1,000 population
SV-1a	Percentage of expected HIS reports submitted from Referral Hospitals
SV-1b	Percentage of expected monthly MIS reports submitted from public HFs
SV-1c	Percentage of expected monthly MIS reports submitted from VMW/MMWs
SV-1d	Percentage of expected monthly MIS reports submitted from private providers/PMWs

	ELIMINATION ODs
IP-6	Number of investigated Plasmodium falciparum cases, including mixed that are classified as local
IP-7	Number of active foci (with local Plasmodium falciparum, including mixed)
EL-1	Percentage of malaria cases notified within 24h
EL-2	Percentage of Plasmodium falciparum (including mixed) malaria cases investigated and classified within 3 days after detection
EL-3	Percentage of patients with Plasmodium falciparum malaria (including mixed) with directly observed treatment (DOT) by VMWs
	Percentage of Plasmodium falciparum (including mixed) malaria cases investigated and classified as local followed by reactive case detection
EL-4	Proportion of cases investigated who were diagnosed within 24 hours after onset of symptoms
EL-5	Percentage of new active foci investigated according to surveillance manual
EL-6	Percentage of investigated foci in which response was initiated according to surveillance manual

Annexes

REFERENCES

WHO TECHNICAL GUIDANCE ON SURVEILLANCE FOR ELIMINATION

Systems for the early detection of malaria epidemics in Africa. An analysis of current practices and future priorities (2006
http://www.who.int/malaria/publications/atoz/9789241594882/en/

Malaria elimination. A field manual for low and moderate endemic countries (2007)
http://www.who.int/malaria/publications/atoz/9789241596084/en/

Disease surveillance for malaria elimination: operational manual (2012)
http://www.who.int/malaria/publications/atoz/9789241503334/en/

Policy brief on malaria diagnostics in low-transmission settings (2014)
http://www.who.int/malaria/publications/atoz/policy-brief-diagnosis-low-transmission-settings/en/

Information note on recommended selection criteria for procurement of malaria RDTs (2015)
http://www.who.int/malaria/publications/atoz/rdt_selection_criteria/en/

Policy brief on single-dose primaquine as a gametocytocide in Plasmodium falciparum malaria (2015)
http://www.who.int/malaria/publications/atoz/policy-brief-single-dose-primaquine-pf/en/

Recommendations on the role of mass drug administration, mass screening and treatment, and focal screening and treatment for malaria (2015)
http://www.who.int/malaria/publications/atoz/role-of-mda-for-malaria/en/

Elimination case studies from Asian countries:

Eliminating Malaria: case study 3. Progress towards elimination in Sri Lanka (2012)
http://www.who.int/malaria/publications/atoz/9789241504454/en/

Eliminating malaria: case study 8. Progress towards elimination in Malaysia (2015)
http://www.who.int/malaria/publications/atoz/9789241508346/en/

WHO malaria terminology (2016)
http://www.who.int/malaria/publications/atoz/malaria-terminology/en/

A framework for malaria elimination (2017)
http://www.who.int/malaria/publications/atoz/9789241511988/en/

SELECTED PUBLICATIONS ABOUT SURVEILLANCE IN CAMBODIA

Bosman et al. Malaria Journal 2014, 13:394
Plasmodium prevalence and artemisinin-resistant falciparum malaria in Preah Vihear Province, Cambodia: a cross-sectional population-based study

Cox et al. Malaria Journal 2014, 13:371
Novel approaches to risk stratification to support malaria elimination: an example from Cambodia

Cox et al. Malaria Journal 2014, 13:282
Evaluation of community-based systems for the surveillance of day three-positive Plasmodium falciparum cases in Western Cambodia

Donald et al. PLoS ONE 2016, 11(11): e0167136.
The Utility of Malaria Rapid Diagnostic Tests as a Tool in Enhanced Surveillance for Malaria Elimination in Vanuatu.

Edwards HM et al. (2015) PLoS ONE 10(9): e0124300. doi:10.1371/journal.pone.0124300
Novel cross-border approaches to optimise identification of asymptomatic and Artemisinin-Resistant plasmodium infection in mobile populations crossing Cambodian borders.

Falq et al. (2016) Malaria Journal. 2016, 15(1):446.
Assessing the asymptomatic reservoir and dihydroartemisinin-piperaquine effectiveness in a low transmission setting threatened by artemisinin resistant Plasmodium falciparum.

Herdiana et al. Malaria Journal. 2016 24;15:468
Malaria risk factor assessment using active and passive surveillance data from Aceh Besar, Indonesia, a low endemic, malaria elimination setting with Plasmodium knowlesi, Plasmodium vivax, and Plasmodium falciparum

Hoyer et al. (2012) PLoS ONE 7(10): e45797. doi:10.1371/journal.pone.0045797
Focused Screening and Treatment (FSAT): A PCR-Based Strategy to Detect Malaria Parasite Carriers and Contain Drug Resistant P. falciparum, Pailin, Cambodia.

Hustedt et al. Malar Journal (2016) 15:132
Reactive case-detection of malaria in Pailin Province, Western Cambodia: lessons from a year-long evaluation in a pre-elimination setting

Imwong et al. Malaria Journal (2015) 14:381
The epidemiology of subclinical malaria infections in South-East Asia: findings from cross-sectional surveys in Thailand–Myanmar border areas, Cambodia, and Vietnam

Incardona et al. Malaria Journal 2007, 6:37
Large-scale malaria survey in Cambodia: Novel insights on species distribution and risk factors

Lwin et al. Malaria Journal 2015 14:319
Elimination of Plasmodium falciparum in an area of multi-drug resistance

Maude et al. Malaria Journal 2014, 13:385
Spatial and temporal epidemiology of clinical malaria in Cambodia 2004–2013

Maude et al. Malaria Journal 2009, 8:31
The last man standing is the most resistant: eliminating artemisinin-resistant malaria in Cambodia

Maude et al. PLoS ONE 2012, 7(5): e37166.
Optimizing Strategies for Plasmodium falciparum Malaria Elimination in Cambodia: Primaquine, Mass Drug Administration and Artemisinin Resistance.

Parker et al. Malaria Journal 2016 15:571
Limitations of malaria reactive case detection in an area of low and unstable transmission on the Myanmar–Thailand border

Peto et al. Malaria Journal (2016) 15:240
History of malaria treatment as a predictor of subsequent subclinical parasitaemia: a cross-sectional survey and malaria case records from three villages in Pailin, western Cambodia

Pongvongsa et al. Malaria Journal 2016 24;15:508
Household clustering of asymptomatic malaria infections in Xepon district, Savannakhet province, Lao PDR

Sluydts et al. Malaria Journal 2014, 13:387
Spatial clustering and risk factors of malaria infections in Ratanakiri Province, Cambodia

Song et al. Malaria Journal 2010, 9:57
Rapid and effective malaria control in Cambodia through mass administration of artemisinin-piperaquine

St. Laurent et al. Malaria Journal 2016 24;15:440
Cow-baited tents are highly effective in sampling diverse Anopheles malaria vectors in Cambodia

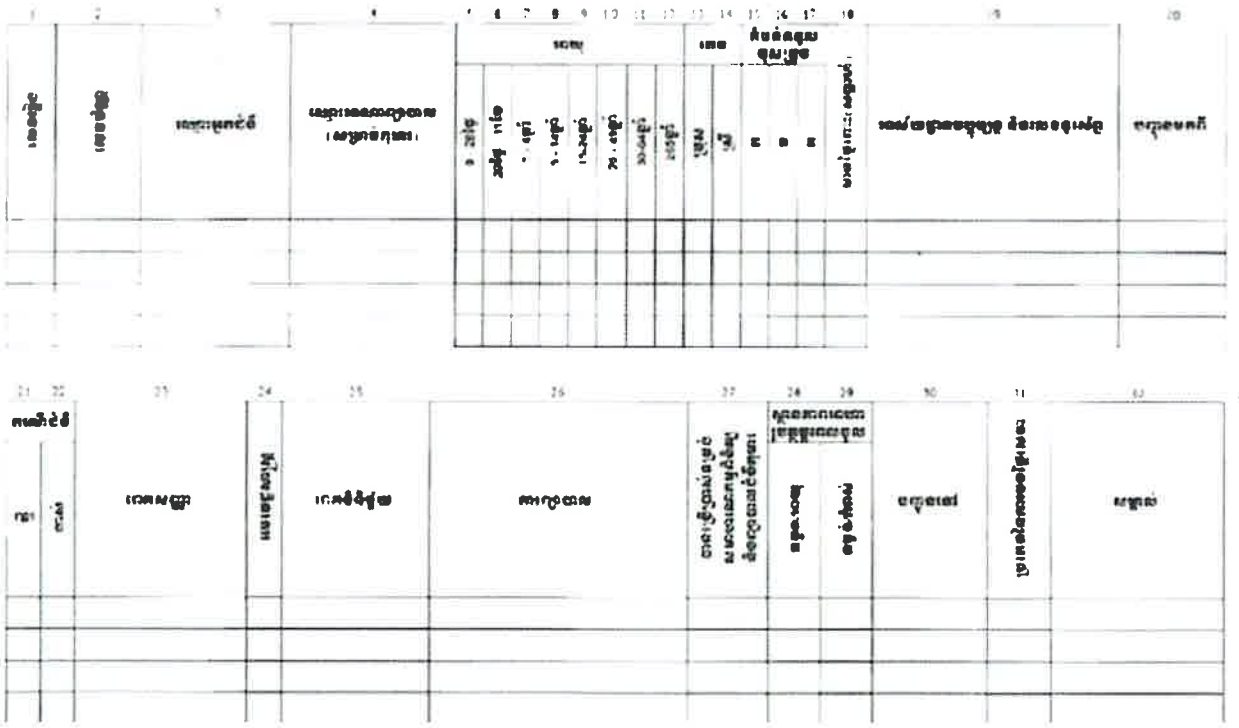
Tripura et al. Malaria Journal. 2016 24;15:181
Persistent Plasmodium falciparum and Plasmodium vivax infections in a western Cambodian population: implications for prevention, treatment and elimination strategies.

Tripura et al. Malaria Journal. 2017 25;16:56
Submicroscopic Plasmodium prevalence in relation to malaria incidence in 20 villages in western Cambodia

ANNEX 1:

REGISTERS IN PUBLIC HEALTH FACILITIES (FDH, HC, HP)

OPD REGISTER



LABORATORY REGISTER

បញ្ជីកត់ត្រាសំរាប់មន្ទីរពិសោធន៍ផ្ទៃក្រុងចាំយ៉ៅ

លេខរៀង	នាម/គោត្តនាម	អាយុ								អស័យដ្ឋានបច្ចុប្បន្ន	តំបន់ដែលភាក់ក្នុងរយៈពេល១ខែមុន	បញ្ជូនមកពី	លទ្ធផល					ថ្ងៃ ខែ ឆ្នាំ	ម៉ោង	ឈ្មោះអ្នកមន្ទីរពិសោធន៍
		<៥		៥_១៤		១៥_៤៩		≥៥០					ធាតុវិនិច្ឆ័យ			ពិនិត្យឡើងវិញ				
		ប្រុស	ស្រី	ប្រុស	ស្រី	ប្រុស	ស្រី	ប្រុស	ស្រី	ភូមិ ឃុំ ស្រុក ខេត្ត	ភូមិ ឃុំ ស្រុក ខេត្ត		កេស្តរហ៍ស	D1	D2	C1	C2			

ANNEX 2:

HMIS MONTHLY REPORT – HO2 FORMS FOR REFERRAL HOSPITALS

HMIS Monthly Report - HO2 Form

Hospital:.....OD:.....Province:.....From 01 to the last day of the month of ..... Year .....

Population covered: .....

Outpatient Consultation Section

I. OUTPATIENT CONSULTATION (OPD)

1. Volume of activities	In OD/province	Outside OD/province	Total	M	F
# of new cases referred from health centers					
# of new cases visiting hospital by themselves					
Total new cases					
Total consultations					
Total patients access to all services/units					

2. Health Problems (new cases)	ICD10	0-28 days		29 days-11 months		1-4 years		5-14 years		15-24 years		25-49 years		50-64 years		≥ 65 years		Total		Referred to		Use HEF	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1. General medicine																							
2. Communicable diseases																							
42 Sexually Transmitted Diseases	A64																						
43 Dengue fever without shock	A91																						
44 Dengue fever with shock	A91.1																						
45 Unspecified dengue	A91.2																						
46 Approximate dengue	A91.3																						
47 Chikungunya virus disease	A92.0																						
48 Approximate Chikungunya	A92.1																						
49 Hand, foot and mouth disease	B08.4																						
50 Hepatitis A	B15																						
51 Hepatitis B	B16																						
52 Hepatitis C	B17.1																						
53 AIDS	B20																						
54 Malaria	B50																						
55 Severe malaria	B50.8																						

Inpatient Section

II. HOSPITALISATION (IPD)

1. Discharged Diagnosis	ICD10	0-28 days				29 days- 11 months				1-4 years				5 - 14 years				15 - 24 years				25-49 years				50-64 years				≥65 years				Total				Referred to		Use HEF	
		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Dead		Sick		Sick	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1. General medicine																																									
2. Communicable diseases																																									
42 Sexually Transmitted Diseases	A64																																								
43 Dengue fever without shock	A91																																								
44 Dengue fever with shock	A91.1																																								
45 Unspecified dengue	A91.2																																								
46 Approximate dengue	A91.3																																								
47 Chikungunya virus disease	A92.0																																								
48 Approximate Chikungunya	A92.1																																								
49 Hand, foot and mouth disease	B08.4																																								
50 Hepatitis A	B15																																								
51 Hepatitis B	B16																																								
52 Hepatitis C	B17.1																																								
53 AIDS	B20																																								
54 Malaria	B50																																								
55 Severe malaria	B50.8																																								

Laboratory Section

III. LABORATORY ACTIVITIES

3. Malaria

3.1. Slides

Slide Diagnosis	0-28 days		29 days-11 months		1-4 years		5-14 years		15-24 years		25-49 years		50-64 years		≥ 65 years		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Positive																	(1)	(2)
Falciparum																		
Vivax																		
Mixed																		
Negative																	(3)	(4)
																Total Slides Controlled	(5)	(6)
																Total Slides Examined	(1+3+5)	(2+4+6)

3.2. Dipsticks (at Health Facility)

Slide Diagnosis	0-28 days		29 days-11 months		1-4 years		5-14 years		15-24 years		25-49 years		50-64 years		≥ 65 years		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Positive																	(1)	(2)
Falciparum																		
Vivax																		
Mixed																		
Negative																	(3)	(4)
																Total dipstics	(1+3)	(2+4)

ANNEX 3:

MALARIA INFORMATION SYSTEM - MONTHLY LINE-LIST REPORTS

HEALTH FACILITY FORM

Health Facility Malaria Patient Monthly reporting form

Province ..... **Operational Disrict...** ..... **Commune** ..... **Health facility name**.....

Year.....**Month**..... **Submission date:** .....

1. Positive Tests (only fill out the table below who test positive (+) for malaria)

No.	Current village of residence (village/commune/district/province)	Age (years) [Enter 0 for <1 year]	Sex (F/M)	Tick (✔) wherever appl cable																
				Pregnant (Y/N)	Diagnosis		Service		Diagnosis method		Test Result			Treatment (tick)				Referred to Referral Hospital (tick)	Dead
					Simple	Severe	OPD	IPD	RDT	Micrscope	Pf	Pv	Mixed	ASMQ	DHA-PIP	PQ	Other (specify)		
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

2. Summary

Number of confirmed cases: _____ Number of tests: RDT_____Microscopy_____

VILLAGE MALARIA WORKERS (VMW) FORM

កម្មវិធីអ្នកស្ម័គ្រចិត្តភូមិ
ល្បាលជម្ងឺគ្រុនចាញ់

Meeting date.....

Monthly malaria data record for Village Malaria Workers(VMWs)

Province..... District..... Health Center..... Commune..... Village..... Month..... Year..... VMW name.....

# of population :..... # of Family..... Distance from village to health center ..... Phone number.....

Total Tests (tick box for each malaria suspect tested)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Positive Tests (only fill out the table below who test positive (+) for malaria)

No	Date (day/month/year)	Patient name	Sex (F/M)	Age (years or months)	Pregnant (months)	Weight (kg)	Tempe rature (celcius)	Patient Status (Tick)		RDT result (positive)			Medication (Write down # of tablet)				DOT (3 days)		Referred	Remarks
								Non-Mobile	Mobile	PF	PV	Mix	ASMQ	DHA-PIP	Primaquine	Other (specify)	Non-Complete	Complete		
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				

Summary	
Total tested:	# Population that was provided health education:
Total positive tests:	# of time per month:
Total referred:	# Population that received deworming drug:

No	Commodity	Used	In stock	Quantity supplied
1	RDT			
2	ACT: ☐ DHA-PIP ☐ ASMQ			
3	Primaquine			

PUBLIC-PRIVATE MIX (PPM) FORM

ទំរង់ចុះឈ្មោះអ្នកជំងឺគ្រុនចាញ់ប្រចាំខែ

PSK

- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible]

ខែ.........ឆ្នាំ.........

ឈ្មោះគួប / ក្រុមហ៊ុន:..................... ភូមិ:..................... ឃុំ:..................... ការិយាល័យស្រុកប្រតិបត្តិ:..................... ខេត្ត:.....................

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
[illegible]																									
[illegible]																									

សូមបំពេញតារាងខាងក្រោម សំរាប់តែអ្នកជំងឺដែលលទ្ធផលធ្វើតេស្តឈាមបង្ហាញថាមានជំងឺគ្រុនចាញ់ (+) តែប៉ុណ្ណោះ

ល.រ	កាលបរិច្ឆេទ	ឈ្មោះអ្នកជំងឺ	អាសយដ្ឋានបច្ចុប្បន្ន (ដាក់អាសយដ្ឋានដែលគាត់កំពុងស្នាក់នៅបច្ចុប្បន្ន)	លេខទូរស័ព្ទ	អាយុ	មានផ្ទៃពោះ	ភេទ ប្រុស	ភេទ ស្រី	លទ្ធផលតេស្តឈាម Pf.	Pv.	ចំរុះ	ការព្យាបាលដោយថ្នាំ ACTs DHA-pip	ASMQ	ការព្យាបាលដោយថ្នាំមិនមែន ACTs	ការបញ្ជូនទៅ [illegible]	[illegible]	[illegible]
	ថ្ងៃទី / ខែ / ឆ្នាំ	[illegible]	ភូមិ / ឃុំ / ស្រុក / ខេត្ត		ឆ្នាំ	ខែ	គូស	គូស	គូស	គូស	គូស	គូស	គូស	[illegible]	គូស	គូស	គូស
	ឧ: 21 /07 /2013	ឧ: [illegible]	ឧ: [illegible]	012 000 xxx	25		✓		✓			✓			✓		
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
					សរុប												

ល.រ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
១	[illegible] (RDT)				
២	[illegible] (ACT)				

ល.រ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
១	[illegible]				
២	[illegible]				

☐ [illegible] ■ [illegible] ■ [illegible]

[illegible]:........................ ឈ្មោះអ្នក[illegible]:........................ កាលបរិច្ឆេទ: ...../...../.....

ផ្នែកនេះសំរាប់មន្ត្រី[illegible]

[illegible]	[illegible]	សរុប
[illegible]	[illegible]	
[illegible] (RDT)	ក	
[illegible] (RDT)	ខ	
[illegible]	គ	

[illegible]	[illegible]				សរុប
[illegible]	ឃ				
[illegible]	[illegible]				
[illegible]	0 - 4 ឆ្នាំ	5 - 14 ឆ្នាំ	15 - 49 ឆ្នាំ	50 ឆ្នាំឡើង	
[illegible]					

[illegible]:

[illegible]

[illegible]

កាលបរិច្ឆេទ

ANNEX 4a:

SOP FOR COMPLETION OF MIS MONTHLY LINE-LIST REPORTS IN HEALTH CENTERS

SOP for completion of MIS monthly line-list reports in Health Centers

BURDEN REDUCTION ODs

PURPOSE

1. Surveillance of monthly case counts of patient tested, confirmed malaria cases by specie.
2. Listing of malaria confirmed cases with individual information on village of residence, demographic, diagnosis, treatment and referral
3. Drug and RDT supply and stock information

OBJECTIVE

One report completed every month in each point of care

OPERATOR

Officer in charge of OPD/Information in public Health facilities (FDH, HC, HP)

REQUIRED RESSOURCES AND MATERIAL

Book of self-duplicating printed forms

PLANNING AND PREPARATION:

NA

OPERATION STEP BY STEP

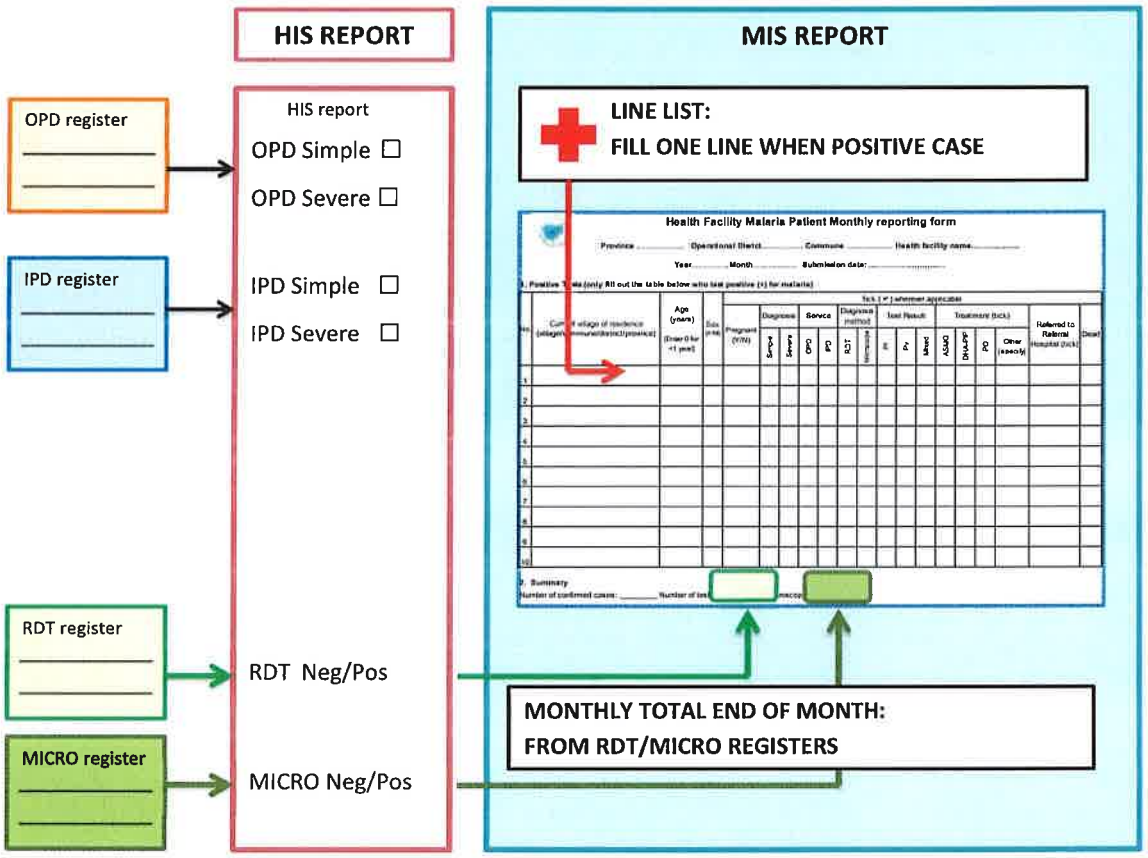
After any consultation, individual patient data is recorded immediately in the following registers:

1. OPD register
2. Laboratory register (microscopy testing)
3. RDT register (if RTD testing)
4. IPD register (IPD section available and patient admitted)

Both HIS aggregate reports and MIS line-list are collected and reported monthly:

- HIS reports are compiled at the end of the month as **aggregate case counts**. Individual patient data is recorded immediately in OPD, Laboratory/RDT registers and IPD registers and information is tallied at the end of the month.
- MIS Line-list is designed to collect additional individual details about **each confirmed malaria patients** about their village of residence, personal contact information and the treatment given. Individual details of each confirmed malaria patients should fill in MIS line list **immediately after the consultation** to preserve the integrity of the detailed, patient-level data captured (see Figure below).

At least one MIS HF form should be used for each reporting period, even if there are no patients. The reporting period is one month, starting from the first of each month to the last day of each month. The information on each form should capture patients that presented to the health facility during the reporting month. If there is no space left, then a new form should be used.



GENERAL INFORMATION

PROVINCE:
OPERATIONAL DISTRICT:
COMMUNE:
HEALTH FACILITY NAME:

} Fill in information for health facility

YEAR: fill in the year for the reporting period. E.g., if the reporting period is June 2016, fill in "2016"

MONTH: fill in the month for the reporting period. E.g., if the reporting period is June 2016, fill in "06"

SUBMISSION DATE: fill in the date that the form is submitted to the OD in the DD-MM-YYYY format. E.g., if the report was submitted to the OD on July 15, 2016, write "15-07-2016"

POSITIVE TESTS SECTION

Information on all patients that tested positive for malaria in the reporting period needs to be entered in this section. For example, if the reporting period is June 2016, information on a patient who tested positive for malaria on June 1, 2016 will need to be filled in in this section. If a patient tested positive for malaria on July 1, 2016, then the information for that patient will need to be on a new sheet, the July 2016 MIS HF form. This is the case even if there is still space on the June 2016 MIS HF form.

PATIENT INFORMATION

CURRENT VILLAGE OF RESIDENCE: fill in the patient's place of residence, specifically their village, commune, district, and province

AGE: fill in the patient's age in years, rounding down to the closest year. For example, if the patient is 18 months old, write "1". If the patient is less than 12 months old, write "0"

SEX: fill in "F" for female and "M" for male

PREGNANT: fill in "Y" if the patient is pregnant, "N" if the patient is not pregnant. Fill this in even if the patient is male

DIAGNOSIS AND TREATMENT INFORMATION:

DIAGNOSIS: tick "simple" if the patient has simple malaria. Tick "severe" if the patient as severe malaria. See National Treatment Guidelines (2014) for the differentiation between simple and severe malaria

SERVICE: tick "OPD" if the patient is an outpatient. Tick "IPD" if the patient is an inpatient (stayed overnight at the health facility)

DIAGNOSIS METHOD: tick "RDT" if the patient was diagnosed with an RDT. Tick "Microscope" if the patient was diagnosed with microscopy.

TEST RESULT: tick "Pf" if patient tests positive for P.falciparum. Tick "Pv" if patient tests positive for P.vivax. Tick "Mix" if patient tests positive for P.falciparum-P.vivax mixed malaria

TREATMENT: tick the drugs that were given to the patient during the consultation. For example, tick "ASMQ" if artesunate mefloquine was given to the patient; tick "DHA-PIP" if dihydroartemisinin-piperaquine (brand name Eurartesim) was given to the patient; tick "PQ" if primaquine was given to the patient. If another drug was given, please write in "Other". More than one box can be ticked

REFERRED TO HOSPITAL: tick if patient was referred to the hospital

DEAD: tick if patient died during or shortly after the consultation

MONTHLY AGGREGATES SECTION

Report aggregate figures for the reporting period

NUMBER OF CONFIRMED CASES: fill in the total number of cases that tested positive for malaria in the reporting period

NUMBER OF TESTS: RDT: fill in the total number of RDT tests conducted (positive and negative). Do not fill in the number of invalid RDT tests

NUMBER OF TESTS: MICROSCOPY: fill in the total number of microscopy tests conducted (positive and negative)

RECORDING AND REPORTING

- One copy kept in the book
- Original submitted to HC or OD

MONITORING

Supervision of points of care:

Timeliness, validity and completeness of reporting is assessed against register and record books

SOP for completion of MIS monthly line-list reports by VMWs

BURDEN REDUCTION ODs

PURPOSE

1. Surveillance of monthly case counts of patient tested, confirmed malaria cases by specie.
2. Listing of malaria confirmed cases with individual information on village of residence, demographic, diagnosis, treatment and referral
3. Drug and RDT supply and stock information

OBJECTIVE

One report completed every month in each point of care

OPERATOR

Village Malaria Worker (VMW)

REQUIRED RESSOURCES AND MATERIAL

Book of self-duplicating printed forms

PLANNING AND PREPARATION

NA

OPERATION STEP BY STEP

At least one MIS VMW form should be used for each reporting period, even if there are no patients. The reporting period is one month, starting from the first of each month to the last day of each month. The information on each form should capture patients that presented to the VMW/MMW during the reporting month. If there is no space left, then a new form should be used.

GENERAL INFORMATION

MEETING DATE: fill in the date of the VMW meeting when this form was handed in, using the DD-MM-YYYY format
PROVINCE: Fill in information on the VMW's location
DISTRICT: Fill in information on the VMW's location
HEALTH CENTER: fill in the name of the health center that the VMW reports to for monthly VMW meetings
COMMUNE: fill in the commune that the VMW is located in
VILLAGE: fill in the village that the VMW is located in
MONTH: fill in the month for the reporting period. E.g., if the reporting period is June 2016, fill in "06"
YEAR: fill in the year for the reporting period. E.g., if the reporting period is June 2016, fill in "2016"
VMW NAME: fill in the name of the VMW
 # OF POPULATION: fill in the number of people residing in the VMW's village
 # OF FAMILY: fill in the number of separate households residing in the VMW's village. A family living together in one house is considered one family. A family living separately in two houses is considered two families.
DISTANCE FROM VILLAGE TO HEALTH CENTER: distance from village to health center in kilometers
PHONE NUMBER: fill in the VMW's phone number. If not available, fill in a phone number that can be used to contact the VMW

MONTHLY AGGREGATES SECTION

Tick one box for each patient that was tested for malaria during the reporting period, which is the first of each month to the last day of the month.

POSITIVE TESTS SECTION

Information on all patients that tested positive for malaria in the reporting period needs to be filled in in this section. For example, if the reporting period is June 2016, information on a patient who tested positive for malaria on June 1, 2016 will need to be filled in in this section. If a patient tested positive for malaria on July 1, 2016, then the information for that patient will need to be on a new sheet, the July 2016 MIS VMW form. This is the case even if there is still space on the June 2016 MIS VMW form.

DATE: fill in the date that the patient went to see the VMW in the DD/MM/YYYY format

PATIENT NAME: fill in patient's first and last name

SEX: write "F" if patient is female, "M" if patient is male

AGE: if patient is less than 12 months old, write in number of months and "M". if patient is more than 1 year old, write in age using years and "Y". E.g., if a patient is 8 months, write "8M". If a patient is 18 months, write "1Y"

PREGNANT: write in number of months pregnant. If patient is not pregnant, write "0"

WEIGHT: fill in patient's weight in kilograms to the nearest whole number

TEMPERATURE: fill in patient's temperature in Celcius to the nearest whole number

PATIENT STATUS: if patient lives in the VMW's village, tick "Non-Mobile". If patient does not live in the VMW's village, tick "Mobile"

RDT RESULT (POSITIVE): tick "PF" if patient tests positive for P.falciparum. Tick "PV" if patient tests positive for P.vivax. Tick "Mix" if patient tests positive for P.falciparum-P.vivax mixed malaria

MEDICATION: fill in the number of tablets given to the patient for the full course of treatment for each type of medication. For example, if patient was given one and a half tablets of artesunate mefloquine for the full course of treatment, write 1.5 under "ASMQ". If another type of medication was given, specify the type of medication in "Other"

DOT: tick "non-complete" if the VMW did not observe the patient taking treatment on all days. Tick "complete" if the VMW observed the patient taking treatment on all days.

REFERRED: tick if the patient was referred

REMARKS: fill in as needed

MONTHLY AGGREGATES SECTION

TOTAL TESTED: fill in the total number of patients tested (positive and negative) during the reporting period

TOTAL POSITIVE TESTS: fill in the total number of positive malaria cases during the reporting period

TOTAL REFERRED: fill in the total number of patients referred during the reporting period

 # POPULATION THAT WAS PROVIDED HEALTH EDUCATION:

 # OF TIME PER MONTH:

 # POPULATION THAT RECEIVED DEWORMING DRUG:

STOCK SUMMARY

At the end of the reporting period, report on how many malaria commodities were used and how much is left in stock. At the VMW meeting, fill in how much was supplied. Below are the units of measurement:

RDT: number of RDTs

ACT: tick which ACT is available. Report based on the number of pills

PRIMAQUINE: to be determined

RECORDING AND REPORTING

- One copy kept in the book
- Original submitted to HC or OD

MONITORING

Supervision of points of care: Timeliness, validity and completeness of reporting is assessed against register and record books

ANNEX 4c:

SOP FOR COMPLETION OF MIS MONTHLY LINE-LIST REPORTS BY PPM

SOP for completion of MIS monthly line-list reports by PPM

BURDEN REDUCTION ODs

PURPOSE:

1. Surveillance of monthly case counts of patient tested, confirmed malaria cases by specie.
2. Listing of malaria confirmed cases with individual information on village of residence, demographic, diagnosis, treatment and referral
3. Drug and RDT supply and stock information

OBJECTIVE

One report completed every month in each point of care

OPERATOR

PPM private provider (PPM)

REQUIRED RESSOURCES AND MATERIAL

Book of self-duplicating printed forms

PLANNING AND PREPARATION

NA

OPERATION STEP BY STEP

At least one MIS PPM form should be used for each reporting period, even if there are no patients. The reporting period is one month, starting from the first of each month to the last day of each month. The information on each form should capture patients that presented to the PPM/PMW during the reporting month. If there is no space left, then a new form should be used.

GENERAL INFORMATION

DATE: fill in the date for the first of each month
OUTLET/COMPANY NAME: fill in the name of the outlet
VILLAGE: Fill in information for private provider / PMW
COMMUNE: Fill in information for private provider / PMW
OPERATIONAL DISTRICT: Fill in information for private provider / PMW
PROVINCE: Fill in information for private provider / PMW
TYPE OF OUTLET: select based on the registration provided by the government

ALL SUSPECTED MALARIA CASES

Circle the number in the box for each suspected malaria case, as defined in the National Treatment Guidelines (2014), seen during the reporting period. Insert letters A, B, C, or D as instructed

POSITIVE MALARIA CASES

Information on all patients that tested positive for malaria in the reporting period needs to be filled in in this section. For example, if the reporting period is June 2016, information on a patient who tested positive for malaria on June 1, 2016 will need to be filled in in this section. If a patient tested positive for malaria on July 1, 2016, then the information for that patient will need to be on a new sheet, the July 2016 MIS PPM form. This is the case even if there is still space on the June 2016 MIS PPM form.
DATE: fill in the date that the patient went to see the PPM in the DD/MM/YYYY format
PATIENT NAME: fill in patient's first and last name

CURRENT ADDRESS: fill in where the patient is currently staying
PHONE NUMBER: fill in the patient's phone number. If that is not available, fill in a phone number that can be used to contact the patient
AGE: fill in the patient's age in years, rounding down to the closest year. For example, if the patient is 18 months old, write "1". If the patient is less than 12 months old, write "0"
PREGNANCY: write in number of months pregnant. If patient is not pregnant, write "0"
SEX: tick "M" if patient is male. Tick "F" if the patient is female.
TEST RESULT: tick "Pf" if patient tests positive for P.falciparum. Tick "Pv" if patient tests positive for P.vivax. Tick "Mix" if patient tests positive for P.falciparum-P.vivax mixed malaria
TREATMENT BY ACTS: tick which ACT was given to the patient
PRIMAQUINE: tick if primaquine was given to the patient
OTHER DRUG: if other drugs were given to the patient, please fill in the drug name
REFERRAL CASE WITH POSITIVE RESULT: tick the reasons for referral. If reason for referral not captured, tick "Other" and specify reason
TOTAL: sum up the total numbers at the end of the reporting period

STOCK UPDATE

At the end of each reporting period, fill in how many commodities were used in the past month and how many are currently in stock. Fill in how much of each commodity you intend to request from the National Malaria Program. After the National Malaria Program supplies you with commodities (through the Bi-Monthly Meeting or direct supply), fill in how much was supplied. Units of reporting specified below
RDT: number of RDTs
ACT: tick which ACT is available. Report based on the number of pills
PRIMAQUINE: to be determined
RECTAL ARTESUNATE: to be determined

RECORDING AND REPORTING

- One copy kept in the book
- Original submitted to HC or OD

MONITORING

Supervision of points of care: Timeliness, validity and completeness of reporting is assessed against register and record books

SOP for data submission to web-based Malaria Information System

BURDEN REDUCTION ODs

PURPOSE

- Passive case detection
- The new web-based MIS upgrades the current system by allowing users to access and enter data from a web portal rather than through the former static, offline Microsoft Access-based system.

OBJECTIVE

One monthly report from each point of care submitted in MIS before the 15th of next month

OPERATOR

- Officer in charge of MIS in OD office
- Other individuals, including CNM central-level staff, may also utilise this method to enter data.

REQUIRED RESSOURCES AND MATERIAL

HARDWARE: A computer or other device that can access the Internet. Optimal connection is via desktop or laptop computer.
SOFTWARE: A web browser (e.g. Firefox, Google Chrome, Internet Explorer, Safari, or Opera) is necessary. The most compatible and recommended browser is Mozilla Firefox 45.0 or later. Users should install Firefox if possible on their device.
INTERNET CONNECTIVITY: Internet connection is necessary to access the system.
SCREEN RESOLUTION: Display resolution should be at least 1360pixels x 768pixels or more (can be changed in the device display settings) for optimal visualisation of the interface.

PLANNING AND PREPARATION

USERNAME AND PASSWORD: A username and password will be provided to each person designated responsible for system usage. Prior to utilisation, ODs must submit a request to the main system focal persons (see below) for CNM approval and username / password creation.

OPERATION STEP BY STEP

SYSTEM CONNECTION
To access the MIS web portal, please copy and paste or type the following web address below into the Internet browser:
URL: http://mis.cnm.gov.kh

In case of technical interruption on the CNM domain and the website cannot be accessed, users can instead type the following into the browser to access the portal directly:
Port: http://216.55.168.210:82/

Please note – this method is only to be used if the primary URL website is unavailable due to CNM technical difficulties.

SYSTEM ACCESS AND DATA ENTRY MODULES
Initial system entry requires a specific username and password for each user to log-in into the system. If a user is unauthorized or enters an incorrect username and/or password combination, s/he will be unable to log in.
Once validated, the user will access the main MIS menu, from which s/he can access the necessary data entry portals: VMW, Health Centre, Bed Net, and Private Sector data.

CASE DATA ENTRY

Within the portal, data entry is divided into separate modules for each source (VMW, Health Centre, Private Sector).
Fields to be entered are unique to the specific data captured by that source, and complements the field-level paper forms.
Certain fields may be exclusive to one particular source (e.g. [Mobile status], [DOTS] for VMWs; [Service], [Death] for health centres); other fields are common to all sources (e.g. [Sex], [Species Diagnosis]).

BED NET DATA ENTRY

A portal for bed net distribution or loan activity reporting is also available. This programming is not currently completed on a monthly or regular basis, but OD staff can enter this information based on the data reported from health facilities in their catchment area.

TIMELINE

Any and all monthly paper forms from VMW, Health Centre, and PPM levels should be received by the OD no later than the 7th of the next month.
All data entry from these forms into the web-based MIS should be completed by the 15th of the month to be considered final and counted towards the data timeliness performance indicator.
After this deadline, users can still access data from previous months to add or modify data based on operational necessity.

MONITORING

- Computerized analysis of MIS database
- Timeliness and completeness of monthly reporting for each point of care

SOP for data validation/check

BURDEN REDUCTION ODs

PURPOSE

Improvement of data completeness and validity

OBJECTIVE

All MIS monthly checked before submission

OPERATOR

Officer in charge of MIS in OD
Officer in charge of MIS in Health Centre

REQUIRED RESSOURCES AND MATERIAL

NA

PLANNING AND PREPARATION

NA

OPERATION STEP BY STEP

VMW REPORTS CHECKED BY HF STAFF

Paper-based reports from VMWs are collected regularly during monthly meetings held at each health facility. During this meeting, health facility staff should do visual checks of each form as a preliminary data inspection. Specific indicators to note:

COMPLETENESS: All monthly aggregate variables and specific relevant case-level data should be complete (e.g. sex, age, test result).

ZERO REPORTING: If a VMW did not test or treat any patients during the time period, a form still needs to be filled as proof of 0 case or 0 test and VMW active status.

VALIDITY: The number of actual RDT tests utilised should be cross-checked with the aggregate number of tests reported. Additionally, the number of total aggregate positive tests should match the number of lines entered with positive case information.

Any VMWs who are not present at the monthly meeting should be noted and marked as either "Active but Absent" or "Inactive" based on the health facility's judgment or communication with that VMW. This list should also be given to the OD upon delivery of the VMW paper forms for accuracy in reporting.

HEALTH FACILITY REPORTS CHECKED BY OD STAFF

Case data from health facilities are compiled, and sent regularly to the OD as accompanied by VMW forms. Although there is no specific meeting with the OD to monitor operationalisation, the OD staff in charge of malaria and MIS data entry should similarly perform a check of the HF form for each outlet. Specific indicators to note:

COMPLETENESS: All monthly aggregate variables and specific relevant case-level data should be complete (e.g. age, sex, test result).

ZERO REPORTING: If a HF did not test any patient or record any positive cases in the month, a form should still be filled as proof of 0 case or 0 test and HF activity status.

VALIDITY: The number of total tests (RDT and microscopy) should match the number of positive cases reported. Additionally, the number of total aggregate positive tests should match the number of lines entered with positive case information.

ANNEX 7:

SOP FOR PRO-ACTIVE CASE DETECTION

SOP for Pro-active case detection

BURDEN REDUCTION ODs

PURPOSE

Pro-active case detection consists of screening and treatment in communities and among specific high risk groups without the trigger of a passively detected index case.

OBJECTIVE

Active case detection is used to fill gaps in the passive case detection system and to detect malaria infections as early as possible in populations that may have a high risk of infection.

OPERATOR

OD and Health Center staff supported by VMW

REQUIRED RESSOURCES AND MATERIAL

- RDTs
- Recording form for Pro-active case detection

PLANNING AND PREPARATION

A plan of visits should be prepared, and the targeted population should be informed of the dates and times they will be visited. They should be conducted when family members are most likely be at home (before or after work or school).

OPERATION STEP BY STEP

Individuals are tested with a RDT if one of 5 documented risk factor of malaria infection is present.
Each individual is asked following questions about risk factors:

- Did you have fever*, chills, sweat over the last 2 weeks?
- Did you sleep in the forest during the last month?
- Did you return from travel during the last month?
- Did you ever get malaria?
- Do you know somebody who got malaria?

**Individuals are asked about recent fever and chills within the last 2 weeks but body temperature is not measured.*

Positive individuals receive standard treatment and questioned with a new "case investigation form".

RECORDING AND REPORTING

Recording form in Annex 8

MONITORING

ANNEX 8:

RECORDING FORM FOR PRO-ACTIVE CASE DETECTION

PRO-ACTIVE CASE DETECTION RECORDING FORM

LOCATION

Date of operation DD/MM/YY ___/___/___ Job title _____

Conducted by _____ Telephone # _____

Name of site _____ OD _____ Province _____

Localisation GIS coordinates LONG ____ . ____ LAT ____ . ____

Type of high risk population		Type of sites	
Mobile forest workers	☐	Forest camp	☐
Migrant forest workers	☐	Construction, dam sites	☐
Local forest goers	☐	Mine site	☐
Mobile construction workers	☐	Plantations	☐
Mobile security personnel	☐	Farm	☐
Others _____		Barracks	☐
		Entry/Exit touch point	☐
		Border crossing point	☐

SELECTIVE SCREENING OF HIGH RISK POPULATION

PAGE # _____ Take new form for each batch of 20 individuals

HH#	Fever		Forest		Travel		History		Relative		No risk		Refused
	P	N	P	N	P	N	P	N	P	N	P	N	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
Total													

SUMMARY Refused _____

Positive: Fever ____ Forest ____ Travel ____ History ____ Relative ____ NR ____

Negative: Fever ____ Forest ____ Travel ____ History ____ Relative ____ NR ____

TREAT ALL POSITIVE AND FILL NEW CASE INVESTIGATION FORM

ANNEX 9:

SOP FOR IMMEDIATE CASE-BASED NOTIFICATION

SOP for Immediate case-based notification

ELIMINATION ODs

PURPOSE

In Elimination ODs, all points of care need to report confirmed cases immediately so that a prompt response can be taken. All points of care will migrate from MIS monthly line-list to case-based immediate notification through dedicated android application installed on smartphone or tablet.

OBJECTIVE

- Every patient tested for malaria is notified on D0 electronically
- Every confirmed case and personal details is notified and registered in MIS database

OPERATOR

All points of care

REQUIRED RESSOURCES AND MATERIAL

Smart phone, Tablet or PC, Android Application to be downloaded and installed

PLANNING AND PREPARATION

NA

OPERATION STEP BY STEP

Every patient tested for malaria should be recorded. When a test is negative, a shorter notification is done but no details about the patient are entered. When a case is confirmed, the application captures the same information that is on the MIS line list for patients who are tested positive. It includes the current village of residence to be selected from a standard drop-list. In addition, the phone number is required to track the patient for the case investigation.

DATA FIELD TO CAPTURE ARE THE FOLLOWING:

Component	Formatting
Notified by	Care provider in App ID coded # with location and contact details
Date/time	Automatic in App.
Testing	NEG/Pf/Pv/mix > Stop here if NEG
Personal details	Name
	Telephone #
	Current Village of residence from standard drop-list ID coded #
	Catchment area's HC and VMW contact?
Date diagnosis	DD/MM
Age (Years)	XX
Sex	M/F
Mobile/Migrant	Y/N
Clinical (HC)	Simple/Severe
Service (HC)	OPD/IPD
Diagnosis	Micro/RDT
Treatment	AS-MQ/DHA-PIP/Other
PQ	Y/N
Referral	Y/N
Death (HC)	Y/N

All confirmed case (regardless of specie) which is notified is given a serial unique ID# and stored in the module of MIS data platform dedicated to the national case register.

The notification of a confirmed Pf or mixed case submitted by the point of care generates an alert to the Health Centre to which the patient's village of residence is situated.

RECORDING AND REPORTING

- Data captured on Smart phone, Tablet or PC
- Computerized analysis of MIS database

MONITORING

SUPERVISION OF POINTS OF CARE: Compare number of notified cases in database with tested/confirmed cases recorded in registers.
INDICATOR: % of patient tested for malaria is notified on DO electronically

ANNEX 10:

SOP FOR CASE INVESTIGATION AND CLASSIFICATION

SOP for Case investigation and classification

ELIMINATION ODs

PURPOSE

The case investigation has the following objectives:

TO CONFIRM INITIAL DIAGNOSIS AND TREATMENT

TO VERIFY COMPLETION OF TREATMENT

TO OBTAIN DETAILED INFORMATION ABOUT THE CASE IN ORDER TO:

- document risk factors for malaria infection
- assess availability and use of ITN in the household
- evaluate risk that infection was acquired locally
- evaluate the risk of ongoing local malaria transmission

OBJECTIVE

Every P. falciparum and mixed confirmed cases is investigated and classified on D3.

OPERATOR

Health Center staff supported by VMW

REQUIRED RESSOURCES AND MATERIAL

- Tablet
- Android Application to be downloaded and installed
- Transportation

PLANNING AND PREPARATION

- Planning of field investigation
- Communication to VMW

OPERATION STEP BY STEP

Case investigation and classification are conducted only for P. falciparum and mixed cases.

After receiving an alert when a confirmed P. falciparum or mixed case is notified with case's village of residence located in the Health Centre's catchment area, the staff should conduct the case investigation on the third day after the diagnosis (D3).

CASE INVESTIGATION:

The team should collect, assemble and review information in 2 phases:

1. The first part of is preferably conducted at the place where the case has been detected to get confirmation of the diagnosis and prescribed treatment.
2. The second part compiles information at the place of residence. It includes demographic information and other characteristics, a history of the current illness including diagnostic test results and prescribed treatment. The correct dosing, adherence and completion of treatment is also verified. It also collects information on risk factors, travel history, where, how and from whom the infection might have been acquired and recent contacts to whom malaria could have been transmitted. It is essential to record the dates of all events in the travel and clinical history.

CASE CLASSIFICATION:

Based on the case's answer to the question: "Did you sleep every night in this village within the last 2 weeks?" the case is classified as one of the four classes of local cases (L1, L2, L3 or L4) or as an imported case.

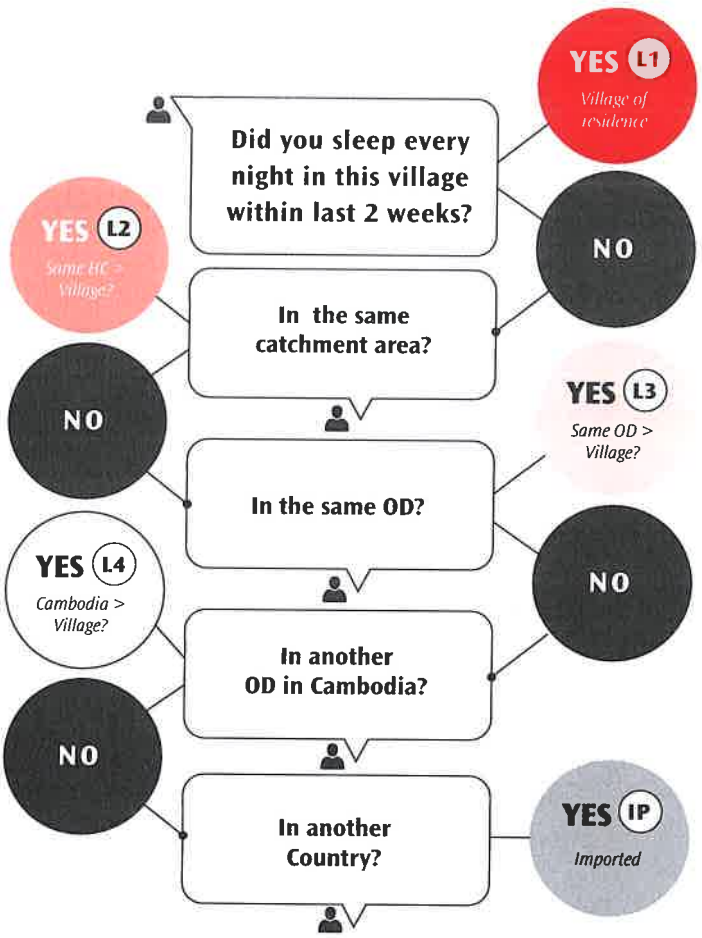
RECORDING AND REPORTING:

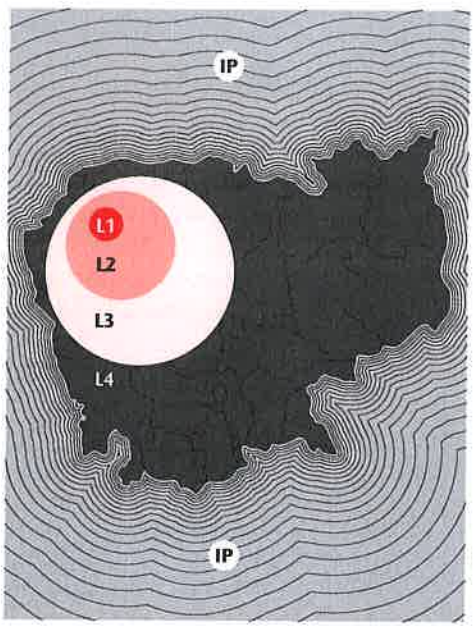
- Data captured on Tablet
- Computerized analysis of MIS database

MONITORING:

Compare number of P. falciparum and mixed cases notified with the number of case investigation

Indicator: % P. falciparum and mixed confirmed cases investigated and classified on D3.





ANNEX 11:

SOP FOR CASE INVESTIGATION AND CLASSIFICATION

MALARIA CASE INVESTIGATION FORM FOR *P.Falciparum or mixed* ONLY

Section 1: CASE NOTIFICATION

Date of notification	DD/MM/YY ___/___/___	Date of birth	DD/MM/YY ___/___/___
First name	_____	Citizen ID #	_____
Last Name	_____	Telephone #	_____
Age (years) ___	Gender M ☐ F ☐		
Village of residence	_____	OD _____	Province _____

Passive case detection	☐	Re-active case detection	☐
Referral Hospital	☐	Secondary to case ID #	☐☐☐☐☐☐☐☐☐☐
Former District Hospital	☐	Health Center name	_____
Health Center	☐	Point of care ID #	☐☐☐☐☐☐☐☐☐☐
Health Post	☐	OD	_____
Village Malaria Worker	☐	Province	_____
Mobile Malaria Worker	☐	Pro-active case detection	☐
Private provider	☐	Mobile and migrants	☐
Armed Force	☐	Border screening	☐
Police	☐	Focal mass screening	☐
Point of care name	_____	Focal fever screening	☐
Point of care ID #	☐☐☐☐☐☐☐☐☐☐	Focal targeted screening	☐
OD	_____	OD	_____
Province	_____	Province	_____

Section 2: CASE INVESTIGATION

Date of investigation	DD/MM/YY ___/___/___	Job title	_____
Conducted by	_____	Telephone #	_____

TO BE COMPLETED AT THE PLACE OF NOTIFICATION

Date of diagnosis DD/MM/YY ___/___/___ *P. falciparum* ☐ mixed ☐

RDT ☐ Microscopy ☐ PCR/LAMP ☐ Presence of gametocytes ☐ Density _____ per µl

Uncomplicated case ☐ Severe case ☐ Hospitalised ☐ Referred to hospital ☐ Name of hospital _____

If uncomplicated: treatment prescribed DHA+PPQ ☐ AS+MQ ☐ Other _____ PQ _____mg

Blister with _____mg / _____mg tablets Dosing ____tablet _____ times per day First dose observed ☐

Died ☐ Date of death DD/MM/YY ___/___/___ Main cause is malaria ☐ Other cause _____

IF REPORTED MALARIA DEATH, CONDUCT SPECIAL INVESTIGATION

Positive RDT available to be checked ☐ If Yes, matching with diagnosis result Yes ☐ No ☐

If No, apparent RDT result is *P. falciparum* ☐ mixed ☐ *P. vivax* ☐ Negative ☐

Test and result recorded in: Microscopy register ☐ in RDT register ☐

Case recorded in: OPD register ☐ IPD register ☐ MIS line-list ☐

Positive slide available to be checked ☐ Slide collected after positive RDT ☐

If yes, was sent to Reference laboratory Yes ☐ No ☐

If Yes, result of verification is: *P. falciparum* ☐ mixed ☐ *P. vivax* ☐ Other ☐ Negative ☐

Blood spot on filter paper available ☐

If yes, was sent to laboratory for PCR/genotyping Yes ☐ No ☐

If Yes, result of PCR is: *P. falciparum* ☐ mixed ☐ *P. vivax* ☐ Other ☐ Negative ☐

If Yes, result of genotyping is: AS resistance-validated K13 mutation ☐ : _____

mdr1 ☐ plasmepsin ☐

TO BE COMPLETED DURING INTERVIEW AT THE CASE'S RESIDENCE
Introduction to village authority, community leaders
Village with VMW □ Available today for case investigation □
Localisation of case residence: GIS coordinates LONG ____ . ____ LAT ____ . ____
Verify case ID, introduction, informed verbal consent
HISTORY OF CURRENT EPISODE
Symptoms before diagnosis: Fever □ Chills □ Sweat □ Headache □ Nausea □ Vomiting □ Diarrhoea □
Date of first symptoms DD/MM/YY ___/___/___ No symptom □ Other notifable signs _____
This main residence for more than 1 year □ less than 1 year but more than 6 months □ less than 6 months □
less than one week: visitors, tourist □ Citizenship: Cambodia □ Other _____
COMPLETION OF TREATMENT
Treatment prescribed: DHA+PPQ □ AS+MQ □ Other _____ Primaquine single dose □
Treatment was not started □ not completed □
Because could not get/buy the drugs □ lost the drugs □ could not tolerate the drugs □ felt better □
IF TREATMENT NOT COMPLETED GIVE A FULL NEW ONE
Treatment taken: ____tablet ____ times per day Primaquine □ ____ tablets
Available blister with _____mg / _____mg tablets with number of missing tablets _____
DOT on day of diagnosis (D0) □ on following day (D1) by VMW □ on next day (D2) by VMW □
Symptoms today: Fever □ Chills □ Sweat □ Headache □ Nausea □ Vomiting □ Diarrhoea □
Do you feel better? Any trouble with treatment? _____ Other concern? _____
MALARIA HISTORY
Had malaria ever □ last 12 months □ last 3 months □ if yes date last episode: DD/MM/YY __/__/__
Was confirmed by testing □ Diagnosis made by: Public HF □ Village Malaria worker □ private provider □
Got treatment from: public HF □ private provider □ Village Malaria worker □ pharmacy □ shop □
Remember which drug? _____ Date of last treatment: DD/MM/YY __/__/__
HOUSE-HOLD AND PREVENTION
Piped water □ Electricity □ Television □ Cement floor □ Iron roof □ Windows screens □
Motorcycle □ Pig/Cow/Buffalo □
Did somebody in your household had malaria within last month □ last 6 months □ last 12 months □
How many people living in this house-hold? ____ < 5 years ____ 5-15 years ____ >15 years ____
How many mosquito nets ____ How many separate sleeping places ____
You slept under a mosquito net last night? □ If YES, please show it to me:
Got the net less than one year ago □ 1-2 year □ more than 2 years □ more than 3 years □
Got the net from Government □ from NGO □ from shop/market □
The net is not impregnated □ impregnated less than 1 year (ITN) □ distributed by CNM (LLIN) □
You sleep under this net every night □ only when there are mosquitos □ only when not too hot □
ACTIVITY IN THE VILLAGE
Agriculture, farming □ Manufacture □ Student □ Only outside village □
Trade, service □ Civil servant □ Other □ _____

Section 3: CASE CLASSIFICATION		
DID YOU SLEEP EVERY NIGHT IN THIS VILLAGE WITHIN THE LAST 2 WEEKS?	YES ☐	NO ☐
IF ANSWER IS YES: CLASSIFY LOCAL CASE L1 AND CONDUCT REACTIVE CASE DETECTION		L1 ☐
IF ANSWER IS NO: DETAIL OVERNIGHT STAYS OUTSIDE THIS VILLAGE		
You slept in a house ☐ in a plot hut ☐ in a tent ☐ in a camp ☐		
You splept under a mosquito net ☐ under a hammock with net		
If Yes: you travelled with it ☐ you got it on the way ☐ was given/lent to you there ☐		
It was not impregnated ☐ impregnated less than 1 year (ITN) ☐ distributed by CNM (LLIN) ☐		
DID YOU SLEEP IN ANOTHER VILLAGE WITIN THE LAST 2 WEEKS?	YES ☐	NO ☐
IF ANSWER IS YES:		
LAST WEEK ☐ Village name _____ OD_____ Province/country _____		
THE WEEK BEFORE ☐ Village name _____ OD_____ Province/country _____		
IF ANSWER IS NO:		
DID YOU SLEEP ELSEWHERE OUTSIDE A VILLAGE WITHIN THE LAST 2 WEEKS?	YES ☐	NO ☐
IN THE FOREST ☐ For harvesting ☐ logging ☐ hunting ☐ fishing ☐		
ON A WORK SITE ☐ Plantation ☐ farm ☐ logging ☐ mine ☐ construction site ☐		
THIS WAS LAST WEEK ☐ THE WEEK BEFORE ☐		
IF LAST WEEK ONLY: CLASSIFY LOCAL CASE L1 AND CONDUCT REACTIVE CASE DETECTION		L1 ☐
IF THE WEEK BEFORE: CLASSIFY CASE DEPENDING OF LOCALISATION OF SLEEPING PLACE:		
L2 IF IN SAME CATCHMENT AREA AND CONDUCT REACTIVE CASE DETECTION		L2 ☐
L3 IF IN SAME OD		L3 ☐
L4 IF ELSEWHERE IN CAMBODIA		L4 ☐
IMPORTED IF IN ANOTHER COUNTRY		IMP ☐
Section 4: REACTIVE CASE DETECTION		
PRESUMPTIVE TREATMENT OF INDEX HOUSEHOLD MEMBERS		
People treated _____ People absent _____		
SCREENING OF 20 NEIGHBOURING HOUSEHOLDS		
FILL RE-ACTIVE CASE DETECTION FORM		
Households visited _____ People sceened _____ RDT positive _____ People absent _____		
People with positive RDT: Fever _____ slept in forest _____ travelled _____ malaria _____ somebody _____		
People with negative RDT: Fever _____ slept in forest _____ travelled _____ malaria _____ somebody _____		
TREAT ALL POSITIVE AND FILL NEW CASE INVESTIGATION FORM		
Section 5: CASE FOLLOW-UP		
D28 ☐ Slide collected by VMW ☐ collected by HC ☐ Slide read by HC ☐ read by Hospital ☐		
Result available ☐ Negative ☐ *P. falciparum* ☐ mixed ☐ P. vivax ☐		
Slide was sent to Reference laboratory for cross-check ☐		
If Yes, result of verification available ☐ Negative ☐ P. falciparum ☐ mixed ☐ P. vivax ☐		
Blood spot on filter paper was sent to laboratory for PCR/genotyping ☐		
If Yes, result of PCR available ☐ Negative ☐ P. falciparum ☐ mixed ☐ P. vivax ☐		
If Yes, result of genotyping is: AS resistance-validated K13 mutation ☐ : _____		
mdr1 ☐ plasmepsin ☐		

SOP for Reactive case detection

ELIMINATION ODs

PURPOSE:

Reactive case detection is conducted to prevent ongoing local transmission by detecting early concomitant and secondary infections that may have occurred but not yet captured through the passive system. This is achieved through screening households living in close proximity to the index case and treating immediately additional cases detected.

OBJECTIVE

Reactive case detection is conducted when a P. falciparum or mixed malaria case is classified as "Local from the village of residence" OR "from a village in same HC catchment area.
Reactive case detection is undertaken in the village of residence of each P. falciparum or mixed malaria case classified as "Local" within 7 days. Objective is to screen all persons living in the 20 households in the vicinity of an index case.

OPERATOR

Health Center staff supported by VMW

REQUIRED RESSOURCES AND MATERIAL

- RDTs
- Recording form for Reactive case detection

PLANNING AND PREPARATION

A plan of visits should be prepared, and the targeted population should be informed of the dates and times they will be visited. They should be conducted when family members are most likely be at home (before or after work or school).

OPERATION STEP BY STEP

House-to-house visits should be conducted with:
1. All members of index case's household receive a presumptive treatment.
2. The 20 neighbouring households should be visited and all the index case's co-travellers, if applicable.

They should all be tested with an RDT regardless of existing symptoms.
Each individual is asked following questions about risk factors:
- Did you have fever*, chills, sweat over the last 2 weeks?
- Did you sleep in the forest during the last month?
- Did you return from travel during the last month?
- Did you ever get malaria?
- Do you know somebody who got malaria?

**Individuals are asked about recent fever and chills within the last 2 weeks but body temperature is not measured.*

Positive individuals receive standard treatment and questioned with a new "case investigation form".

RECORDING AND REPORTING

Recording form in Annex 10

MONITORING

Compare number of P. falciparum and mixed cases classified as "local" with the number of reactive case detection
Indicator: % P. falciparum and mixed confirmed cases classified as "Local" that have triggered a reactive case detection.

ANNEX 13:

RECORDING FORM FOR RE-ACTIVE CASE DETECTION

RE-ACTIVE CASE DETECTION RECORDING FORM **FOR L1 AND L2 CASES ONLY**

INDEX CASE	**CASE ID #** _____	**IF NOT AVAILABLE FILL THE FOLLOWING:**
Date of notification	DD/MM/YY ___/___/___	Date of birth DD/MM/YY ___/___/___
First name	_____	Citizen ID # _____
Last Name	_____	Telephone # _____
Age (years) ____	Gender M ☐ F ☐	
Village of residence	_____ OD	_____ Province _____
Date of investigation	DD/MM/YY ___/___/___	Job title _____
Conducted by	_____	Telephone # _____
Village of residence if L1 ☐	Name of other village in catchment area if L2 _____	

SECTION 1: PRESUMPTIVE TREATMENT OF INDEX HOUSEHOLD MEMBERS

Members treated _____ Members refused _____ Members absent _____

SECTION 2: SCREENING OF 20 NEIGHBOURING HOUSEHOLDS

HH#	Present	Fever		Forest		Travel		History		Relative		No risk		Refused	Absent
		P	N	P	N	P	N	P	N	P	N	P	N		
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															

SUMMARY

Households visited _____ RDT positive _____ RDT negative _____ Refused _____ Absent _____

Positive RDT: Fever _____ slept in forest _____ travelled _____ history _____ relative _____

Negative RDT: Fever _____ slept in forest _____ travelled _____ history _____ relative _____

TREAT ALL POSITIVE AND FILL NEW CASE INVESTIGATION FORM

SOP for Foci investigation and classification

ELIMINATION ODs

PURPOSE

Monitoring the status of foci, with precise identification of their functional status, is a cornerstone for success in interrupting malaria transmission. The objective is to restrict interventions to areas into which the risk of the continuation or resumption of transmission has been once documented and is regularly monitored.

OBJECTIVE

The objective of the focus investigation is to provide the necessary information to (1)describe the areas where malaria occurred, (2) delineate the population at risk, (3) ascertain risk factors, (4) classify the focus, (5) select the optimal strategies for interruption of transmission.

For the classification of foci, the concepts of receptivity and vulnerability are critical:

- Areas are receptive when the abundant presence of vector anophelines and the prevailing ecological and climatic factors favour malaria transmission. It is a reflection of the vectorial capacity of local anophelines during the season most favourable for malaria transmission.
- Areas are vulnerable when they are in proximity to malarious areas or are prone to the frequent influx of infected individuals or groups and/or infective anophelines.

OPERATOR

OD malaria supervisor and a technician. They are assisted by staff from the closest HC and active VMWs if in place.

REQUIRED RESSOURCES AND MATERIAL

- MIS data base for analysis of reported cases
- GIS module for mapping
- Material/traps for mosquito capture
- Material to collect and prepare blood spot

PLANNING AND PREPARATION

A plan of visits should be prepared by contacting community leaders, and the targeted population should be informed of the dates and times they will be visited and interviewed.

OPERATION STEP BY STEP

1. Desk review of past reported cases

Monthly case counts from the village in routine MIS data base over the last 5 years are reviewed. Case investigation reports from the village recorded over the last 12 months are reviewed to assess balance between L1 and other case classes. Seasonal pattern of incidence and average rainfall by month is also assessed.

2. Night capture of mosquitos

The team operates capture of mosquitos over 3 consecutive nights. The objective is to confirm presence and absence of vector. The most sensitive and simple mosquito trapping method will be selected ranging from human landing collection (HLC), cattle baited net collection (CBNC) and human baited net collection (HDNC). Collected mosquitoes will be identified morphologically and stored in ethanol or other suitable preservative and sent to CNM for identification.

3. Geographical reconnaissance and village mapping

If possible, GIS is used to draw detailed map of the village using background geographical features (e.g. roads, rivers, water bodies, forests and elevation). Recent reported and investigated malaria cases are also plotted on the map.

4. Household enumeration and population census

Then every household is visited and geo referenced during comprehensive population census capturing demographics of all permanent and occasional household members. Additional questions to characterize empty households and absent family members are asked to neighbors or available household members.

5. PCR screening of children under 10

Each child aged less than 10 years (about 20% of the population) that has not slept outside the village over the last month is finger-picked for a blood spot. Blood spots are sent to Phnom Penh for PCR.

6. Mobility assessment of male residents

Each male aged more than 15 years is administered a standard questionnaire about their mobility and activity in the forest during the last year. They are classified as mobile, seasonal workers or forest goers and asked how many nights they spent outside the village over the last 4 weeks.

RECORDING AND REPORTING

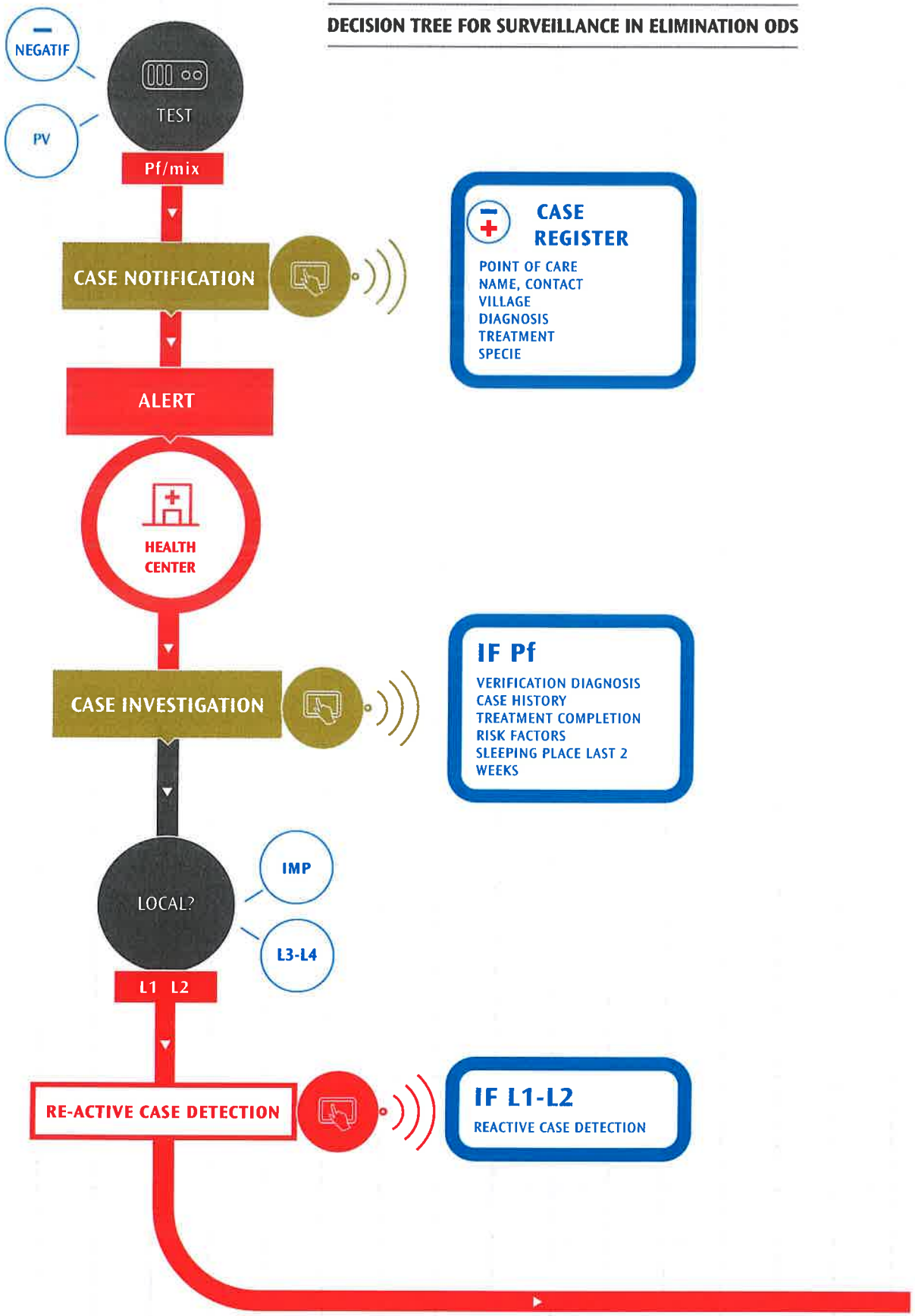
- Foci investigation form
- Household enumeration recording form
- PCR screening form
- Mobility assessment form

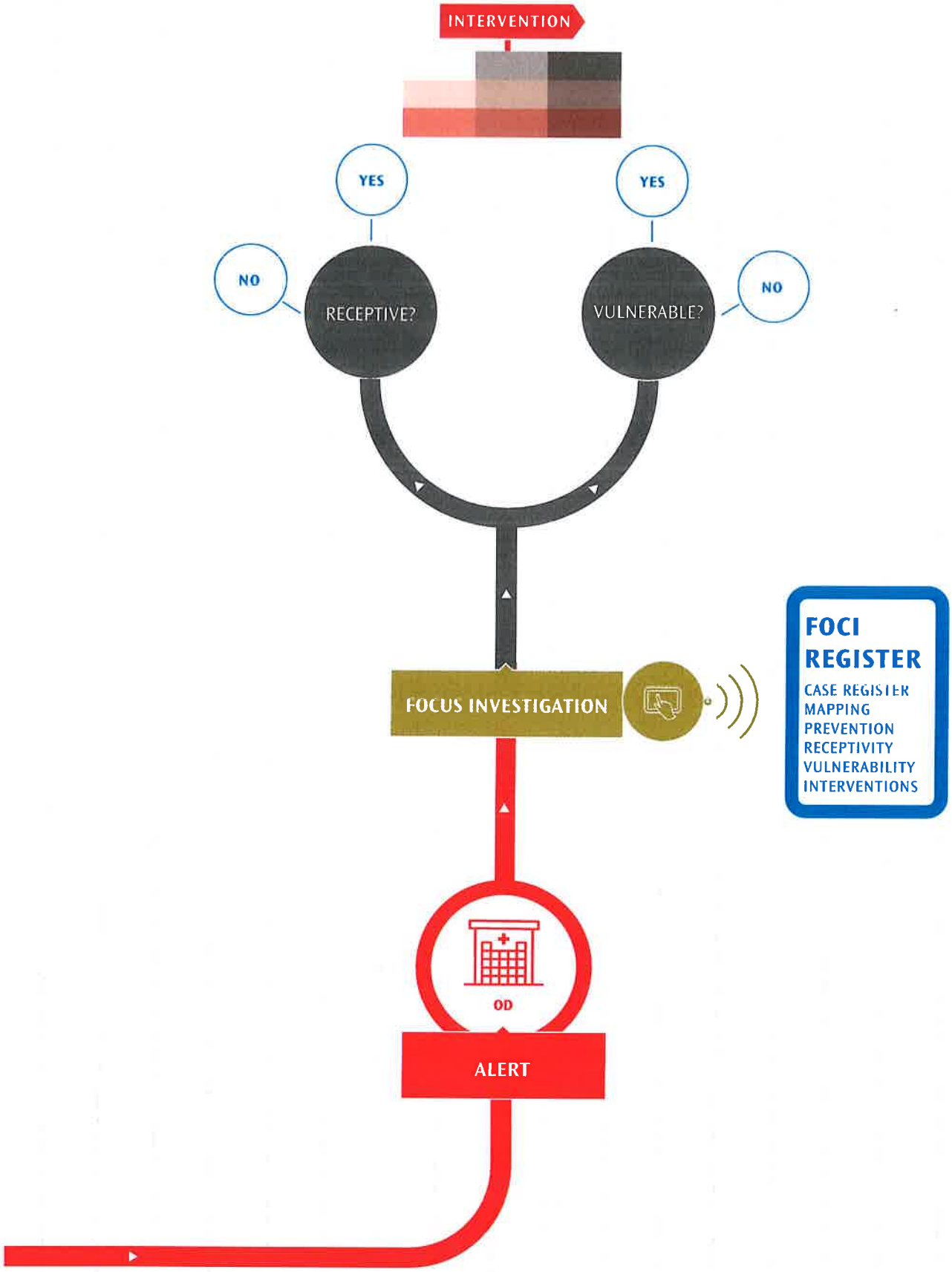
MONITORING

Indicator: % of new active foci (new villages with L1 cases reported) investigated according to surveillance manual

ANNEX 15:

DECISION TREE FOR SURVEILLANCE IN ELIMINATION ODS




INTERVENTION
YES
YES
NO
RECEPTIVE?
VULNERABLE?
NO
FOCUS INVESTIGATION
FOCI
REGISTER
CASE REGISTER
MAPPING
PREVENTION
RECEPTIVITY
VULNERABILITY
INTERVENTIONS
OD
ALERT

Surveillance for Malaria elimininationoperational manual

The manual is designed as a practical guide to standardize implementation of surveillance strategies at the central, peripheral and community levels.

The Operations Manual is structured as follows:

chapter 01 — Overview of surveillance strategy provides an overview of malaria situation and surveillance strategy in the context of the malaria elimination in Cambodia

chapter 02 — Surveillance in Burden Reduction ODs serves as a practical guide to implement surveillance activities for staff located in ODs targeted for malaria burden reduction

chapter 03 — Surveillance in Elimination ODs serves as a practical guide to implement surveillance activities for staff located in ODs targeted for malaria elimination

chapter 04 — Data management and analysis serves as a practical guide for CNM staff on routine management and analysis

2017
EDITION

Surveillance for Malaria elimination

OPERATIONAL MANUAL