Malaria Elimination Readiness in Selected Districts of Madagascar: A Mixed-Methods Assessment

www.mcsprogram.org

Table of Contents

List of Tables and Figures

Acknowledgments

This report was written by Rachel Favero with support from Oliva Rabozakandraina, Sitraka Ramamonjisoa and Jean Pierre Rakotovao. The authors acknowledge the important contributions of many institutions and individuals in every phase of the study and report. We are grateful for the collaboration and cooperation of colleagues who gathered the valuable information that was part of this assessment.

We would like to thank the Madagascar Ministry of Public Health and the entire team for its support. We also acknowledge the cooperation of the:

- Chiefs and health providers of the basic health centers
- Director of family health
- Regional directors of public health
- Health providers and in-charges of private health facilities
- Implementing partners who granted key informant interviews for this assessment
- Community health volunteers
- All patients who agreed to participate in the study

We express our appreciation for the support of the President's Malaria Initiative/Centers for Disease Control and Prevention, particularly Catherine Dentinger, Laura Steinhardt, Laurent Kapesa, Joss Razafindrakoto Anjoli Anand and USAID in Washington and in Madagascar, particularly Dr. Jocelyne Andriamiadana of USAID Madagascar.

We also thank Malanto Rabary, Eliane Razafimandimby, Patricia Gomez, Katherine Wolf, Natalie Apcar, and Karine Nankam for their involvement in the assessment.

Abbreviations

ACT	artemisinin-based combination therapy
CHV	community health volunteer
CU5	children under 5
DLP	Directorate of Malaria Control
HP	health provider
HF	health facility
HFA	health facility assessment
iCCM	integrated community case management
IRS	indoor residual spraying
LLIN	long-lasting insecticide-treated net
MAR	monthly activity report
MER	malaria elimination readiness
MOPH	Ministry of Public Health
NMCP	National Malaria Control Program
NSP	National Strategic Plan
RDT	rapid diagnostic test
SBCC	social and behavior change communication
USAID	US Agency for International Development
WHO	World Health Organization

Executive Summary

Malaria is endemic in 90% of Madagascar, with the entire population considered at risk of infection. In 2016, malaria was the cause of 6% of outpatient visits nationally, 4,913 admissions to hospitals, and 7% of deaths.[1] Young children and pregnant women are particularly vulnerable. Malaria control requires integrated strategies for reducing vectors, preventing illness, diagnosing cases, and rapidly and effectively managing them.[2] Malaria remains the fourth leading cause of morbidity and mortality in Madagascar. However, disease rates vary across the island nation. Some areas have low transmission, likely due to ecologic factors that do not favor the vector or parasite (e.g., high elevation, low rainfall).[3]

The Malaria National Strategic Plan 2018–2022 describes a policy of progressive geographic elimination. It defines an elimination district as one where malaria incidence is less fewer than one per 1,000 people and a pre-elimination district as one where malaria incidence ranges between one and 10 per 1,000 people and the rapid diagnostic test (RDT) positivity rate is under 5%. From 2013–2016, Madagascar saw a nationwide decrease in RDT-confirmed cases from 10% to 5% positivity rate in children under 5 (CU5) according to MIS data.[1] According to 2016 data, Madagascar has five districts that meet elimination criteria and three that meet
pre-elimination criteria among a total 114 districts.

Lower-level *centres de santé de base* (basic health centers) and community health volunteers (CHVs) play an important role in combating malaria. Facilities are referral and supervisory centers for CHVs, who test and treat febrile CU5 and refer cases of illness among older people or young children with signs of severe malaria to the facility. Facility staff report aggregate data on malaria indicators, such as numbers of patients tested and treated, into the health management information system. Facilities are responsible for managing stocks of antimalarial drugs and other malaria commodities, which are available free of charge with support from partners of the National Malaria Control Program (NMCP) via the government supply chain. Quantification of commodity needs is determined using monthly reports from the facilities and is based on average monthly consumption. Facilities are crucial to timely epidemic response because of their proximity to the affected population. Knowledge of epidemic thresholds for malaria and action plans implemented in response to epidemics are therefore essential for health providers (HPs) at the facility level. CHVs are the first-line HPs in their communities, particularly in remote and rural areas. Their roles are to raise awareness among the population and manage fever among CU5 as part of integrated community case management (iCCM) of childhood illnesses.

Objectives

Although the NMCP has a goal of progressive malaria elimination, no strategic or operational plan for malaria elimination currently exists. To prepare for the development of this plan, the US Agency for International Development's Maternal and Child Survival Program, in collaboration with the President's Malaria Initiative and the Ministry of Public Health (MOPH)/NMCP, assessed the state of preparedness of the elimination and pre-elimination districts, measured by the operational capacity of health facilities (HFs) and readiness of the health system as a whole. The objectives of this assessment were to:

1. Document the availability and functionality of key malaria commodities, equipment, materials, job aids, guidelines, and trained staff.

2. Measure the knowledge and capacity of health professionals to provide febrile illness and malaria case management services.

3. Document the role and needs of CHVs in malaria surveillance and control.

---

[1] Madagascar Health Management Information System (HMIS) GESIS. 2016.
[2] World Health Organization (WHO). 2015. *Guidelines for the Treatment of Malaria.* 3rd edition. Geneva: WHO.
[3] Ihantamalala F, Rakotoarimanana FML, Ramiadantsoa T, et al. 2018. Spatial and temporal dynamics of malaria in Madagascar. *Malar J.* 17(1):58. doi: 10.1186/s12936-018-2206-8.

4. Identify internal and external/environmental factors of the health system that impact malaria case management and elimination in Madagascar.

Methods

For this assessment, the study team used a mix of quantitative and qualitative methods in a sample of five of the eight elimination or pre-elimination districts. HF checklists, provider interviews, observations of provider/patient outpatient consultations, provider knowledge tests, CHV interviews, and key informant interviews with stakeholders were conducted. Assessment respondents included facility HPs and heads of health facilities, CHVs, and stakeholders, including MOPH staff and implementing partners who participate in malaria activities at all levels of the health system. The health facility and HP components of this survey were also part of an HF assessment conducted in Madagascar at the same time in a representative sample of 16 of 112 accessible districts, the results of which are documented in a separate report.

Results

HF checklist

Thirty-one public health facilities and four private facilities from the five assessment districts were included in the final sample. At least one malaria RDT was available in 77% of facilities on the day of the survey, and a functional thermometer was available in 89% of facilities. Roughly 80% of facilities had at least one formulation (i.e., infant, young child, older child, adolescent/adult) of an artemisinin-based combination therapy (ACT) on the day of the survey. The availability of drugs for severe malaria and for the prevention and treatment of malaria in pregnant women in their first trimester was as follows: injectable artesunate (29%), quinine tablets (6%), and injectable quinine (14%). Among HFs, 97% had experienced a stock-out for at least 1 day in the previous 2 months of the following essential supplies: quinine tablets (97%), injectable quinine (89%), injectable artesunate (29%), and RDTs (26%). Stock-outs of ACT for adults (> age 14) and children ages 5–13 years occurred in 29% and 23% of HFs, respectively. Only 37% of facilities had a copy of the most recent national malaria guidelines.

During the previous 6 months, 68% of surveyed HFs received at least one supervision visit, 44% of which included the topic of malaria case management. Most of the supervision visits were conducted by district MOPH staff (52%) or regional MOPH staff (44%). Supervision visits covered the following topics: malaria case management (44%), commodity management (50%), malaria reporting/data (42%), laboratory supplies and stocks (4%), social and behavior change communication activities (13%), and vector control (0%).

HP survey

Forty-one HPs were interviewed for the assessment, including 37 public HPs and four private HPs. Doctors represented three-quarters of the surveyed HPs (76%), while midwives and nurses each represented 12% of HPs surveyed. Interviewed HPs reported training needs on several topics, including epidemic thresholds (42%), active case detection (34%), analysis and use of the data for malaria epidemic response (32%), management of severe malaria (29%), and malaria-related monitoring and evaluation (29%). About two-thirds (68%) of HPs had received malaria-specific training during the past 2 years. Malaria-specific training topics included treatment for uncomplicated malaria (59%), treatment of severe malaria (54%), malaria in pregnancy (39%), malaria diagnosis (32%), fever management (27%), and malaria surveillance and monitoring, malaria elimination, and epidemic thresholds (5% each).

Observations of clinical consultations

Observations of 300 outpatient patient consultations were conducted in the 35 facilities within the five malaria elimination districts. Of the 120 patients who reported having a fever or were documented to have a fever (having a temperature of 37.5°C or higher), 47% were given a malaria RDT, and 0% received microscopy. Of the 56 patients who received a malaria RDT, 2%, or five patients, were positive. Of the five

confirmed malaria cases, four (80%) received an ACT for treatment. One confirmed malaria case received amoxicillin. None of the five cases received primaquine, as recommended by national guidelines in pre-elimination and elimination districts.

Provider knowledge test

All 41 interviewed providers also took the malaria knowledge test. Nearly all (90%) knew that malaria testing is needed when a patient reports fever in the previous 48 hours but does not present with fever. All providers knew that either a malaria RDT or microscopy should be conducted when a CU5 presents with fever, and 59% could name the first-line treatment for uncomplicated malaria in women during the second and third trimesters of pregnancy. In the event of a negative malaria RDT, providers said they would evaluate the patient for other possible afflictions, including other causes of fever (98%), respiratory infection (37%), diarrheal disease (32%), dehydration (15%), and pregnancy (10%). Overall, 51% of HPs scored above 85% on the malaria knowledge test.

CHV interviews

Of the 34 CHVs interviewed, 26 (76%) reported that they provide care for CU5 who report a fever. Of those, 20 (77%) said that they perform a malaria RDT when the patient presents with fever. Nearly two-thirds (59%) reported that they received trainings in the preceding 2 years on malaria prevention and case management, including iCCM of childhood illnesses. In addition, 19 (56%) and 18 (53%) reported training on data collection and use of antimalarial products, respectively. Of the 27 (80%) CHVs who reported receiving at least one supervision visit in the past year, most had received the visit within the last 3 months.

Nearly 30% of CHVs responded "'no'" when asked if a CHV should perform an RDT if a patient had fever at home but no longer has it at the center. Fewer than half (46%) spontaneously said they would provide ACT to a child with a positive RDT, and 54% reported giving paracetamol. Forty-six percent said they referred the patient to an HF if they reported symptoms of severe malaria. When asked what CHVs are able to do to respond to an increase in malaria cases, 88% reported they could conduct outreach activities in the community, 12% said that they could request emergency products to test or treat malaria, and 3% said that they could distribute long-lasting insecticide-treat nets.

Key informant interviews

Seventeen stakeholders from district, regional, and national government and technical/financial implementing partners provided information on challenges to effective malaria case management, including supply chain management; data management, reporting, and monitoring/evaluation; challenges with provider training, supervision, knowledge, and motivation; and challenges with lack of budget and reliance on donor funding. Heavy workloads, low salaries, and poor living conditions were also among the challenges documented for quality malaria care. Stakeholder respondents gave varying answers regarding how an epidemic threshold should be calculated. The key informant interviews revealed that while epidemic response plans exist in theory, many of the plans have never been enacted. Stakeholders noted that many activities need to be implemented for MOPH staff and partners to be prepared for a malaria epidemic, including training and supervision of providers on malaria case management, febrile illness case management, active case detection, and commodity management.

Discussion/Recommendations

A successful malaria elimination program requires that each case of malaria be identified, treated appropriately, investigated, tracked, and reported. According to the World Health Organization (WHO) framework for malaria elimination,[4] response activities around an identified case in an elimination district may include active case detection or focal mass drug administration in addition to entomological monitoring. . These activities require a minimum level of health facility, HP, CHV, and health system readiness. Madagascar

---

[4] World Health Organization (WHO). 2017. *A Framework for Malaria Elimination*. Geneva: WHO.

has a functional malaria control program from which to build an elimination program in low-prevalence districts; however, this survey revealed several challenges that must be addressed when developing its malaria elimination strategy and operational plans. Below, the report highlights the key challenges identified during this malaria elimination readiness survey that planners will need to address and offers suggestions to those developing the Madagascar malaria elimination strategy.

Only 47% of patients presenting with or having reported a fever in the previous 48 hours were observed to have been tested with an RDT during clinical observations. For a successful elimination program, this will need to be 100%. To this end, HFs and HPs will need adequate and reliable supplies, training, and supportive supervision. During this survey, several HFs, HPs, CHVs, and key informants reported stock-outs of essential equipment; 25% of HFs reported not having RDTs for at least 1 day in the previous 2 months. HPs may not be testing all fevers due to insufficient RDTs and concerns about supplies. Drugs for treating severe malaria (injectable artesunate or injectable quinine) were available at 29% and 14% of facilities, respectively. HP interviews, knowledge tests, and clinical observations also revealed knowledge gaps, which likely contribute to nonadherence to case management guidelines. Stakeholder interviews identified systemic structural problems, including HP, overload that may contribute to lack of quality care or lack of proper tracking and reporting of cases. CHVs and key informants also highlighted weakness in the community health program, including knowledge and practice gaps, stock-outs, and inadequate support for workers. For a successful elimination program, targeted districts will need support to address gaps.

When preparing its elimination plan and beginning implementation, the NMCP should keep in mind the following more specific recommendations from this assessment:

1. Provide refresher training and supportive supervision to facility-level HPs to help ensure access and understanding of the most up-to-date febrile illness and malaria case management protocols. Only 43% of the patients with fever or history of fever received a malaria RDT. Only half of providers scored above 85% on the malaria knowledge test. Only two-thirds of providers had received a supervision visit in the last 6 months.

2. Ensure the availability of essential commodities at the facility and community levels, including functional thermometers, malaria RDTs, and ACTs, among others. Facilities had stock-outs of key commodities and diagnostic tools, with only 77% of facilities having a malaria RDT on the day of the survey. Only 13 of 26 CHVs (50%) who reported caring for CU5 had malaria RDTs, and 11 CHVs (42%) had artesunate-amodiaquine malaria treatment. Nineteen of 34 CHVs (56%) did not have any malaria commodities.

3. Ensure the availability of the most up-to-date malaria guidelines and relevant job aids at the facility level. Most facilities did not have a copy of the most up-to-date malaria case management guidelines.

4. Further investigate why all CHVs are not providing care to CU5. Only 26 of the 34 CHVs surveyed for this assessment said that they provide care for CU5.

5. Review the various aspects of HPs' job and situation, and see if there are opportunities for improving workload and compensation. Improving conditions may help improve the ability of the HP to provide high-quality malaria care. Stakeholder interviews revealed challenges facing HPs, including workloads, low salaries, and poor living situations.

6. Provide refresher training and supportive supervision to CHVs to help ensure access and understanding of the most up-to-date febrile illness and malaria case management protocols. Nearly 30% of CHVs responded "no" when asked if a CHV should perform an RDT if a patient had fever at home but no longer has it at the center. Fewer than half (46%) spontaneously said they would provide ACT to a child with a positive RDT.

7. Improve quality control of private facility data. Stakeholder interviews revealed challenges incorrect or late reporting, which led to challenges with district-level situational analyses.

Introduction

Background and Rationale

Malaria is endemic in 90% of Madagascar, and the entire population is at risk of infection. Malaria was the cause of 6% of outpatient visits nationally, 4,913 admissions to hospitals, and 7% of deaths in 2016.[5] Young children and pregnant women are particularly vulnerable. Malaria control requires integrated strategies for reducing vectors, preventing illness, diagnosing cases, and rapidly and effectively managing them.[6] From 2013 to 2016, the proportion of rapid diagnostic test (RDT)-confirmed cases among children under 5 (CU5) in Madagascar decreased from 10% to 5% positivity rate according to MIS 2016 data.[7] Nevertheless, malaria remains the fourth leading cause of morbidity and mortality in Madagascar.

The Ministry of Public Health (MOPH) in Madagascar developed the Malaria National Strategic Plan (NSP) 2018–2022 based on malaria program recommendations and feedback from relevant stakeholders. The NSP focuses on improving malaria control in higher-burden zones and initiating malaria elimination efforts in very low-burden zones of the country. The plan defines an elimination district as having a malaria incidence under one case per 1,000 people and a pre-elimination district as having a malaria incidence rate of one to 10 per 1,000 people at risk and a malaria RDT positivity of under 5%. In 2016, five districts were classified as elimination districts and three as pre-elimination districts. According to the 2018–2022 Malaria NSP, the overall objectives to be achieved by 2022 are to reduce malaria mortality to zero and gradually move the country toward elimination.

An elimination plan is under development in Madagascar and scheduled for validation in 2019. Activities will focus on enhanced case detection, management, investigation, surveillance, and reporting to foster early case detection and enable immediate response.

Malaria case management, including treatment of malaria in pregnant women, in health facilities (HFs) and at the community level is a major focus of malaria control in Madagascar and draws on WHO's 3T guidelines: Test. Treat. Track.[8] The 3T guidelines are implemented to properly manage at least 95% of malaria cases detected in HFs, properly manage at least 80% of malaria cases detected at the community level within 24 hours of the onset of symptoms in CU5, and promptly refer those who are older to HFs.[9]

To assess the readiness for elimination activities, the US Agency for International Development's Maternal and Child Survival Program, in collaboration with the President's Malaria Initiative and the MOPH/National Malaria Control Program (NMCP), conducted a survey on the readiness of Madagascar to implement malaria elimination strategies and activities as described in WHO's *Global Technical Strategy for Malaria 2016–2030* reference. Data were collected from the national, district, facility, and community health volunteer (CHV) levels in a sample of five of the eight districts meeting elimination or pre-elimination criteria with a focus on the system's ability to detect, test, and treat all febrile illnesses associated with malaria.

Study Objectives and Expected Results

The study team aimed to assess the malaria elimination readiness (MER) of the health system in Madagascar in five districts that met elimination or pre-elimination criteria using 2016 or 2017 data. The assessment consisted of:

- Assessing the availability at HF and CHV levels and readiness to use key equipment, drugs, supplies, guidelines, and tools used in prevention, illness assessment, and malaria case management

---

[5] Madagascar HMIS GESIS. 2016.
[6] World Health Organization (WHO). 2015. *Guidelines for the Treatment of Malaria.* 3rd edition. Geneva: WHO.
[7] USAID. The DHS Program: Demographic and health surveys. Malaria Indicator Survey, Madagascar. 2016
[8] WHO. 2015. *Global Technical Strategy for Malaria 2016–2030.* Geneva: WHO.
[9] Madagascar Directorate of Malaria Control. 2017. *Plan stratégique national de lutte contre le paludisme 2018–2022.* Antananarivo, Madagascar: Directorate of Malaria Control.

- Documenting training and supervision opportunities for health providers (HPs) as well as reporting practices at the facility level
- Measuring the knowledge and capacity of HPs to provide high-quality prevention and case management services
- Documenting implementation of the fever management protocol at the facility level
- Documenting the role that CHVs play in malaria case management, referral, and surveillance
- Identifying internal and external/environmental factors in the health system that impact malaria case management and elimination readiness in Madagascar

Methodology

Overview of Study Design and Methods

The MER assessment was conducted in a subset of districts in which an HF assessment (HFA) was being done. The goal of the HFA, conducted in a representative sample of the country's HFs, was to describe the operational capacity of HFs to provide adequate management of malaria cases and febrile illness. MER methods, described herein, were therefore identical to HFA methods, but additional tools were added to capture information regarding elimination readiness. The study team used a mixed-methods, cross-sectional design to assess the ability of HFs to detect and assess febrile illness and to document MER at the national, regional, district, and CHV levels.

The data collection tools are listed below and can be found in Annex 1 of this report.

- Tool 1: HF checklist
- Tool 2: Interview guide for HPs
- Tool 3: Observation guide for HPs
- Tool 4: Knowledge test questionnaire for HPs
- Tool 5: CHV interview guide
- Tool 6: Stakeholder interview guide

The health facility checklist was adapted from the WHO Service Availability and Readiness Assessment tool and the Demographic and Health Survey Service Provision Assessment tool. Other tools were adapted from assessments of malaria case management that the President's Malaria Initiative has conducted in other countries.

Study Population

The units of analysis for this study are HFs, HPs, CHVs, stakeholders, and, for some case management indicators, patients observed.

Malaria Transmission Zones and Health District Selection

Madagascar has 114 districts. In the Malaria NSP 2018–2022, these are stratified into eight malaria transmission zones (see Annex 2) based on malaria prevalence.[10] Two districts known to be inaccessible were removed from the sampling frame, leaving 112 districts. Eight districts were targeted for malaria elimination in 2016, and these fall into four different transmission zones. Four of these eight districts were purposively selected into the study: Antananarivo-Atsimondrano, Mahajanga I, Antsiranana I, and Antsiranana II. The

---

[10] Zone classification was based on epidemiologic stratification estimated from the 2016 Malaria Indicator Survey, malaria surveillance data, and a vulnerability index calculated from health care utilization and poverty data.

statistics obtained by the NMCP at the end of 2016 showed that these HFs have RDT positivity rates under 5% and thus can be classified as elimination districts. Because Antsiranana I did not have enough outpatient consultations to complete the target sample size, during data collection, seven HFs in district Antsiranana II (basic health center level 2 Anivorano Nord, Antanamitarana, Mahavanona, and basic health center level 1 Antongombato, Mangaoka, Ramena, and Andrafiabe) were randomly selected to complete the sample. Antsiranana II did not meet elimination criteria according to 2016 data; however, according to 2017 NMCP data, the RDT positivity rate was under 5% across the facilities in the district and thus could be classified as an elimination district.

The populations from which the study subjects/study facilities were selected are listed below.

HFs

The number of facilities selected in the five districts was based on a sample size calculation completed for the HFA,[11] which was assuming that 20% of outpatients have a febrile illness and that 50% are tested for malaria with a malaria diagnostic. The study team chosen other parameters including a desired 95% confidence interval precision of +/- 10%, a design effect of 2 and a 10% non-response rate. Thirty-five facilities were selected for the MER assessment.

HPs

One HP per sampled HF was selected to participate in the assessment. At the start of each HF visit, the team counted the number of HPs providing outpatient care who were present on that day. In cases where there was only one HP providing outpatient care, as is largely the case at lower-level HFs in Madagascar, that HP was chosen for the survey, knowledge test, and observation. If more than one HP providing outpatient care was present, the senior outpatient HP was selected. If this HP did not consent to participate, other outpatient HPs providing outpatient care were selected at random until one consented to participate. The survey and knowledge test were conducted when there were no patients to be seen.

Observations of HP consultations with patients

HP/patient observations took place in HFs with consenting HPs and their patients. All patients who attended the clinic were eligible for participation in the assessment. The target sample size was eight outpatient consultations per facility. Selection of observed patients is detailed in the data collection section below.

CHVs

Questionnaires with CHVs were completed by the study team. CHVs affiliated with each selected public facility (there are no CHVs affiliated with private facilities) were eligible to participate in the assessment. There are usually two CHVs per *fokontany* (the smallest administrative unit), and several *fokontanys* were affiliated with each facility. One CHV per HF was randomly chosen for inclusion in the assessment.

National-/Regional-/District-Level Stakeholders

A total of 17 key informant interviews at national, regional, and district levels were conducted with stakeholders purposively selected for their roles in the implementation of malaria activities in Madagascar. The study team completed these qualitative interviews with assessment participants.

Approval by Institutional Review Boards

This study received approval from the Johns Hopkins Institutional Review Board (JHSPH-IRB) as well as ethical clearance from the Madagascar Ethics Committee.

---

[11] MCSP. 2019. *Operational Capacity to Provide Malaria Services in Madagascar: Health Facility Assessment.* Washington, DC: MCSP.

Data Collection

The assessment team visited each selected HF for 3 days and used the following tools: 1) HF checklist on key malaria equipment, commodities, job aids, and training of providers; 2) structured interview guide for HPs; 3) observation checklist for assessing HP/patient interactions; 4) HP knowledge test questionnaire; 5) CHV survey; and 6) stakeholder interview guide (qualitative). All HFs and participants in the assessment were informed in advance about the visit and data collection.

Health facility checklists were administered by the assessment team either with HF in-charges or available HPs and were conducted when a participant was available and patients were not in need of care.

For the observation, interview, and knowledge test with the HP, direct observations started right after the HP and patient gave their consent. Typically, when the assessment team arrived at an HF, it checked the registers for the number of new outpatient visits on the same day of the previous week visit (for example, if the assessment team arrived at an HF on a Thursday, it reviewed the registers for the previous Thursday). When fewer than 20 outpatient visits were anticipated, the team approached each patient and conducted observations of patient visits until nine observations were completed. If 20 or more outpatient visits were anticipated, the team approached every other patient individually for consent until nine patients consented to observation. If no doctor agreed to participate or if no doctor was available at the HF on the day of the visit, nurses or midwives providing care to patients were randomly selected until one of them agreed to participate in the observations. The study team recruited and consented patients before their consultation with the HP. During the consenting process, the study team asked patients whether they had experienced fever in the previous 48 hours. Their answers were documented on the consent form. HPs were interviewed and knowledge tests were administered during a time when they did not have to care for patients. Patient observations usually took place in the morning depending on HPs' availability and patient visits to the HF. When there were fewer than nine patients at the HF on the first day of visit, the team remained another day to obtain at least nine observations. If there were still fewer than nine patients observed after the second day, the team supplemented the assessment through additional observations from other HFs.

Observers used the observation tool to record whether the patient spontaneously reported fever to the HP and what the patient indicated was his/her reason for seeking care (chief complaint). Observers recorded whether HPs asked the patient about fever within the previous 48 hours and noted whether the patient's temperature was taken and recorded. For all patients with fever ≥ 37.5°C and for those who reported subjective fever within the previous 48 hours, observers recorded whether the HP administered an RDT, whether it was administered correctly, and whether the results were recorded. Observers recorded what treatment was prescribed for the patient. Of note, if a patient with a positive RDT was prescribed an inappropriate treatment, the observer discreetly worked with the HP to assure the patient received the correct drug. Observers also noted whether the HP did any patient education, including tracking the patient's progress.

All potential participants were interviewed to assess their eligibility and interest before being enrolled in the assessment. Patients were eligible if they were attending an outpatient consultation visit on the day of the survey and consented to participate. Recruitment scripts were used to determine HP eligibility before explaining the assessment and assessing their interest in participating. Participants expressed their consent in private and in Malagasy after reading the consent form. Upon confirmation of eligibility, respondents were asked to provide informed consent to an assessment team member either in an office or a closed meeting room. Recruitment and eligibility for patient observations were done using prepared scripts. Written consent was requested from adult patients, while caretakers gave consent for children ages 0–17. For children ages 7–17, verbal assent was also obtained from the child.

Consent and recruitment forms and data collection tools were translated into French to facilitate the training and coordination of assessment staff with foreign financial and technical associates. Each consent form was translated into Malagasy for use with participants in the field. Consent forms are in Annex 3.

During the study visits with the selected facilities, the assessment team monitored stock-out records at the facilities. In the event of a stock-out at the facility, the team had commodities on hand to supply the facilities. Facility staff were not informed about the team's supply of drugs. After the greetings and introductions with facility staff, the assessment team checked the list of drugs in stock at the center before starting patient observations. In case the assessment team encountered cases where a patient was diagnosed as having malaria but was not given the appropriate treatment, the team recorded the case in the observation form and gave a drug directly to the patient. If the team did not encounter any case of confirmed malaria not receiving appropriate treatment, the drugs were handed over to the HF at the end of the assessment visit. As a result, no patient with confirmed malaria was left without an appropriate drug during the team visit. In addition, stock-outs of essential antimalarials were reported at the health district and NMCP at the end of the day to ensure urgent stock replenishment.

Definitions of Key Outcomes

Definitions of key study outcomes referenced throughout this report are presented in Table 1 below.

Table 1. Definitions of key study outcomes

Outcome	Definition
Fever/history of fever	One or more of the following: 1) patient reports having fever in the previous 48 hours when directly asked by study team during consenting process, 2) patient spontaneously complains of fever in the previous 48 hours to health provider during consultation visit, 3) temperature upon examination was >=37.5°C
Malaria diagnosis	Rapid diagnostic test is positive
Correct treatment of malaria*	Prescription of an artemisinin-based combination therapy (ACT) at the correct dose for age (artesunate-amodiaquine or artemether-lumefantrine) for patients with malaria
Incorrect treatment of malaria	Failure to prescribe an ACT for patients with malaria (includes no antimalarial prescribed or a non-ACT antimalarial, such as sulfadoxine-pyrimethamine or quinine among any patient not a pregnant woman in her first trimester, prescribed)
Overtreatment of malaria	Prescription of an ACT for patients without a positive rapid diagnostic test

*Information on pregnancy status was not collected.

Data Management and Analysis

Quantitative Data

Data were collected on paper questionnaires and transferred into tablets with Census and Survey Processing System version 7.0 software. To ensure data quality, programs with consistency checks and skip patterns were predefined. A unique code was assigned to each HF and registered in the tablets to avoid coding errors and duplicates. Paper questionnaires were used to have a physical backup of the data in the event tablets had problems. Supervisors checked the data recorded in the paper tools to ensure data were complete and consistent. At the end of data collection, quantitative data were cleaned using StataIC 15 to check data quality and prepare analysis.

Quantitative data were analyzed with StataIC 15 to extract the main results, including factors related to compliance with national malaria guidelines. Descriptive analysis was conducted using Stata by comparing selected indicators to target objectives. Descriptive statistics, including frequencies and cross-tabulations, were employed to elicit trends in data and compare results in different categories of participants and facilities. Direct observations of HPs and HP knowledge tests were performed and then analyzed to document knowledge of and compliance with national malaria guidelines.

In terms of data confidentiality and security, HFs and all assessment respondents were given codes, and all links to personnel and facility identifiers were destroyed.

Qualitative Data

Qualitative data were recorded in audio format, transcribed, and translated from Malagasy into French. All respondents were given codes, and all links to personnel identifiers were destroyed. The data were stored in password-protected, cloud-based Microsoft Word documents. Supervisors reviewed all data on a daily basis to ensure quality, completeness, proper use of tools, and the provision of expected information. The aim of the data analysis was to illuminate key themes found throughout the transcripts. As such, an analysis approach was used that linked identified themes to codes that had either been developed before or during analysis. A list of codes that reflected study objectives was developed in advance of the analysis and added to throughout the analysis as new themes emerged. Microsoft Excel 2016 was used to analyze the data. All respondents were given codes, and all links to personal identifying information were destroyed.

Results

Participants were included in the survey from five elimination-targeted districts. The final survey sample is detailed in Table 2 below.

Table 2. Survey sample

Malaria Operational Zone	District Name	HF Public	HF Private	HF Total	HF Checklist	Provider Survey	Observation	Provider Knowledge Test	Community Health Volunteer Survey	Key Informant Interview Stakeholder
National/regional level										6
Central Highlands	Antsirabe II	2	1	3	3	5	20	5	3	3
Highland Fringe East	Antananarivo-Atsimondrano	14	1	15	15	18	134	18	14	2
Northwest	Mahajanga I	5	1	6	6	6	54	6	5	3
Northeast	Antsiranana I	3	1	4	4	4	36	4	3	2
Northeast	Antsiranana II	7	0	7	7	8	56	8	9	1
Total		31	4	35	35	41	300	41	34	17

Abbreviations: HF = health facility

Thirty-five HFs were surveyed for the assessment, including two from Antsirabe II, 14 from Antananarivo-Atsimondrano, five from Mahajanga I, three from Antsiranana I, and seven from Antsiranana II. HF readiness checklists were completed with the facility in-charge in all 35 facilities, which included 31 public

and four private facilities. Four HPs from private HFs and 37 HPs from public HFs were interviewed, observed in provider/patient consultations, and completed a knowledge test. Thirty-four CHVs from 35 HFs were interviewed; one CHV declined to participate.

Availability of Key Malaria Guidelines, Equipment, Commodities, and Supplies for Febrile Illness and Malaria Case Management

Table 3 shows the availability of key malaria equipment, diagnostic tools, and guidelines in the 35 surveyed facilities. Among all HFs, 89% had a working thermometer, and only 37% had a copy of the most recent national malaria guidelines. About three-quarters of facilities (77%) had at least one RDT, and 6% had a microscope.[12]

Table 3. Availability of equipment, diagnostic tools, and treatment guidelines in health facilities (n = 35)

Percentage of HFs that have:		n (%)
Equipment and Diagnostic Tools	Microscope	2 (5.7)
	Rapid diagnostic test	27 (77.1)
	Functional thermometer	31 (88.6)
	Functional baby scale	32 (91.4)
	Functional adult weighing scale	28 (80)
Guidelines	Copy of the most recent national malaria treatment guidelines	13 (37.1)

Figure 1 shows the availability of commodities in HFs. At least 80% of HFs had some formulation of an artemisinin-based combination therapy (ACT)—artesunate-amodiaquine, a first-line treatment for malaria—available on the day of the survey. Drugs for treating severe malaria (injectable artesunate or injectable quinine) were available at 29% and 14% of facilities, respectively. Drugs for treating pregnant women in their first trimester (quinine tablets) were available in only 6% of HFs. Primaquine, to be given as a gametocytocidal drug for transmission reduction in elimination areas, was available in 43% of facilities.

---

[12] In Madagascar, lower-level health centers (facilities) are not mandated to have microscopes or perform microscopy.

Figure 1. Percentage of health facilities with malarial commodities available in stock on the day of the survey (n = 35)
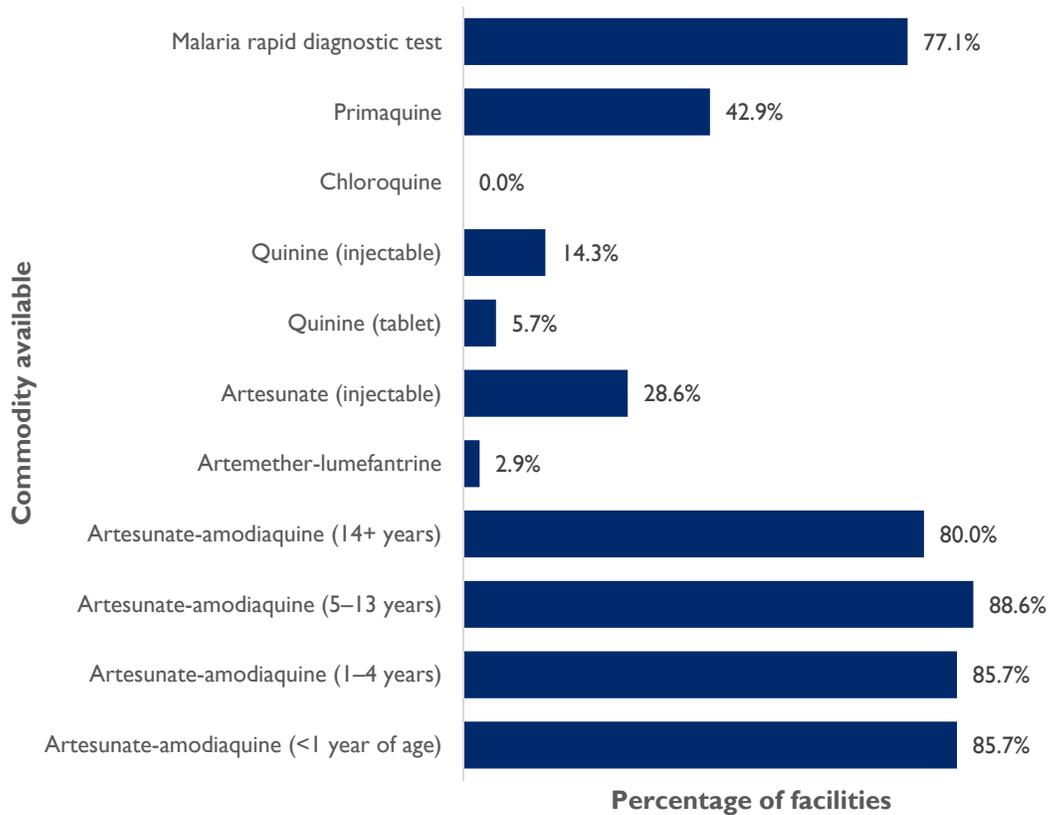
Among HFs, 26% experienced a stock-out of RDTs during the past 2 months for at least 1 day. Stock-outs of ACT for adults (age 14 and up) and children ages 5–13 occurred in 29% and 23% of HFs, respectively. Among HFs, 97% experienced a stock-out of quinine tablets, and 89% experienced a stock-out of injectable quinine in the past 2 months. On the day of the survey, 6% of HFs had expired RDTs in stock, and 11% had expired ACTs (any formulation).

Figure 2. Percentage of health facilities that had a stock-out of commodities for at least 1 day during the past 2 months (n = 35)
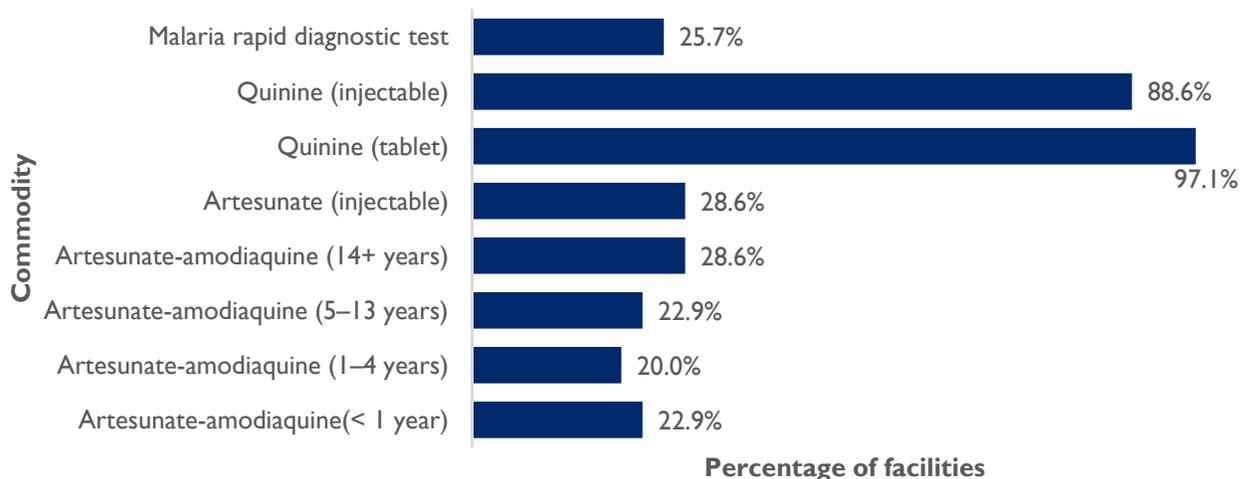
Some HFs experienced stock-outs of more than 3 days during the 2 months preceding the survey. Products included RDTs (23% of HFs), ACTs (26%), and injectable artesunate (20%). See Figure 3.

Figure 3. Percentage of health facilities that had stock-outs for more than 3 days during the past 2 months of a specific commodity (n = 35)
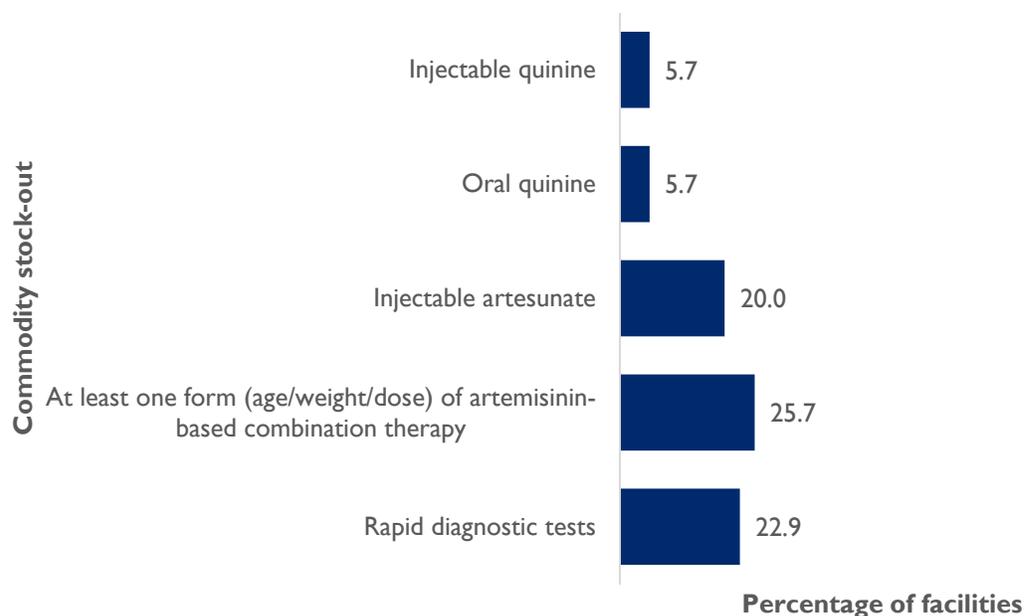
HF-Initiated Communication Activities for Social and Behavior Change

Among HFs, 97% reported conducting malaria-specific social and behavior change communication (SBCC) activities. However, only 11% of HFs have printed sensitization materials. Almost half of facilities (40%) reported conducting SBCC activities in the community in group-based settings, and 80% conducted sensitization activities at the facility. See Table 4.

Table 4. Malaria-specific social and behavior change communication (n = 35)

	n (%)
Social and behavior change communication activities initiated by the health facility	34 (97.1)
Home visits	2 (5.7)
Sensitization within the community in group settings	14 (40.0)
Printed sensitization materials	4 (11.4)
Sensitization in the health facility	28 (80.0)
Sensitization through the military	0 (0.0)
Malaria prevention and treatment communication plan exists at HF	27 (77.1)

HP Training, Supervision, and Knowledge Regarding Malaria Care Services

HP Characteristics

Forty-one HPs were interviewed, including 37 public HPs and four private HPs. Of the participants surveyed, doctors represented three-quarters of the surveyed HPs (76%), while midwives and nurses each represented 12% of HPs surveyed. Roughly the same proportions of HP cadre were interviewed in public and private facilities (data not shown). HPs had been in their position for a median of 4 years.

Training on Malaria Received by HPs

About two-thirds (68%) of HPs had received malaria-specific training during the past 2 years. As shown in Figure 4, malaria-specific training topics included treatment for uncomplicated malaria (59%), treatment of severe malaria (54%), malaria in pregnancy (39%), malaria diagnosis (32%), fever management (27%), and malaria surveillance and monitoring, malaria elimination, and epidemic thresholds (5% each).

Figure 4. Percentage of health care providers who received training on a specific malaria topic in the previous 2 years (n = 41)
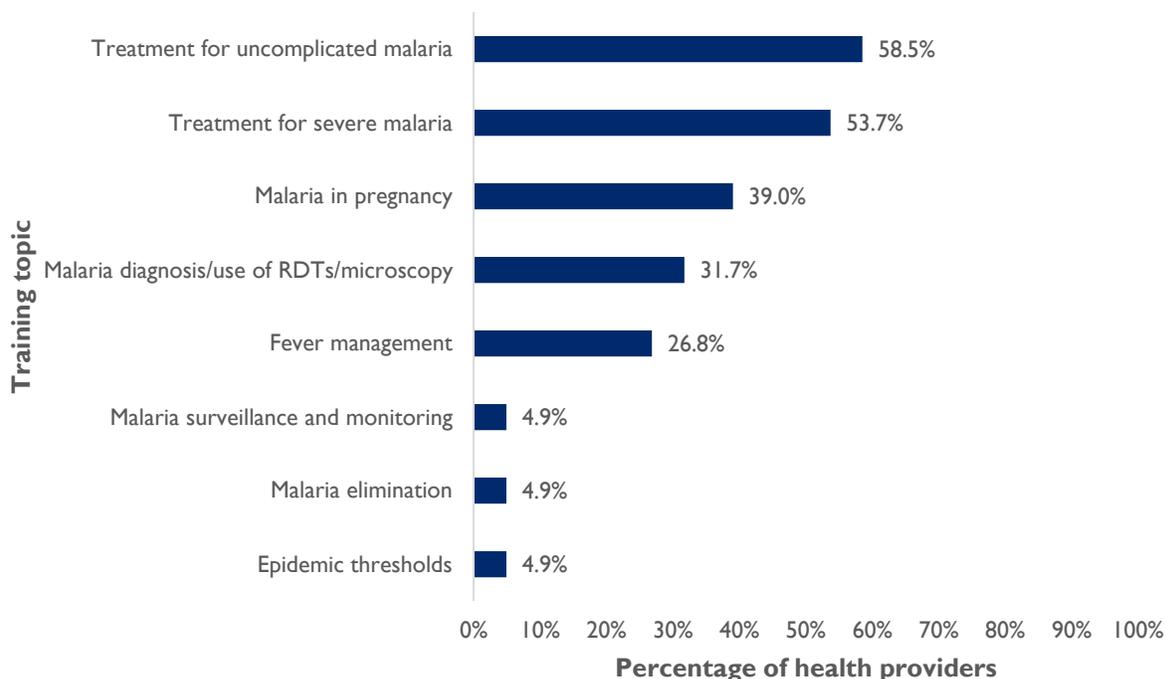
HPs also reported their needs for training in specific topics. One-fifth (20%) said they needed training in malaria diagnosis, and 22% said they needed training in malaria treatment. Nearly one-third (29%) reported a need for training in the management of severe malaria. Almost half (42%) reported a need for training on the epidemic threshold, and 15% said they need training on the health data management and information system. See Table 5.

Table 5. Self-reported training needs on specific topics (n = 41 providers)

Training Topic	n (%)
Epidemic threshold	17 (41.5)
Active search for cases	14 (34.1)
Analysis and use of the data on responses to malaria epidemics	13 (31.7)
Management of cases of severe malaria	12 (29.3)
Malaria-related monitoring and evaluation	12 (29.3)
Malaria treatment	9 (22.0)
Integrated Weekly Disease Monitoring and Notification System	9 (22.0)
Malaria diagnosis	8 (19.5)
Case-based reporting	7 (17.1)
Health data management and information system	6 (14.6)
Malaria in pregnancy	5 (12.2)
Management of nonmalarial fevers	3 (7.3)
Epidemics detection and management	3 (7.3)
No training needed	3 (7.3)
Social and behavior change communication for malaria	2 (4.9)
Integrated community case management of childhood illnesses in children under 5	1 (2.4)

Supervision and Technical Assistance at HFs

Only two-thirds (66%) of surveyed HFs received a supervision visit over the past 6 months. Most of the visits were conducted by district staff (52%) and regional staff (44%). Topics relating to vector control and laboratory supplies were seldom addressed during supervision visits (0% and 4%, respectively), with malaria case management being reported as part of supervision visits by only 44% of facilities. Among HF in-charges, 66% expressed a need for technical assistance with respect to malaria diagnosis and case management.

Table 6. Percentage of health facilities that received supervision and technical assistance over the past 6 months (n = 35)

Supervision and Technical Assistance Received	n (%)
Supervision visits received (n = 35)	
Minimum of one supervision visit over the past 6 months	23 (65.7)
Supervising entity, of those who received supervision (n = 23)	
Central staff	2 (8.7)
Regional staff	10 (43.5)
District staff	12 (52.2)

Supervision and Technical Assistance Received	n (%)
Aspects addressed during the supervision, of those who received supervision (n = 23)	
Commodity management (drugs, rapid diagnostic test, long-lasting insecticide-treated net)	12 (52.2)
Data/reports on malaria	10 (43.5)
Laboratory supplies (rapid diagnostic test, pipettes, reagents, etc.)	1 (4.4)
Case management (diagnosis, treatment, and follow-up)	10 (43.5)
Social and behavior change communication	3 (13.0)
Type of technical assistance received (n = 35)	
Malaria detection and case management	7 (20.0)
Malaria in pregnancy	3 (8.6)
Data management and reporting	3 (8.6)
No technical assistance on malaria control activities	11 (31.0)
Need for technical assistance (n = 35)	
Detection and management of malaria cases	23 (65.7)
Assistance to respond to epidemics	0 (0.0)

Patient Characteristics and Case Management

Observations of 300 outpatient patient consultations were conducted in the 35 facilities within the five malaria elimination districts. CU5 visits accounted for 31% of the observations. The presenting complaints of the observed patients are shown in Table 7. Most patient complaints fell into an "other" category, which included eye problems, lack of energy, and bodily wounds. Slightly more than one-third (37%) of patients spontaneously reported fever to the HP. About one-quarter of patients complained of either a cough (23%) or diarrhea (22%).

Table 7. Presenting complaint of patient (n = 300)

Patient complaint	n (%)
Other*	208 (69.3)
Fever	111 (37.0)
Cough	70 (23.3)
Diarrhea	66 (22.0)
Runny nose	43 (14.3)
Headache	42 (14.0)
Vomiting	36 (12.0)
Loss of appetite	27 (9.0)
Chills	21 (7.0)
Stomach ache	18 (6.0)
Abnormal breathing	12 (4.0)
Body pain	4 (1.3)

Patient complaint	n (%)
Seizures	0 (0.0)

*Some of the presenting complaints included eye problems, lack of energy, and injury.

Table 8 shows the diagnosis that providers gave each patient. The majority of the diagnoses fell into an "other" category, which included stomach maladies, bodily wounds, and eye problems. Five were diagnosed with malaria. Fifty-five patients were diagnosed with a cough/cold. Twenty-six were diagnosed with diarrhea.

Table 8. Diagnosis of patient (n = 300)

Diagnosed illness	n (%)
Other*	209 (69.7)
Cough/cold	55 (18.3)
Diarrhea	26 (8.7)
Acute respiratory infection	16 (5.3)
Skin lesions	9 (3.0)
No diagnosis given	7 (2.3)
Malaria	5 (1.7)
Injuries	1 (0.3)

*The majority of diagnosis in this category were stomach maladies, injury, and eye problems.

Malaria Case Management

Fever was spontaneously reported to the HP during the consultation by 37% of all patients; 49% of those who did not spontaneously report fever or history of fever were asked about fever by the HP (Table 9). Almost all (99%) patients who spontaneously reported fever during the consenting process either mentioned it again during the consultation with the HP or were asked about it by the HP. HPs asked about fever in 92/189 (48.7%) of patients who did not spontaneously complain to them about fever. HPs took the patient's temperature in 65% of all consultations (195/300). HPs took patients' temperature correctly according to guidelines[13] in all but one consultation, of those who had their temperature taken. Fever was either reported by the patient or documented through a temperature reading by the HP in 129 patients. Of those, 56 (43%) received a malaria RDT, 9% of which were positive (five positive RDTs). Four of the five cases were in patients ages 5 and older; one case was in a CU5 (Table 11). Eighty percent of patients (four) with a positive RDT were treated with an ACT (one patient was treated with amoxicillin). All four patients also received paracetamol. None of the confirmed cases received primaquine.

Table 9. Malaria case management of patients

	n/N (%)
Fever assessment	
Fever reported to study team during consenting process	103/300 (34.3)
Fever spontaneously reported during consult	111/300 (37.0)
Fever reported to study team during consenting process among those spontaneously reporting fever during consult	92/111 (82.3)
Provider asked about fever during consult, among patients not spontaneously reporting fever	92/189 (48.7)

[13] There are no specific guidelines for temperature taking in Madagascar, but this assessment looked at whether providers took temperature electronically under the arm for 1 minute.

	n/N (%)
Fever reported by patient or patient was asked about fever	203/300 (67.7)
Fever reported by patient or patient was asked about fever, of patients who reported fever during consenting process	102/103 (99.0)
Temperature taken	195/300 (65.0)
Temperature taken correctly, of those who had their temperature taken	194/195 (99.5)
Temperature recorded by the provider	142/300 (47.3)
Temperature 37.5 degrees or higher	53/142 (37.3)
Patient had fever or reported history of fever*	129/300 (43.0)
RDT	
Rapid diagnostic test (RDT) done, among patients with recorded or reported fever	56/129 (43.4)
RDT positive, among patients who received a RDT	5/56 (8.9)
Result shared with patient, among patients who received a RDT	52/56 (92.8)
Treatment	
Received artemisinin-based combination therapy (ACT), among patients with a positive RDT	4/5 (80.0)
Counseled on use of ACT, of those who received an ACT	4/4 (100.0)
Received primaquine, among patients with a positive RDT	0/5 (0.0)
Received another medicine**, among patients with a positive RDT	1/5 (20.0)
Received ACT, among patients with a negative RDT	0.0
Received ACT, among patients who did not receive a RDT	0.0
Microscopic examination	
Microscopic examination done	0.0

* Patient reported history of fever during consenting process and/or during consultation with health provider and/or had a fever of 37.5°C or higher as documented by the health provider.

** Patient was treated with amoxicillin.

Table 10 shows the percentage of patients who had their temperature taken by category of fever reporting. Nearly 80% of patients who spontaneously reported fever during the consultation had their temperature taken.

Table 10. Fever and temperature

Fever reporting	Patient's temperature taken (n/N)
Reported fever during consent (n = 103)	79/103
Did not report fever during consent (n = 197)	116/197
Spontaneously reported fever during consult (n = 111)	87/111
Did not spontaneously report fever during consult (n = 189)	108/189
Was asked about fever if not spontaneously reported (n = 92)	63/92

Fever reporting	Patient's temperature taken (n/N)
Was not asked about fever if not spontaneously reported (n = 97)	45/97

Table 11 depicts the malaria case management cascade by CU5 and patients 5 and older. Only 38% of all CU5 with febrile illness received a malaria RDT. Roughly half of patients 5 or older received a malaria RDT.

Table 11. Malaria case management and age

	Age: Children under 5 (n = 93)	Age: Patients 5+ (n = 207)	Total Patients (n = 300)
Recorded or measured fever**	58/93	71/207	129/300
Received a RDT, of those with fever	22/58	34/71	56/129
Positive RDT, of those with RDT	1/22	4/34	5/56
Received ACT, of those with a positive RDT	0/1	4/4	4/5

**Patient reported history of fever during consenting process and/or during consultation with health provider and/or had a fever of 37.5°C or higher as documented by the health provider.

Figure 5 shows the malaria case management cascade as implemented by HPs in the observed outpatient consultations.

HP Knowledge on Malaria

Results from the knowledge tests conducted during the assessment showed variable levels of HP knowledge on specific topics: 39% knew that malaria RDT or microscopy should be performed for CU5 with fever, and 59% were aware of the first-line treatment of uncomplicated malaria in women during the second and third trimester of pregnancy. HPs' knowledge of malaria prevention measures, signs of severe malaria, procedures to follow in case of a negative test, and other causes of fever are presented in Table 12. Overall, only 51% of HPs scored above 85% on the malaria knowledge test. The benchmark of 85% is the same benchmark used during knowledge tests conducted during MOPH-led trainings.

Table 12. Health care provider knowledge on malaria: percentage who answered questions correctly on a specific topic (n = 41)

Test topics	n (%)
Mode of transmission of malaria	35 (85.4)
Fever as a potential indication of malaria	32 (78.0)
Symptoms of uncomplicated malaria	28 (68.3)
Malaria prevention actions	40 (97.6)
Need to perform a malaria test in case of fever	32 (78.0)
First-line treatment of uncomplicated malaria in patients in their second or third trimester of pregnancy	24 (58.5)
Procedure to follow in case of negative malaria diagnostic test	40 (97.6)
Signs of severe malaria with complications	40 (97.6)
Other causes of fever	41 (100.0)
Knowledge of the first-line treatment of uncomplicated malaria in a woman in her first quarter of pregnancy	29 (70.7)

Test topics	n (%)
Key information needed to interpret microscopy results	34 (82.9)
Malaria tests to be performed in cases of fever in children under 5	16 (39.0)
Health care providers who scored above 85% on the knowledge test	21 (51.2)

Roles Played by CHVs in Malaria Monitoring

The findings discussed in this section were derived from the information collected from the interviews with 34 CHVs, most of whom (85%) had a secondary level of education or above. The median time spent in the role of CHV was 9.5 years among those interviewed. Figure 6 provides further details on the sample.

Figure 5. Respondent profiles: highest level of education attained and years of service as a community health volunteer (n = 34)
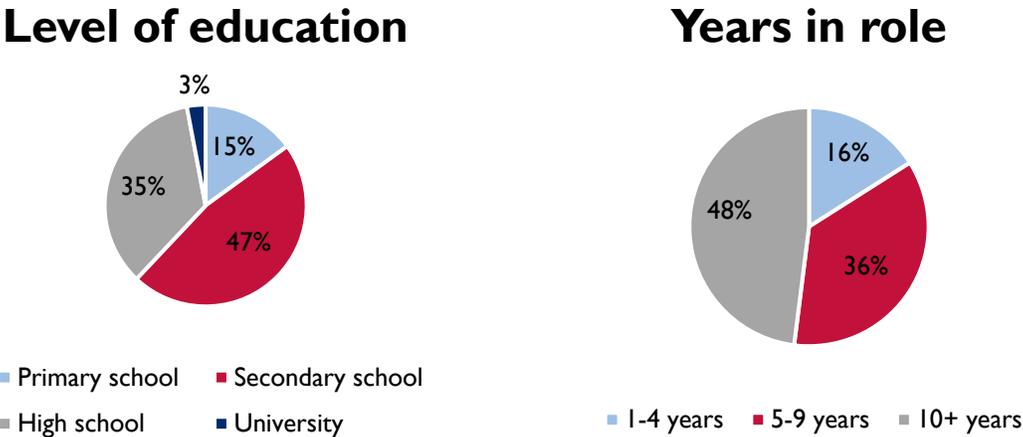
Training and Supervision Received by CHVs in Relation to Malaria

CHVs reported that they received specific trainings over the 2 years preceding the assessment in malaria prevention and case management, including iCCM of childhood illnesses (59%), data collection (56%), and antimalarial products (53%) (Table 13).

Of those trained, 59% of CHVs reported that they were trained in facilities during monthly activity report (MAR) reviews, 29% were trained by nongovernmental organizations, and 12% benefited from training in both locations.

Table 13. Trainings received in previous 2 years by community health volunteers (CHVs), n = 34

	Type of Training					
Trainings Received	**Malaria Case Management/Integrated Community Case Management of Childhood Illnesses**		**Data Collection**		**Antimalarial Products**	
	Number of CHVs trained	**%**	**Number of CHVs trained**	**%**	**Number of CHVs trained**	**%**
Yes	20	58.8%	19	55.9%	18	52.9%
No	14	41.2%	15	44.1%	16	47.1%

Only 18 of the 34 CHVs (53%) reported that they received supervision from facility managers sometime in the last year. Nine CHVs out of 34 (26%), received a visit by an *equipe management de district de la santé* (district management team) sometime in the last year. Of the CHVs who reported receiving at least one supervision visit, the majority received the visits every 1–3 months (see Table 14).

Table 14. When and from whom did you receive your last supervision visit? (n = 34)

Supervisor type	No visit in last year	1–3 months ago	3–6 months ago	>6 months ago	Total number of community health volunteers who received a supervision visit	Percentage who received at least one visit
Basic health center (facility) manager	16	12	5	1	18	53%
District management team	25	3	3	3	9	26%
Nongovernmental organization	23	8	2	1	11	32%
Other facility staff members	33	0	0	1	1	3%

CHV Knowledge

When asked about signs of severe malaria, fever was the sign most frequently mentioned (38%) by CHVs (see Table 15). All CHVs were aware that cases of severe malaria must be referred to facilities, with or without RDT results and with or without ACT treatment (data not shown).

Table 15. CHV spontaneous recall of the signs of severe malaria (n = 34)

Signs	n (%)
Seizures	9 (26.5)

Signs	n (%)
Altered state of consciousness	5 (14.7)
Abnormal breathing	7 (20.6)
Vomiting	5 (14.7)
Diarrhea	9 (26.4)
Asthenia	3 (8.8)
Headache	3 (8.8)
Arthralgia	1 (2.9)
High temperature	13 (38.2)
Jaundice	2 (5.9)
Dark urine	1 (2.9)
Generalized edema	1 (2.9)
Red eyes	3 (8.8)
Cough	1 (2.9)
Pallor	2 (5.8)
Neck stiffness	2 (5.8)
Chills	2 (5.8)

CHV Practices Regarding Suspected Malaria Cases

When asked if CHVs care for CU5 who report a fever in the community, only 26 of the 34 CHVs (76%) interviewed reported that they do. Table 16 shows the reported criteria for a suspected case of malaria, among the CHVs who reported caring for CU5.

Table 16. Reported criteria for a suspect case of malaria per community health volunteers who report caring for children under 5 (n = 26)

	n (%)
Patient reports a history of fevers at home	18 (69.2)
Patient reports other symptoms	13 (50.0)
Patient reports traveling in a high-transmission region	5 (19.2)
Patient's temperature was taken during the visit	3 (11.5)
Patient reports fever but no other symptoms	3 (11.5)

Only two-thirds of CHVs (69%) said that they would perform an RDT if a patient reported having a fever at home, even if they did not report a fever during the time of the visit (Table 17).

Table 17. Rapid diagnostic test performed by community health volunteers when a patient reports a previous fever (n = 26)

Should a community health volunteer perform a rapid diagnostic test if a patient had fever at home but no longer has it at the center?	n (%)
Yes	18 (69.2)
No	8 (30.8)

Regarding malaria case follow-up at the community level, 88% of CHVs reported that they always follow up with their patients' treatment, and 9% said they do not.

Table 18 shows the actions CHVs spontaneously reported taking in cases of positive RDTs. Roughly half (46%) reported providing an ACT in the case of a positive RDT. About one-third (35%) said they would provide paracetamol, and only one-quarter (23%) said they would refer to an HF if the patient exhibited signs of severe malaria. Eighty-five percent of the CHVs surveyed spontaneously reported that they would ask patients with a positive RDT if they traveled in areas of high transmission of malaria, 12% would not, and 3% said that they would sometimes (data not shown).

Table 18. Actions spontaneously recalled as steps taken by community health volunteers in cases of a positive malaria rapid diagnostic test (n = 26)

Community health volunteer-reported action after a patient receives a positive rapid diagnostic test	n (%)
Provide artemisinin-based combination therapy	12 (46.2)
Provide paracetamol	9 (34.6)
Refer to a health facility if patient exhibits symptoms of severe malaria (seizures, altered state of consciousness, abnormal breathing, vomiting/diarrhea)	6 (23.1)
Other	5 (19.2)
Give oral rehydration salt	2 (7.7)
Ask the mother to bring her child back if condition does not improve	1 (3.8)
Inquire about other symptoms	0 (0.0)
No action is taken	0 (0.0)

Epidemic Response

Only 50% of CHVs surveyed reported having received training or supervision on immediate response to malaria epidemics. None of the CHVs interviewed reported having responded to a malaria outbreak. Table 19 displays actions CHVs believe they have the ability to take if they encounter an increase in malaria cases.

Table 19. What are community health volunteers able to do to respond to an increase in malaria cases? (n = 34)

	n (%)
Conduct sensitization activities in the community.	21 (61.8)
Refer severe cases of malaria to other health centers/hospitals for advanced care.	5 (14.7)
Make emergency requests for antimalarial products.	4 (11.8)
Other (notify basic health center, have not seen an increase in malaria cases)	2 (5.9)
Receive emergency products within a short time.	1 (2.9)

	n (%)
Rest and treat/perform active surveillance in the community.	1 (2.9)
Distribute long-lasting insecticide-treated nets.	1 (2.9)
They have no capacity to respond to an increase in the load of malaria cases.	0 (0.0)
They generally do not have enough products to treat two or more times the usual number of malaria cases in children under 5.	0 (0.0)
Contact partners and request assistance to respond to increases in the number of malaria cases.	0 (0.0)

Commodity Availability and Management at the CHV Level

Nineteen of 34 CHVs (56%) did not have any malaria commodities (see Figure 7). When asked why they did not have any commodities, some CHVs responded that they no longer have the mandate to implement iCCM[14] and instead are charged only with SBCC activities at the community level. Others said that that have not received their first batch of commodities.

Only 13 of 26 CHVs (50%) who reported caring for CU5 had malaria RDTs, and 11 CHVs (42%) had artesunate-amodiaquine malaria treatment.

Figure 6. Commodity availability among community health volunteers (n = 26)

---
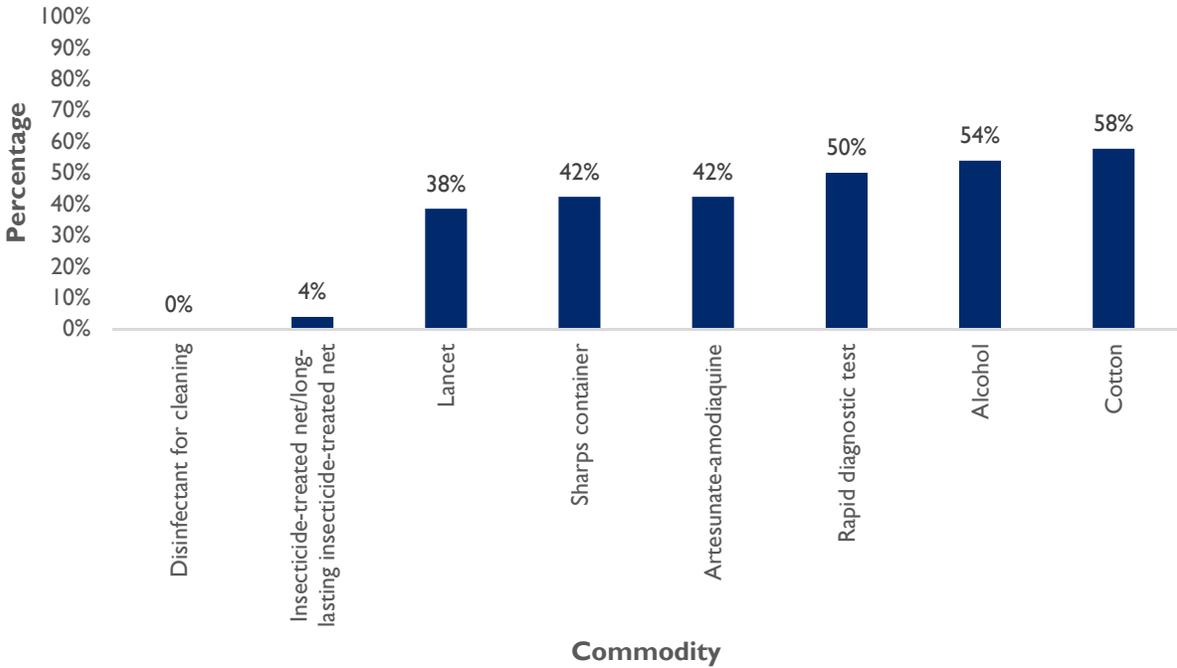
[14] CHVs in urban communes are no longer required to provide iCCM of childhood illnesses in their communities; their mandate is to carry out SBCC activities around timely care seeking for fever. The timing of this mandate was unclear at the time of this report. Further, CHVs are not commonly working at all in urban communes. CHVs from rural communes are authorized to carry out case management. Because the study team was not able to determine a definition for rural/urban facilities, this disaggregation was not done.

Malaria Monitoring and Reporting by CHVs

Results showed that about half of CHVs (16/34, or 57%) reported having a stock management monitoring system, with 14 of the 16 reporting that they use the community stock card and two using the consultation register to manage stocks. Most CHVs (89%) reported using consultation registers; reasons for not using the consultation registers were not given. Five CHVs (15%) indicated that they did not check data quality in their registers due to lack of knowledge and adequate training. About half (56%) of the surveyed CHVs collect data for community MARs,[15] and 53% reported that they used community MARs to make decisions after reviewing their data. The decisions made pertain mainly to strengthening awareness raising in their community.

Qualitative Data

Stakeholders described challenges and opportunities related to the successful implementation of malaria control activities. Table 20 shows the numbers and types of stakeholders interviewed for the assessment.

Table 20. Final stakeholder sample

	Interviewee	
	Head of Directorate of Malaria Control	1
Ministry of Public Health	Regional malaria officers	5
	Malaria district officers/medical inspectors or technical assistant	7
	Central Purchasing Center for Essential Drugs and Medical Equipment of Madagascar (vertical program coordinator)	1
Technical/financial partners	Population Services International (malaria case management officer)	1
	Mahefa Miaraka, USAID bilateral responsible for community activities in west and north (malaria officer)	1
	Procurement and Supply Management project (distribution manager)	1
	Total	**17**

Challenges with Supply Chain Management

In the opinion of several district malaria managers, the routing of commodities between the district level and HFs is problematic because HFs lack a dedicated person responsible for forecasting the need for malaria commodities and managing the stock. In addition, some HFs do not have adequate storage available for commodities.

> "In the peripheral areas, some facilities cannot manage the stock of drugs because they handle both wholesale and retail commodities, while they have no room for storage. During the training with the [USAID Deliver Project], we previously had a malaria manager who managed commodities. But currently, this position is no longer there, and as a result, a [community-managed pharmacy] has to manage malaria commodities. That's where the stock management challenge begins. We can no longer define the average monthly consumption. The head doctor, who is always overwhelmed, is also in difficulty when there is a stock-out." –District malaria manager

All interviewed commodity coordination managers reported that orders placed by the districts were provided by donors, which indicates that funding is available for commodities, they noted. The challenges noted were instead due to delayed or low-quality data reporting and forecasting from facilities, and the subsequent drug misappropriations. The delay in reporting by some facilities led to delays by the districts in forwarding reports

---

[15] In Madagascar, MARs are reports that are completed by CHVs and then reported up through facilities.

to the central level, which caused interruptions in supply at the facilities. In addition, errors in the calculation of average monthly consumption of commodities made at the facility level led to quantification errors at the central level, resulting in insufficient supply of commodities to facilities. Reports and orders were also sometimes found to be invalid. A respondent recalled a time when the quantity of a drug order was the same for different age groups in some districts, suggesting that the needs were the same for all age groups, which the MOPH knew was incorrect from past data.

> "Human resources are a challenge here. Most managers do not have the capacity to handle logistics. You really need someone who has studied logistics to manage the commodities because it is not an easy thing." –Technical and financial partner

In addition to the problems of data reporting, drug misappropriation was observed as a result of the lack of means to verify the actual use of commodities after removal vouchers were approved at the central and regional levels.

> "If in 1 year, we release 1 million boxes of ACT, only 600,000 can be traced down and arrive at the district level. We do not know where the rest went. It is said, for example, that such a person will go on a mission and needs such a quantity, but there are never any reports about the outgoing stock." – Technical and financial partner

Product leakage from the public sector to the private sector was also been raised as an issue. Participants noted that products are free in the public sector and can be sold in the private sector. One stakeholder reported his evidence for the leakage he thought was occurring:

> "As a proof [of leakage], each cyclical dispatch represents 3 months' stock, while the stock is exhausted after only 1 month." –Technical and financial partner

Survey respondents reported that to ensure uninterrupted commodity supply, the NMCP is working on a supportive supervision strategy that would involve checking compliance with minimal storage standards, compliance with the minimum/maximum stock requirements according the HF's level, and reminders on compliance with the Central Purchasing Center for Essential Drugs and Medical Equipment of Madagascar's cyclical planning, commodity management integration, stock management, and alert threshold. In the event of ACT stock-outs, as part of the strategy, district-level officers would attempt to dispatch drugs again, and in the event of a total stock-out, they would adjust doses. For instance, in the event of adult ACT stock-outs, they would give adults a double dose of ACT for children ages 5–13. The same applies to children ages 1–5 who will be given portions of an ACT dose for children ages 5–13. Interviewees noted that such arrangements would then pose challenges to drug quantification and needs for each age group. This supportive supervision strategy has not yet been implemented.

Challenges with Malaria Surveillance, Data Management, and Monitoring and Evaluation

Respondents noted data quality challenges, including data completeness, timeliness, and reliability. Through training and supervision, HPs are taught and encouraged to submit their reports to public health service districts on a specific day each month. During MARs, data are checked by district officials both electronically and on paper. In cases of data inconsistencies, district officials are mandated to call HFs to rectify errors. The data quality checks are performed using the *gestion de système d'information sanitaire*, or health management information system, which is compared with data in the Global Malaria Program database. To improve upon this system, Madagascar is moving toward the District Health Information Software 2, a platform where data will be entered electronically by the district level, with a vision that facility staff will directly enter data via tablets in the future. As detailed by survey respondents, an electronic database has recently been established for malaria surveillance at the central and regional levels of the NMCP, along with a technical monitoring and evaluation committee. This electronic database has not yet been implemented. Plans for a database called

Integrated Electronic Surveillance are also being established for all health districts as well as a community monitoring system. Stakeholders noted that the use of technology by untrained staff and the lack of tablets available for use might raise challenges in obtaining high-quality data.

Challenges with HPs and HFs

As documented in interviews with stakeholders, malaria officials were aware of the guidelines in the malaria treatment protocol, namely that treatment of uncomplicated malaria in elimination areas is based on a combination of ACTs with a single dose of primaquine to eliminate gametocytes. They also knew that all fevers should be tested with a malaria diagnostic test. They noted that confirmed uncomplicated malaria should be treated with an ACT, except among pregnant women in the first trimester.

One district-level MOPH manager noted that failure of HPs to follow the NMCP's malaria treatment protocol could result due to ACT stock-outs, but it could also reflect the deliberate choice of some HPs who believe they are viewed in a more positive light by their patients for prescribing drugs that are more expensive than ACTs (ACTs are available free of charge from the MOPH). This manager believed that patients felt providers were giving them better care if they prescribed a more expensive treatment:

> "It's better to prescribe a drug that costs more to promote your benefit." –District-level manager

Stakeholders reported that the number of HPs is insufficient to meet the needs of the population in terms of febrile illness detection, malaria prevention, and malaria case management. The majority of HPs work alone at their posts and have more work than they can complete, especially during long-lasting insecticide-treated net (LLIN) campaigns or indoor residual spraying (IRS) activities. Respondents noted that HPs are responsible for an extraordinary amount of work, including the management of existing health programs at an HF, such as the Expanded Programme on Immunization, family planning, nutrition, HIV/AIDS, TB, and malaria. In addition, they see patients for routine illness and injury, and perform deliveries. For each of these areas, reports must be prepared each month. Respondents noted that HPs are also direct supervisors of the CHVs who report to their facility. Being rushed to see many patients or complete many tasks can lead to inadequate consultations with patients, which can result in missing key symptoms, such as fever. In addition, HPs may not fill out a report completely and may not ask for the correct amount of RDTs, leading to stock-outs and the inability to diagnose malaria.

Interviewees stated that in the event of staff turnover, in theory, challenges should not arise if replacement staff have received the same training and have the same skills as the HPs they replace. However, new staff have not always received the latest training in malaria care and reporting, and they miss key elements of fever detection, case management, and reporting. This causes disruptions in the availability of high-quality malaria care services and ultimately undermines malaria elimination efforts.

Respondents across stakeholder category also noted they observed some HPs' lack of professionalism, including patient neglect, laziness, and office abandonment to pursue lucrative businesses, such as mining for precious stones or gold. Some HPs' misbehavior, such as failing to prepare reports, being inebriated during working hours, or even abandoning their work, are all challenges that need to be addressed.

> "With regard to health providers, we must be more severe on discipline so as to have them stay at their workstation, as some of them voluntarily leave the facility. Paramedics working in the peripheral zones return to town at night. This situation has a considerable impact on indicators, since when clients are used to find no health provider at facilities, they will go elsewhere, and the number of people who come to the health facility will decrease." –Regional manager

Failures also occur during recruitment, as nepotism and corruption are the quickest ways to get into a job, resulting in a lack of motivation once in a position. A lack of motivation may lead to HPs' inadequate care of patients or issues in reporting.

"They join their position just in order to be registered as civil servants, and after 2 years, they will leave for other positions." –District manager

"We cannot do much against careless staff members because they are sometimes protected at the higher level. They have no respect for you, and if you apply sanctions against them, you end up being the one assigned elsewhere." –Regional manager

Survey respondents also noted that while HP allowances are very low, their lack of motivation can also be attributed to their poor living and working conditions, such as the lack of housing for them at health centers in remote areas. For instance, a facility with two small rooms will be required to provide one room to the HP for his/her office and consultation room, while the other room will be dedicated as the facility in-charge's accommodation. In addition, HPs sometimes have to pay their own mobile phone costs when sending the epidemic surveillance report.

Moreover, HPs face various logistical challenges. Apart from inadequate commodities and equipment, registers and stock cards are also lacking, contributing to questionable data quality when preparing MARs and information on stock management.

"In peripheral zones, we never received an original register at our facility before this year. Consequently, health workers fill these registers very vaguely, often leading to data inconsistency." –District-level malaria officer

"With regard to the filling of stock cards, we previously used stock cards in color for malaria, but these cards are currently out of stock. In addition, according to the central officials, donors do not want to cover the transportation cost for the delivery of registers. As management tools are not available, we are forced to make our own registers because outpatient consultations cannot be done without a register." –District-level manager

Finally, stakeholders noted that frequent supervisions of HPs are necessary for processes to be implemented correctly:

"Even the filling of stock cards has to be reviewed and will have to be updated during supervision. The same goes for program and commodity management. Reminders are also needed on case management from time to time. That's why supervision is very important and should be done regularly." –Regional manager

Respondents also noted that communities may not be interested in receiving sensitization by HPs and CHVs regarding the need to come to HFs in case of fever and for pregnant women to attend antenatal care. Some community members also do not believe that the commodities provided are effective.

"When we talk to them, there are those who answer that LLINs do not protect them, since mosquitos start biting right at sunset when they are not yet in bed, so they do not see [their] usefulness." –Regional manager

As a result, the population uses the products for other activities rather than for protection, which is a bottleneck and even a danger. As noted by one stakeholder, LLINs are sometimes used as fishing nets or field fencing.

Challenges Faced by CHVs

Supplies and Commodities

According to the case management manager at the Directorate of Malaria Control (DLP), many challenges arise with maintaining supplies and commodities for CHVs:

> "In the past, it was [Population Services International] that supplied the CHVs at supply points. But currently, these supply points have stopped operating, and [the Ministry of Public Health] has issued an instruction allowing CHVs to source from their supervising facilities. The challenge is that CHVs do not have enough money to purchase drugs in large quantities, and the order takes 1 month to be supplied by the [district wholesale pharmacy]. Another challenge is that malaria commodities are free at facilities. Apart from their own orders, facilities must also supply CHVs. For example, if a facility covers 10 *fokontanys*, it means that 10 CHVs have to be supplied as well. So, do you realize how much stock this facility has to take? Where are they going to store all these commodities? In addition, facilities won't make any profits, while CHVs can make MGA 100 per drug, though this amount may be small. So, there are cases where the facility never places an order for CHVs at [district wholesale pharmacies]." –Case management manager, DLP

> "In June, I trained CHVs in Andramasina, but so far, they have nothing to work with: no management tools, no commodities, nothing. They just have a site, but there is nothing in it." –Regional manager, implementing partner

Interviewed stakeholders, including a technical implementing partner and malaria district officers, noted that in practice, the actions taken by CHVs to manage malaria varied according to the commodities they had. They thought that those who had RDTs in their possession performed the test before referring cases to health centers, while those who did not have any malaria case management commodities tended to immediately refer patients to the HF and, in so doing, filled out a referral card or book. Among CHV respondents who reported referring patients, 18% reported that they accompanied their patients to the facility after referring them. One of the CHVs reported occasionally paying for the transport of their patient to a facility.

Stakeholders noted in interviews that it is difficult for CHVs to prepare for malaria outbreaks, as they procure drugs for their current needs only due to the lack of funds.[16] In addition, it is difficult for them to calculate the stock needed to respond to an epidemic, as many have never faced a malaria outbreak.

Few Incentives for CHVs

In responses to open-ended questions, CHVs raised the issue of finance, as they work as volunteers. Because it is crucial that they provide for themselves first, their activities as CHVs are not their top priorities. This sentiment was echoed in interviews with stakeholders:

> "The situation of CHVs can be a problem because they have responsibilities in mobilization, census, and routine case management for CU5, while they are only volunteers. They may lose motivation, as they are unpaid, and they sometimes do things wrong." –National-level program manager

> "There are those who left for different reasons. This will be a challenge, especially when two CHVs from the same *fokontany* are gone; you have to train their replacements immediately." –Technical partner

CHVs working with nongovernmental organizations, as in the case of Mahefa Miaraka, received an allowance at each monthly meeting. However, at the end of the program, the CHVs did not receive anything:

---

[16] CHVs are given a starter kit, and it is understood that they will make a small of profit when they sell to clients. They then use these small profits to purchase more commodities. This helps with their motivation to continue CHV work.

> "I haven't sent another report since July because we haven't received our allowance since then."
> –CHV

Potential Community Distrust

A small percentage of CHVs (12%) also mentioned the lack of adequate training and tools for their awareness-raising activities. However, nine CHVs (27%) reported they did not experience any challenge in carrying out their community activities.

Challenges with the Private Sector

Many private HFs do not send their monthly reports to the district level as mandated, according to respondents. Consequently, malaria data are incomplete and may distort the estimation of the disease burden in the districts. Moreover, several private HPs do not attend the MAR review meetings, during which supportive supervision is provided as a refresher and/or initial training for those who have not yet been trained.

In addition, private health centers are responsible for training private-sector HPs, but some HPs show disinterest in training opportunities for fear of loss of profit.

> "They think they will lose a client when they leave their practice for training."
> –District malaria officer

Another challenge noted by some survey respondents is that some private-sector HFs do not believe in the effectiveness of subsidized drugs:

> "They think that a cheap drug is less effective than those that cost more, and they prefer to inject quinine, even for simple malaria." –Regional malaria officer

Challenges at the District and Regional Levels

The lack of funds for operating costs at all levels of the health system is a prevailing issue, resulting in a lack of materials and equipment to carry out malaria control activities. Due to inadequate budget, computers are old and often broken, and there is no budget for repairs. Decision-making is delayed due to the lack of funding for communication expenses, such as telephone and Internet connection airtime. Furthermore, there are few staff at the district level, and they cannot always provide adequate supervision to facilities.

> "Sometimes we do not set our budget or our itinerary while we are supposed to do it. For example, during the last LLIN campaign, we were only given fuel for 50 kilometers per day while we were going to supervise all the *fokontanys*. It's still top-down planning." –Regional manager

> "There is a fund sent by the DLP for supervision, but the amount is very small. As a result, we only supervise nearby facilities, even though the need for supervision is more acute in remote facilities since they cannot send their reports." –District-level manager

Redundancies are experienced by MOPH staff, which lead to an inefficient use of resources. For example, one interviewee mentioned supervision activities that are implemented in parallel:

> "Central and regional staff conduct the same supervision in one place and at the same time. This should be avoided because it is both a waste of time and money. Why is it that there no integration program, since a single entity is being supervised?" –Regional manager

Communication challenges were also noted by respondents between the different levels of the health system:

"Normally, the communication between the peripheral and the central levels must be two-way, but it is often one-way. There is a retention of information, and communication does not flow very well between the central and the regional levels." –District manager

Challenges with Reliance on Donors

Full reliance on donors and on technical and financial partners for malaria control activities was noted as a challenge by respondents. In the event that donor funding ends, activities and supplies for high-quality fever management and malaria care may end as well. In 2013, the lack of funding for IRS campaigns due to departures of donor-funded implementation support projects was followed by a malaria outbreak with a number of fatal cases.

"Implementation funds come 97% [of the time] from donors. As a result, when there is no funding, there are no activities. For example, the 2013 IRS campaign could not be done. The government's share in all malaria control activities represents 7% of the total budget of our service."
–National program manager

Interviewees also said that the cumbersome administrative and financial procedures at the donor level require a large amount of paperwork and take a long time.

"[The administrative and financial procedures] cause the delay in all activities, and we do not know if we will be funded at the end of the day." –DLP representative

Challenges with Support and Strategies for High-Risk Populations

Interviewees said that there are few strategies or activities implemented for high-risk populations that differ from the national malaria case management protocol. According to the Malaria NSP and as detailed by respondents, high-risk populations include pregnant women, CU5, seasonal workers, indigenous minorities, homeless people, prison populations, people living in orphanages or hospitals, people with poor access to health services, and people living in mining areas. Though the Malaria NSP includes LLIN distribution to high-risk populations, due to the lack of resources, distribution often only occurs for pregnant women who come for antenatal care and to CU5 who come for consultation at facilities. Though intermittent preventive treatment of malaria in pregnancy is no longer indicated for pregnant women in elimination districts, interviewees stated that elimination districts report stock-outs of sulfadoxine-pyrimethamine.

Challenges Related to Geographic Factors

Challenges related to security are illustrated by the zone bordering Bongolava and Ambatomainty districts, as surges in malaria cases are frequent in this area due to immigration and its shared border with Manja district, in Menabe region, where danger alerts have been issued for the 2 preceding years. Participants noted that the use of LLINs in these areas is impossible because they alert bandits to places where people have set up camp:

"The population sleeps in the forests to escape from bandits. The outlaws spot people from the mosquito nets, which are light-colored, especially during full moon. And even at home, they cannot escape in case of alarm if they sleep under LLINs. As a remedy, people have asked to use repellent lotions, for which we have not found resources yet, but it deserves reflection." –Technical partner

Facilities' remoteness from communities and districts is also an issue for reporting and supervision, as well as stocking of malaria care commodities.

"There is a facility that is 150 kilometers away from the district and that can be reached only after 4 hours of canoe and 2 hours of walking. During rainy season, this area becomes completely isolated because the river is dangerous—not because of rising water, but because of the crocodiles that are real-life threats." –District-level manager

Malaria Elimination Planning

Respondents were asked whether an elimination plan exists and, if so, how its components were currently implemented in Madagascar. Respondents noted that a malaria elimination plan did not currently exist in Madagascar.

Epidemic Thresholds

Stakeholders reported that epidemic thresholds are determined according to zones, and when that threshold is met, an alert and response are triggered. According to stakeholders, in elimination areas/districts, the epidemic threshold is calculated with data from at least the 3 previous years. The calculation of the epidemic threshold varied according to each respondent, and those not directly involved in program implementation said they were not sure how to calculate the epidemic threshold. This included technical and financial partners (Population Services International, Central Purchasing Center for Essential Drugs and Medical Equipment of Madagascar, Mahefa Miaraka, and Procurement and Supply Management project). Among the 17 key informant interview respondents, four (24%) replied that they drew a curve issued by the DLP that was displayed at the facility that will determine the threshold. The rest gave different answers, such as "average +2 standard deviations," "average standard deviation of the past 5 years," "average standard deviation of the past 3 years" (at the level of epidemiological surveillance), "doubling of cases during 2 successive weeks," and "doubling of cases during 3 successive weeks."

Respondents varied in their understanding of which level of the health system determines the epidemic threshold: six of the 17 respondents thought the HF should determine the level, three respondents thought the commune, six respondents thought the district, and two respondents thought the region.

The frequency at which the epidemic thresholds are adjusted also varied according to respondents on an annual basis, according to three respondents (17%); monthly, according to one respondent (6%); weekly, according to two respondents (12%); and seasonally, according to one respondent (6%), who added that the threshold should be lowered during the rainy season. The rest (59%) replied that adjustments are not necessary, as they consider that one case of malaria constitutes an epidemic on its own, especially if the case is not imported.

Malaria Epidemic Response

One district-level manager in an elimination district said that in the event of an epidemic, verification of the malaria case is conducted along with active searches for other possible cases:

> "We travel to the field and carry out investigations by asking, 'Where does the person come from, or is he/she a resident of the locality?' And when needed, we conduct IRS as a response. We actively search for contact persons." –District-level manager

Interviewees noted that in the elimination areas, timely case detection according to a monitoring and evaluation plan must also be carried out. Alert sheets are filled out and notifications sent to their supervisors. Interviewees said that in the event of an epidemic, the district will support the supply of drugs and commodities needed without waiting for the request from facility heads. The DLP representative said that a team exists at the district level that otherwise fills other roles and is available to support epidemic response.

> "This plan is adapted to the district level, where there is a team available in case of an outbreak." –DLP

> "If there is a doubling of cases, health workers conduct an investigation at their level. If they cannot solve the problem, they will notify the district, and depending on the severity of the situation, it will go up to the regional level, then to the central level." –Regional-level malaria manager

Elimination Activities

Stakeholders noted that the Malaria NSP defines the activities to be carried out in elimination zones, namely case confirmation using an RDT; treatment (ACT and low-dose primaquine) in case of a positive RDT; focused coverage in response to an epidemic by IRS with insecticide; focused coverage in the household and population at risk with LLINs, weekly epidemiological surveillance, active detection around a case diagnosed with malaria (RDT, microscopy, polymerase chain reaction), and other specific interventions, such as social mobilization; information, education, and communication; and behavior change communication for travelers and migrants. In addition, data collection and reporting should be strengthened along the other activities. One district-level manager provided details on case investigation implemented in her district:

> "If the person is sick at the time he/she arrives, he/she is given treatment. But if he/she had stayed more than a week before getting sick, we consider it as an index case and investigate malaria in the five houses surrounding the patient's house." –District-level manager

> "For the preparation of the response at the district level, we ensure commodities' availability, then we carry out information, education, and communication, and, at the same time, we provide training on case management to the staff." –Regional manager

The region also provides supportive supervision and conducts simulation exercises with local authorities:

> "The instructions to be followed are given by the NSP. The President's Malaria Initiative action plan with community surveillance also needs to be strengthened with the DLP. There is already a curriculum on this topic that has been validated by the MOPH."
> –Representative, implementing partner

According to interviewees, CHVs' contribution to malaria epidemic responses consists of carrying out community-based information, education, and communication on malaria; community-based screening and case management; referring severe cases to facilities; and redeploying their products to facilities according to their stock situation.

Community epidemiological surveillance is still being discussed and is part of the Malaria NSP, but implementation appears to be difficult because of challenges relating to commodity availability among CHVs. One interviewee noted that the availability of commodities in large quantities at the community level would help overcome this obstacle and allow for effective community epidemiological surveillance.

Limitations

In some of the surveyed facilities, none of the CHVs could answer Section E of Tool 5 on stock commodities because either their job was mainly restricted to sensitization and patient referral to facilities in case of fever, or they had not received their startup batch of supplies.[17]

Respondents were asked to recall activities and processes that may have happened weeks or months before the day of data collection; as such, the findings of the study may be subject to recall bias.

Discussion

The objective of this assessment was to evaluate MER at all levels of the Madagascar health system in select districts targeted for elimination, with the aim of informing the development of an elimination strategy and operational plan. Throughout the assessment, HF staff, HPs, CHVs, clinic attendees, and district, regional

---

[17] As explained by malaria control program officials, in 2016, the MOPH decided to withdraw iCCM of childhood illnesses in urban communes because its communities live within 5 kilometers of a facility. As a consequence, they have not received any equipment or products to manage malaria in children in their communities.

and national stakeholders participated actively and provided insightful, practical commentary toward the goal of developing a sound elimination plan. Their participation and the findings of the survey indicate willingness on the part of all of the participants to understand barriers to malaria elimination activities and identify potential solutions.

Correct Case Management

Malaria elimination will only be achieved if each case of disease is detected and correctly treated. The operational capacity of HFs to achieve this will be determined by several factors, including HP capacity to provide high-quality fever and malaria case management and malaria in pregnancy services, commodity availability, availability of functional equipment, presence of malaria guidelines, and high-quality sensitization activities with HF catchment area on timely care seeking for fever. It will also depend on adequate training of and ongoing support for health care workers.

Detecting each case of malaria depends on having a high level of suspicion, even in low-transmission settings. As such, the NMCP recommends screening all patients for febrile illness and testing all fever cases for malaria. This assessment revealed that fever was spontaneously reported by patients or elicited by the HP in only 68% of observations, and patient temperature was taken in only 65% of them. Forty-three percent of patients had fever or history of fever, and malaria RDTs were performed for only 43% of these identified fever cases, indicating that up to half of malaria cases could be going undetected and untreated. These untreated cases could contribute to ongoing transmission. Once cases are detected, correct management is critical. Of the five malaria cases detected during this assessment, four (80%) were treated with ACT only, and none received a single dose of primaquine, as is recommended in malaria elimination zones. One of the cases was treated with amoxicillin, which is not indicated for any reason in malaria elimination districts and highlights the need to reinforce correct case management among providers.

Community Case Management

Under the current Malaria NSP, CHVs in remote areas detect and treat malaria among CU5, and they refer older people suspected of malaria to HFs for evaluation. Thus, CHVs are critical to the effort to detect and correctly treat each case of malaria. The national malaria guidelines stipulate that a malaria RDT is conducted for patients with history of fever or current fever, followed by administration of the appropriate antimalarial drug if the RDT is positive. Of the 76% (26/34) of CHVs surveyed who provide care for CU5, 77% (20/26) reported they do not systematically perform malaria RDTs on CU5 whose parents reported the child had a fever at home. This could be due to a lack of RDTs or to a lack of knowledge by CHVs to conduct a malaria RDT even when a patient's fever is no longer apparent by the time the patient is seen by the CHV. Nearly 30% of CHVs responded "no" when asked if a CHV should perform an RDT if a patient had fever at home but no longer has it at the center. During the survey, reasons that CHVs did not perform RDTs in cases of reported fever were not elicited. Key informants from the district, regional, or national levels stated that CHVs may fail to do an RDT and instead provide amoxicillin, suggesting that CHVs may need training in correct malaria case management. Additional evidence of CHV training needs is supported by results indicating that only half of the CHVs received training in malaria prevention and management during the previous 2 years. The reported lack of follow-up by some CHVs (3/26) of patients with malaria diagnosis represents a failure to ensure adherence to treatment.

Case Management in Private Facilities

Detecting and correctly treating each case of malaria will also require private HP engagement. As noted in key information interviews, challenges with private-sector facilities related to incorrect reporting and late or incomplete requests for commodities complicate district-level situational analysis of malaria and febrile illness estimates. Because private-sector HPs do not always attend trainings due to disinterest or fear of losing profits, adequate care may not be delivered in the private sector.

Supporting Correct Case Management: Stock-Outs

Detecting each case of malaria and correctly treating it whether in HFs or by CHVs in the community is dependent on providers and CHVs having working equipment and sufficient diagnostic and treatment tools. For example, primaquine was not available in any of the facilities where the five malaria cases were documented. Additionally, only 94% (33/35) HFs had artesunate-amodiaquine, and 77% had a malaria RDT available, which is below the Malaria NSP's goal of at least 90% of HFs having ACTs and malaria RDTs for patients at all times. Only 13 of 26 CHVs (50%) who reported caring for CU5 had malaria RDTs, and 11 CHVs (42%) had artesunate-amodiaquine malaria treatment. In HFs, drugs for treating severe malaria and pregnant women in their first trimester—quinine tablets and injectable quinine—were available in only 6% and 14% of HFs, respectively. Furthermore, 97% of HFs experienced a stock-out of quinine tablets, and 89% experienced a stock-out of quinine injections. Essential equipment that was lacking included functional thermometers, which were absent in four of the 35 HFs (11%). In three of these facilities, patients spontaneously reported their fever, and if they did not, the HP verbally asked about fever. In one facility, however, the patient did not report fever during the consultation, and the HP did not ask. The lack of functioning thermometer might have contributed to fevers not being systematically assessed.

Malaria commodities can be made available only if the required data are reported to the health district level, and the average monthly consumption of commodities by HFs is calculated to quantify commodity needs at the level of coordination bodies. One obstacle to improving stock management that was noted in this assessment is the timely, comprehensive, and accurate reporting of stock use and requests; however, survey respondents reported limited training of HPs and inadequate time to complete these tasks. Several stakeholders noted that having dedicated personnel at the HF level for commodity management is key to preventing stock-outs of essential supplies and equipment. Interviews with CHVs also revealed a need for training in data collection and antimalarial commodities to prevent stock-outs.

HP Knowledge and Training Needs

Correct detection and treatment of malaria is also dependent on HP knowledge and skills. Malaria knowledge tests administered to HPs revealed that 51% scored above 85%, indicating a need for refresher training and/or supervision. While nearly half (46%) of the HFs had at least one person trained in RDTs or microscopic examination within the previous 2 years, this is likely insufficient, given that all HPs in HFs likely test and treat for malaria and thus require current training on malaria case management. Furthermore, HPs are responsible for training and supervising CHVs in their catchment area, thus lack of HP knowledge can translate to lack of CHV knowledge. Interviews with CHVs also revealed knowledge gaps that will need to be addressed.

According to the MOPH in Madagascar, HPs should receive supportive supervision at least once every 6 months; however, only 66% of HFs reported receiving at least one supervision visit in the previous 6 months. During these visits, laboratory supply management was rarely reviewed. In addition, 31% of the HFs had not received regular technical assistance on malaria control activities, including epidemic thresholds and response to epidemics, which may have resulted in knowledge gaps. Survey participants indicated that regular effective supervision could help ensure that the malaria prevention and treatment protocols detailed in the Malaria NSP are implemented consistently and correctly.

Only half of the CHVs reported receiving advice on immediate actions to be taken in the event of a malaria epidemic, which may be related to limited training of their supervisors. Only half of CHVs reported receiving supervision from their affiliated HF, and only one-quarter of them were visited by the district management team; increasing these supervisory visits could improve febrile illness and malaria case management at the community level.

Health Systems

Health systems challenges complicate malaria case management, including the ability of HPs to deliver high-quality care. These include the heavy workloads for HPs, many of whom are the sole HP in their facility. Stakeholders noted that HPs are expected to conduct several time-consuming tasks in addition to providing patient care, including CHV supervision, reporting for multiple health programs, SBCC, and commodity and equipment management. Other challenges facing HPs include low salaries and poor living and working conditions, which can result in poor motivation. CHVs also expressed workload concerns. For example, a minority reported being able to carry out active surveillance during the period of a disease outbreak in addition to outreach activities. Stakeholders also noted challenges with limited budgets and reliance on donors for support for critical aspects of the supply chain and training/supervision. Some HPs noted structural issues, including lack of space for properly storing commodities and equipment. Additional health systems concerns identified during interviews with stakeholders included need for support for managing HPs who are not meeting minimum expectations, such as those who have unexcused absences or who show up for work inebriated.

SBCC

Malaria elimination will also require the engagement of the population. As districts progress toward elimination and disease rates decline, concern about the disease may also wane. Thus, additional SBCC efforts will be needed to remind and encourage individuals and caretakers to seek prompt care for febrile illness. This assessment revealed that 97% of HFs initiate SBCC activities, but only 11% have printed materials to support their efforts. Increasing the availability of visual aids in HFs to complement verbal messages may improve awareness among patients and facilitate improved care seeking.

Conclusion

To achieve its goal of progressive malaria elimination, Madagascar must assure detecting and correctly treating each case of malaria. This will require motivated, well-trained health care workers; a reliable system to assure adequate stocks of essential supplies and functional equipment; excellent surveillance; effective strategies to encourage people who are ill to seek care promptly; and a health care system that supports these efforts. Many of these challenges are not new, nor are they unique to elimination districts; however, capitalizing on the interest in malaria elimination in targeted districts may allow for designing and testing possible solutions that could be scaled up.

Informing the Malaria Elimination Strategy and Operational Plan

To achieve a successful elimination strategy and plan, the MOPH, NMCP, regions, districts, providers, and communities should consider the following recommendations.

1. Provide refresher training and supportive supervision to facility-level HPs to help ensure access and understanding of the most up-to-date febrile illness and malaria case management protocols. Only 43% of the patients with fever or history of fever received a malaria RDT. Only half of providers scored above 85% on the malaria knowledge test. Only two-thirds of providers had received a supervision visit in the last 6 months.

2. Ensure the availability of essential commodities at the facility and community levels, including functional thermometers, malaria RDTs, and ACTs, among others. Facilities had stock-outs of key commodities and diagnostic tools, with only 77% of facilities having a malaria RDT on the day of the survey. Only 13 of 26 CHVs (50%) who reported caring for CU5 had malaria RDTs, and 11 CHVs (42%) had artesunate-amodiaquine malaria treatment. Nineteen of 34 CHVs (56%) did not have any malaria commodities.

3. Ensure the availability of the most up-to-date malaria guidelines and relevant job aids at the facility level. Most facilities did not have a copy of the most up-to-date malaria case management guidelines.

4. Further investigate why all CHVs are not providing care to CU5. Only 26 of the 34 CHVs surveyed for this assessment said that they provide care for CU5.

5. Review the various aspects of HPs' job and situation, and see if there are opportunities for improving workload and compensation. Improving conditions may help improve the ability of the HP to provide high-quality malaria care. Stakeholder interviews revealed challenges facing HPs, including workloads, low salaries, and poor living situations.

6. Provide refresher training and supportive supervision to CHVs to help ensure access and understanding of the most up-to-date febrile illness and malaria case management protocols. Nearly 30% of CHVs responded "no" when asked if a CHV should perform an RDT if a patient had fever at home but no longer has it at the center. Fewer than half (46%) spontaneously said they would provide ACT to a child with a positive RDT.

7. Improve quality control of private facility data. Stakeholder interviews revealed challenges incorrect or late reporting, which led to challenges with district-level situational analyses.

Annex 1. List of study tools

1. **Checklist Health Facility (HF) Manager, Tool 1:** The study team will administer a questionnaire and complete a checklist with either the facility manager or the provider in-charge to assess the availability of key commodities and personnel for preventing, diagnosing, and treating malaria, including prevention and treatment of malaria in pregnancy.

2. **HF Provider Survey, Tool 2:** A structured survey will be conducted with sampled health providers (HPs) at sampled facilities. The survey will include questions to better understand HP and HF readiness to offer malaria prevention services, febrile case management services, and malaria case management services. In elimination districts, several questions will be added to explore HP and HF readiness to implement elimination plans.

3. **Observation Guide for HPs, Tool 3:** There will be at least one doctor on every survey team. That person will conduct observations of one consenting HP during outpatient consultations focusing on febrile illness case management and malaria prevention/case management.

4. **Knowledge Test Questionnaire for HPs, Tool 4:** A test to document malaria prevention and case management knowledge will be administered to all consenting HPs at the HF, including doctors, nurses, and midwives.

5. **Community Health Volunteer (CHV) Questionnaire**, **Tool 5:** A questionnaire will be administered to CHVs to assess their awareness of malaria prevention, case management, and readiness to undertake elimination activities, including adherence to current guidelines, timely surveillance and reporting, appropriate referrals, and reliable availability of malaria commodities.

6. **Stakeholder Interview Guide, Tool 6:** A key informant interview guide will be used to discuss issues of health system readiness to implement malaria elimination phase activities.

Annex 2. Malaria transmission zone map

These ecozones are based off of the *Plasmodium falciparum* map (regional figures correspond to the mean district-level *Plasmodium falciparum* value [2010–2015]) and the min–max *Plasmodium falciparum* values from the districts in each ecozone.
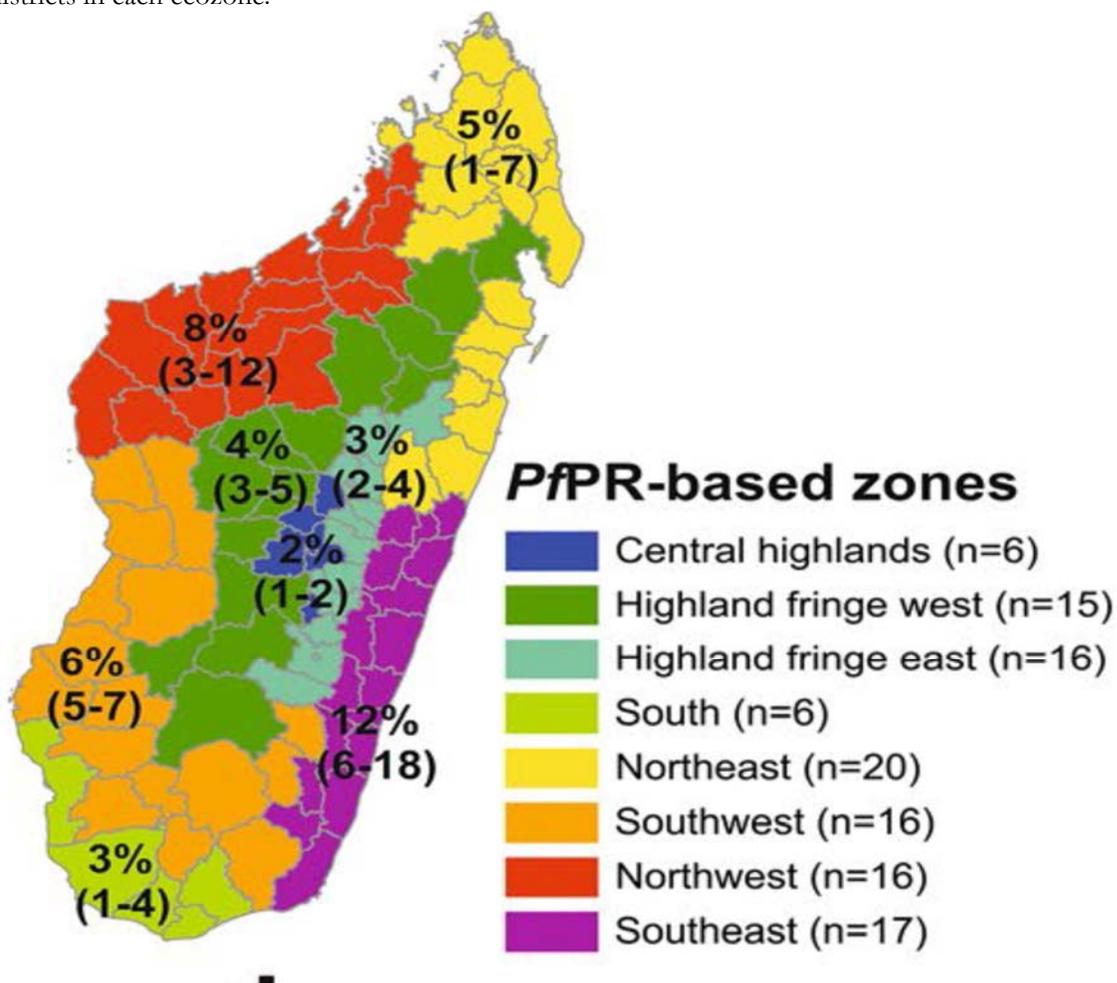
Reference: Howes et al. Contemporary epidemiological overview of malaria in Madagascar: operational utility of reported routine case data for malaria control planning. Malaria Journal. 2016. 15:502.