

Universal Diagnosis and Treatment to Improve Maternal and Child Health

End of Project Report
October 2012–December 2017

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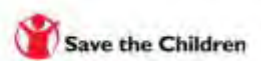
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Acronyms

ACT	artemisinin-based combination therapy
aMDRT	advanced malaria diagnostics refresher training
ASLM	African Society for Laboratory Medicine
ASTMH	American Society for Tropical Medicine and Hygiene
BOL	Binomial Optimus Limited, Nigeria
CCMRT	clinical case management refresher training
CDC	United States' Centers for Disease Control
CHO	community health officer
CHSL	community health service liaisons (Burma)
CHSP	community health service provider (Burma)
CHSU	community health services unit (Malawi)
CHW	community health worker
CLU	Clinical Laboratory Unit, Ghana Health Service
CME	continuing medical education
CNM	National Center for Parasitology, Entomology and Malaria Control, Cambodia
CSCom	community health centers (<i>centres de santé communautaires</i>) (Mali)
CSRef	Reference health center (<i>centres de santé de référence</i>) (Mali)
DHIS2	district health information system
DHO	district health office (Malawi)
DHMT	district health management team
DLP	Malaria control division (<i>Département de Lutte contre le Paludisme</i>) (Madagascar)
DPS	provincial division of health (<i>Département Provincial de Santé</i> in DRC, or <i>Direcção Provincial de Saúde</i> in Mozambique)
DRC	Democratic Republic of the Congo
ECAMM	WHO's external competency assessment for malaria microscopy
EDS	Electronic Data System
EPHI	Ethiopian Public Health Institute
EQA	external quality assurance
ESMPIN	Expanded Social Marketing Project in Nigeria
FBO	faith-based organization
FRHP	Focus Region Health Project, Ghana
HIO	health information officer (Ghana)
HIV	human immunodeficiency virus
HMIS	health information management system
HMTC	hospital medicines and therapeutics committee
HNQIS	health network quality information system
HSA	health surveillance assistants (Malawi)
HZMT	health zone management team (DRC)
iCCM	integrated community case management

ICD	Institutional Care Division, Ghana Health Service
IHPB	Integrated Health Project in Burundi
IMaD	Improving Malaria Diagnostics project
IMCI	integrated management of childhood illness
INRB	National Institute of Biomedical Research (<i>Institut National de Recherches Biomédicales</i>) (DRC)
INRSP	National Institute of Public Health Research (<i>Institut National de Recherche en Santé Publique</i>) (Mali)
INS	National Institute of Health (<i>Instituto Nacional de Saude</i>) (Mozambique)
INSP	National Institute for Public Health (<i>Institute National de Santé Public</i>) (Guinea)
IPM	Madagascar Pasteur Institute (<i>Institut Pasteur Madagascar</i>)
IQA	internal quality assurance
KHRC	Kintampo Health and Research Centre (Ghana)
L1/L2/L3	Level (WHO ECAMM scoring)
LGA	local government areas (Nigeria)
LLW	lessons learned workshop
M&E	monitoring and evaluation
MCDI	Medical Care Development International
MCMC	malaria case management committee
MCS	malaria case surveillance
MCSP	Maternal and Child Health Program
MDRT	malaria diagnostic refresher training
MEAF	Malaria Elimination and Action Framework for Cambodia 2016-2020
MERG	Roll Back Malaria Monitoring and Evaluation Reference Group
MOH	Ministry of Health
MOHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children (Tanzania)
MOHP	Ministry of Health and Prevention (Senegal)
MRL	malaria reference laboratory
MSDQI	Malaria Service Delivery Quality Improvement (Tanzania)
NAMS	National archive of malaria slides
NAFDAC	National Agency for Food and Drug Administration and Control (Nigeria)
NAPPMED	Nigeria Association of Patent and Proprietary Medicine Dealers
NCAMM	national competency assessment of malaria microscopy
NGO	nongovernmental organization
NIMR	National Institute of Medical Research, Tanzania
NMCP	national malaria control program
NMEP	national malaria elimination program
NMRL	national malaria reference laboratory
ONSE	Organized Network for Services for Everyone's Health project (Malawi)
OTSS	outreach training and supportive supervision
PAMO	Program for Advancement of Malaria Outcomes (Zambia)
PCG	Central Pharmacy of Guinea (<i>Pharmacie Centrale de Guinée</i>) (Guinea)

PCN	Pharmacy Council of Nigeria
PCR	polymerase chain reaction
PDSS	Health System Strengthening for Better Maternal and Child Health project (DRC)
PMI	United States President's Malaria Initiative
PMP	performance monitoring plan
PMW	plantation malaria worker (Cambodia)
PNCM	national malaria control program (<i>Programa Nacional de Controlo da Malária</i>) (Mozambique)
PNLMD	National Program for the Control of Diarrheal Diseases (<i>Programme Nationale de Lutte Contre Maladies Diarrhéées</i>) (DRC)
PNLP	national malaria control program (<i>programme national de lutte contre le paludisme</i>) (DRC, Mali)
PPM	Public-private mix (Cambodia)
PPME	Policy Planning Monitoring and Evaluation Division, Ghana Health Service
PPMV	proprietary patent medicine vendors
PSI	Population Services International
PSK	Population Services Khmer (Cambodia)
PT	proficiency testing
PY	project year
QA	quality assurance
RBM	Roll Back Malaria partnership
RDT	Rapid diagnostic test
RHMT	regional health management team
RITM	Research Institute of Tropical Medicine, Manila
RMFP	regional malaria focal person
SFH	Society for Family Health (Nigeria)
SHSA	senior health surveillance assistants (Malawi)
SLAP	Parasitology Control Section, Senegal (<i>Section de Lutte Anti-Parasitaire</i>)
SLIPTA	WHO's Stepwise Laboratory Improvement Process toward Accreditation
SOP	standard operating procedures
SQH	Sun Quality Health network (Burma)
SSDI	Support for Service Delivery Integration project (Malawi)
SSGI	High Impact Health Service, Malawi (<i>Service de Santé à Grand Impact</i>)
TOT	training-of-trainers
UCAD	Cheikh Anta Diop University, Senegal (<i>Université Cheikh Anta Diop</i>)
USAID	United States Agency for International Development
VHC	village health committee (Malawi)
WHO	World Health Organization
ZAMEP	Zanzibar Malaria Elimination Program
ZISSP	Zambia Integrated Systems Strengthening Program

Executive Summary

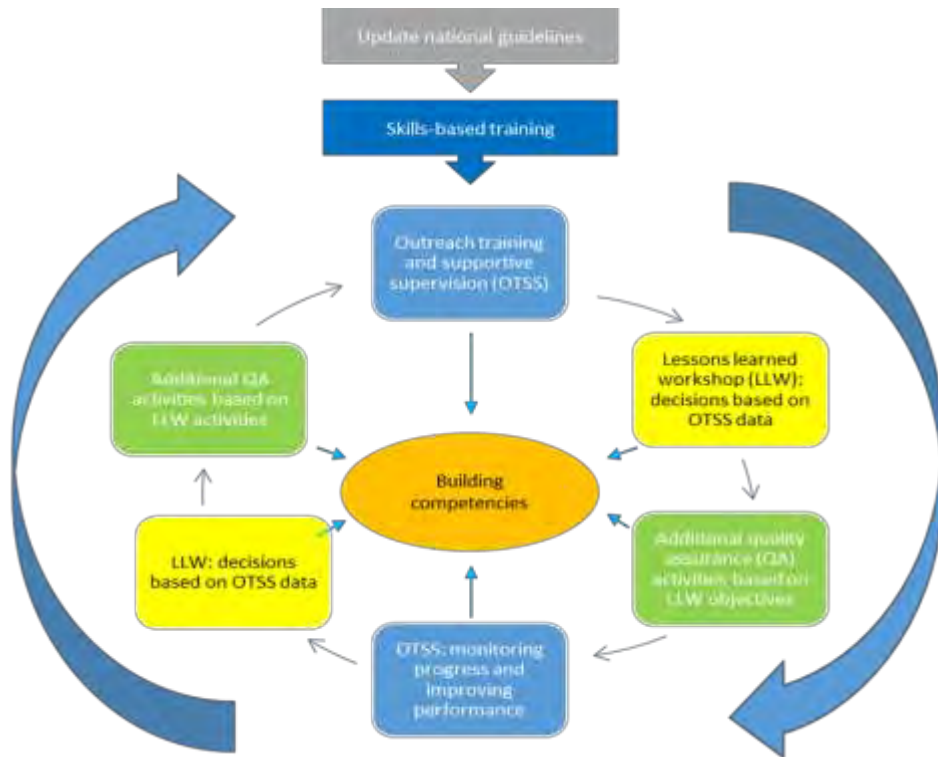
MalariaCare supported the United States President’s Malaria Initiative (PMI) in its global effort to reduce malaria morbidity and mortality. MalariaCare, a five-year partnership led by PATH and funded by the United States Agency for International Development (USAID) through PMI, supported national malaria programs to strengthen and scale up high-quality case management services, both diagnosis and treatment, for malaria and other febrile illnesses. From October 2012 through December 2017, the project worked in a total of 17 countries, comprising of 16 PMI focus countries and Burundi, to reduce the burden of serious disease and promote healthy communities. Partners with PATH were Save the Children, Medical Care Development International (MCDI), and Population Services International (PSI).

MalariaCare’s strategy was built around three key malaria case management quality assurance (QA) intervention areas:

1. Improving the quality of malaria diagnosis using microscopy and rapid diagnostic tests (RDTs).
2. Building competency in quality clinical case management.
3. Strengthening the quality of data collection and use for decision-making.

The project’s QA components included training, supportive supervision, development and revision of tools and job aids, and working with health management teams to institute lessons learned across the health system and improve the competency of clinical, laboratory, and pharmacy staff at health facilities in diagnosing and treating malaria (see Figure 1 below). MalariaCare placed emphasis on strengthening capacity for constructive mentoring, with continuous feedback to supervisors and providers based on both observation and objective data, and on encouraging collaboration between clinical and laboratory staff.

Figure 1. MalariaCare’s quality assurance approach



MalariaCare’s QA strategy represented a series of activities that empowered local managers and providers to use information to improve case management. Supervisors, trained by MalariaCare, reinforced providers’ skills during outreach training and supportive supervision (OTSS). They collected data on facility readiness and provider diagnostic and clinical competency to deliver quality case management, and they conducted observations to identify strengths and weaknesses. Supervisors then discussed the data and their observations with facility staff, and they developed action plans. In between OTSS visits, lessons learned workshops (LLWs) performed a similar function, but they focused on groups of facilities in an administrative area. These groups developed realistic action plans for implementation at an administrative level, with input from the facilities, based on OTSS data and the shared experiences from supervisors. Agreed-upon action plans included specific interventions supported directly by MalariaCare but also those that could be implemented locally and independently, at relatively low cost, by facility managers and administrative health management teams, thus demonstrating that change is possible without the need for external support.

Although MalariaCare’s focus was on strengthening case management for febrile illnesses at the facility level, the project supported capacity-building at all administrative levels to ensure effective policy making (national) and management and technical oversight (national, provincial/regional, and district). In addition, MalariaCare also supported community-level febrile illness case management services, delivered by both the public and private sectors.

Through all its interventions, MalariaCare applied the principles of test-based treatment to more specifically target therapies, thus leading to better treatment outcomes and reduced risk for increasing antimalarial drug resistance. This is in line with the World Health Organization (WHO) call for testing prior to treatment. The widespread

availability of an affordable and reliable point-of-care test, the malaria RDT, facilitated the implementation of this strategy, and the project significantly contributed to the scaling up of the approach across the malaria-endemic world in Africa and Southeast Asia.

This end-of-project report presents the overall successes and challenges faced by the project during its five years of implementation. MalariaCare’s semiannual and annual reports presented achievements in detail specifically for the 6- or 12-month period covered by those reports. No annual report was submitted for project year (PY) 5, and this end-of-project report is inclusive of PY5 achievements. The report is presented in four major sections:

1. Global Accomplishments Toward Achieving the Objectives
2. Core Achievements
3. Country Achievements
4. Appendices—including a financial report and performance monitoring plan

The Global Accomplishments section describes global program results for strategies applied across a number of countries. Results are organized under the four objectives of the Cooperative Agreement.

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

Activities were designed to improve the overall performance of malaria microscopy, with a focus on reference-level facilities. Microscopy, when performed well, can diagnose an infection at low parasite density, determine the infective *Plasmodium* species, and in some cases determine if other types of infection or blood abnormalities are affecting the patient. It also allows for careful monitoring of patient response to therapy, by allowing serial visual analysis of blood smears once treatment has started. This is important for patients with severe malaria and for monitoring malaria parasite drug resistance.

Recognizing that improving and maintaining these skills require substantial hands-on practice, MalariaCare designed a multilayered training program to develop adequate skills among cadres of technical trainers and supported them to conduct on-site mentoring through OTSS at the facility level. Experienced microscopists at provincial/regional and district levels were selected to receive five-day malaria diagnostic refresher training (MDRT), combined with three-day supervisor skills training. The best performers among the trainees were selected to receive further training, aiming to establish cadres of national and regional-level trainers.

Those meeting the highest standards (A and B competency levels, which are similar but not equivalent to the Level 1 [L1] and Level 2 [L2] WHO accreditation levels) were eligible to attend the WHO External Competency Assessment for Malaria Microscopy (ECAMM) course. ECAMM attendees who obtained the top two score levels (L1 and L2) were accredited as international microscopy experts, and they were deemed capable to act as expert trainers in their country, or beyond. The results for MDRT, pre-ECAMM preparation, and ECAMM showed significant improvement over time, as described in detail in the report. During the last year of the project, MalariaCare introduced two other promising interventions that could extend the reach of microscopy skills development efforts: 1) using standardized proficiency testing (PT) slide panels at the facility level, and 2) a 40-hour, self-directed “virtual microscopy” training course. Both interventions offer learning opportunities to each individual microscopist and represent a continuing education program that has been missing in most health systems in the developing world.

Key numbers:

- 1,778 microscopists received skills-based training through MDRT.
- The proportion of facilities meeting a microscopy performance minimum standard improved from 88 to 94 percent.
- 52 expert microscopists obtained WHO L1 or L2 ECAMM accreditation.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

Through country-level support from global programs like PMI and the Global Fund, malaria RDTs have become the first-line test of choice at the peripheral level in most malaria-endemic countries. These tests, while easy to use in principle, still pose challenges in performance on testing procedures. Given that most patients with fever are likely to have an RDT test done at peripheral level, MalariaCare leveraged the training and mentoring methodologies developed for microscopy toward RDT performance improvement interventions. The project used a “training-of-trainers” (TOT) model to flow down best practices to individuals within health facilities, whether clinicians, laboratorians, or other staff involved in performing the test. RDT testing performance quality showed steady improvements at the facility level during the project, with QA training pre-test scores improving from an average of 64 percent to a post-test average of 86 percent, and 97 percent of all facilities meeting a minimum standard of performance at their last OTSS visit.

The project also supported RDT skills training at the community level, using workshops and mentorship for community health workers (CHWs) performing integrated community case management (iCCM) in some countries. This work helped develop 71 new iCCM sites in the Democratic Republic of the Congo (DRC) and link community care to the closest public health facility for ongoing mentoring support. In Malawi, MalariaCare supported 460 individual iCCM sites—helping to complete an expansion of community-level work throughout the country.

MalariaCare also trained private-sector health workers (private clinicians, drug shop workers, and plantation health workers). In Burma, the team trained local physicians operating through franchised health networks and provided ongoing mentoring support to them. In Cambodia, the project trained plantation health workers and CHWs to perform RDT testing and treatment in rural and at-risk populations—supporting efforts to reduce the prevalence of artemisinin resistance and eliminate malaria. In Nigeria, the team tested training protocols to strengthen the capacity of proprietary patent medicine vendors to provide point-of-care testing in their communities. Each of these interventions contributed private-sector caseload data, which improved overall understanding of the malaria burden in these regions.

The microscopy and RDT QA interventions not only improved the quality of test procedures, but they also led to measurable improvement in the proportion of health facilities that used tests prior to treatment. The number of health facilities that had 90 percent adherence to testing before treatment improved from 68 percent at first visit to 85 percent at the most recent OTSS visit—representing significant improvements for most regions evaluated.

Key numbers:

- RDT QA training performed for 8,607 individual health care workers.
- RDT skills strengthened during OTSS visits, increasing the proportion of facilities meeting the minimum standard from 90 to 97 percent.
- Strengthened case management at the community level in 531 communities in the DRC and Malawi.
- The proportion of facilities meeting the target of 90 percent for testing prior to treatment increased from 68 to 85 percent.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

At the start of the project, MalariaCare’s work heavily focused on strengthening diagnostic capacity in the countries where it operated. This was mostly due to the transition from its predecessor, the Improving Malaria Diagnostics (IMaD) project, which solely focused on the diagnostic component of case management. The project team soon realized the importance of improving the quality of clinical treatment and that significant gaps existed in this performance area. Despite the availability of quality test results from better trained microscopists or from RDTs, clinicians often treated patients presumptively—using a constellation of symptoms traditionally ascribed to malaria but also frequently found in association with a wide variety of other febrile illnesses.

MalariaCare worked with ministries of health to update national treatment guidelines and clinical algorithms where necessary, and then trained clinical supervisors at provincial and district level to prepare them for clinically focused mentoring of outpatient clinicians. The primary training tool was a three-day clinical case management refresher training (CCMRT) for active clinicians. Trained clinical supervisors effectively transmitted skills and knowledge down to health facility staff through OTSS using focused observation and mentorship. A key measure of success was the significant improvement made in all countries in improving adherence to test results—marking a dramatic shift toward the desired “test and treat” approach recommended by WHO. The project also sought to improve common clinical gaps—including rapid triage of severely ill patients, improving history-taking and focused physical examination skills, and providing improved feedback to the patient and caregiver. In Malawi, Kenya, and Ghana, the project worked to reduce mortality through training and/or on-site health facility OTSS on severe malaria—seeking to reduce mortality by improving inpatient management for the critically ill and including those with severe anemia and needing blood transfusion.

Key numbers:

- Technical assistance to national malaria control programs (NMCPs) to review and update national case management guidelines in four countries.
- Clinical skills-based training on outpatient case management for 16,680 clinical providers.
- Clinical skills strengthened during OTSS visits, increasing the proportion of facilities meeting the minimum standard from 68 to 90 percent.
- Increased the proportion of facilities meeting the overall performance standard for adherence to a negative test result from 70 to 87 percent.

- Increased the proportion of facilities meeting the overall performance standard for adherence to a positive test result from 86 to 91 percent.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

MalariaCare worked with national and regional reference laboratories to improve their capacity to detect malaria and other infectious diseases. Most of these facilities receive sporadic funding from projects and major donor programs, but few receive support to continue ongoing QA programming within their countries. The project worked with technical working groups to update national diagnostics guidelines and training materials and develop malaria diagnostics programming QA manuals. These materials provided the practical implementation guidance for building and sustaining a high-quality laboratory system. To facilitate training and on-site mentoring, the team also worked with reference laboratories to develop national archives of malaria slides (NAMS) in several countries and smaller PT panels in others—standardized slide sets with known composition that are intended for ongoing training of microscopists and on-site PT. The team also trained many of the NMCPs on the use of these slide sets for on-site performance evaluation and learning. Lastly, MalariaCare worked directly with some reference laboratories to perform capacity assessments and make equipment (e.g., single and multi-head microscope purchases) and infrastructural improvements to facilitate their ongoing reference and training parasitology functions.

Key numbers:

- Technical assistance to NMCPs to review and update national diagnostics QA guidelines in nine countries.
- Supported development of PT panels in seven countries and development of a NAMS in five countries.

Cross-cutting accomplishments

Over the course of the project, MalariaCare became increasingly aware that the quality of supervisor skills needed focused attention in order to ensure that learning during OTSS had the desired impact. MalariaCare worked with national programs on criteria to assist them with the selection of candidates with the prerequisites to develop the necessary technical and mentoring skills. Selected candidates then underwent a skills training to ensure that they were able to observe health worker performance, provide quality feedback, and work together to build action plans designed for incremental problem-solving. To better monitor performance, MalariaCare began using annual performance assessments.

In order to improve the project's capacity to monitor progress and trends at the health facility level due to OTSS, MalariaCare moved toward use of an electronic data system (EDS) during PY3. This allowed for the on-site collection of infrastructural and case management performance data onto a tablet-based checklist. The checklist, a tool designed with different functional modules (laboratory, outpatient clinic, pharmacy records and stock, and inpatient department), allowed for the monitoring of six key performance indicators. The data collected during each facility visit was uploaded to an internet district health information system (DHIS2) server and used to create facility- and regional-level performance dashboards. The EDS helped the project, and the countries it supported, to access performance data of much higher quality than had previously been possible, with data completeness of five of MalariaCare's six indicators improving to greater than 90 percent by the end of the project. This led to

significantly better and timelier monitoring of specific problem areas by facilities, districts, the national malaria program, and MalariaCare. Even though the system was relatively new, MalariaCare noted early adoption by health system administrators to make adjustments based on collected data. The team continued to work on expanding the use of EDS, and on the use of data for decision-making, as a priority area until the end of the project.

In order to preserve performance gains and help expand the QA system approach, MalariaCare spent much of PY5 working with countries on ways to independently take over full or partial implementation of components of the case management QA system. MalariaCare assisted five NMCPs with inclusion of MalariaCare-developed QA activities in Global Fund grant applications. In addition, the team also worked with PMI and some country implementing partners to incorporate OTSS into work plans—effectively disseminating the system throughout key implementation areas. The team worked throughout the year with NMCPs that planned to carry on active QA programming with OTSS after the project end date—and in most of these countries worked to transfer capacity to use, and to expand the use of, EDS (see Figure 6 below).

Key numbers:

- Trained 3,244 OTSS supervisors during project.
- 11,396 OTSS visits performed with the use of EDS.
- Five of nine countries that implemented OTSS are currently using EDS to implement OTSS independent of MalariaCare support.

Core achievements

The MalariaCare headquarters team was organized into five functional structural units: finance and administration, field operations, monitoring and evaluation, advocacy and communications, and technical support. Accomplishments of each of these units are summarized in the Core Achievements section under the following headings:

- Project operations
- Monitoring and evaluation
- Advocacy and communications
- Technical leadership

As key core highlights, MalariaCare accomplished the following:

Project operations

- Implemented activities in 17 countries, and was active for three years or more in 14.
- Conducted 14 partner advisory group meetings and four annual planning retreats for US and global staff, and carried out two close-out meetings with PMI and key international stakeholders.

Monitoring and evaluation

- Developed and implemented a six-indicator scoring system for monitoring case management performance at the health facility level that measured progress in the laboratory and outpatient departments.
- Linked on-site data collection tools (EDS) with the internet-based DHIS2 system for remote monitoring of health facility progress.
- Developed additional EDS modules for severe malaria (clinical and laboratory), malaria in pregnancy, logistics and supply chain management, and data QA.

Advocacy and communications

- Implemented seven webinars to disseminate lessons learned by MalariaCare and other implementers of case management improvement activities to the global malaria community.
- Created a website—<https://malariacare.org/resources/toolkit/>—with 28 key tools and documents intended for use by global implementers of malaria case management activities.

Technical leadership

- Participated in Roll Back Malaria (RBM) and WHO working groups—including the RBM Monitoring and Evaluation Reference Group (MERG), RBM Case Management Working Group, RBM Communications Community of Practice, and several WHO technical consultations on fever management and improving malaria diagnostics use.
- Presented 21 posters, four oral presentations, and one two-hour symposium on MalariaCare work at international conferences, including the American Society of Tropical Medicine and Hygiene (ASTMH) annual meeting and African Society for Laboratory Medicine (ASLM) conference.
- Prepared six peer-reviewed articles (publication anticipated in 2018) on implementation work carried out across the five project years.

Individual country achievements

The report presents a comprehensive review of country-level activities implemented, progress made, and suggested next steps for improvement of case management in the 17 countries where MalariaCare worked. Information on the following key categories is presented:

- Key accomplishments by project objective.
- Progress made on key MalariaCare indicators.
 - Trend analysis (improvements from baseline over multiple OTSS visits).
 - Most recent visit (current health facility status).
- Challenges/solutions.
- Additional recommendations.

Some key country-level highlights include:

- Burma/Cambodia: Progress made in implementing private-sector mentoring and data management programs.
- Burundi: Implementation of a community-level rapid response program for testing and treating during a malaria epidemic.
- DRC/Ghana/Ethiopia/Malawi/Zambia: Details on implementation of a NAMS.
- Ghana/Kenya/Mali/Malawi/Mozambique/Tanzania: Implementation of laboratory and outpatient management OTSS programs at scale, covering major malaria endemic regions.
- Ghana/Kenya/Malawi: Training and/or OTSS on management of severe malaria.
- DRC/Malawi: Description of community-level case management interventions.
- Nigeria: Operational research project piloting private-sector drug shop case management.
- Tanzania/Zambia: Artemisinin-based combination therapy (ACT) therapeutic efficacy studies.
- Ethiopia/DRC/Senegal: A focus on national reference laboratory strengthening.
- Senegal: In-depth national reference laboratory assessment for parasitological services.
- Kenya: Implementation of hospital management committees and/or continuing medical education (CME) programs.

Summary and next steps

The MalariaCare project has facilitated a major shift in the quality of malaria case management practices, where increasingly each patient is reliably tested and treated based on test results. Many of the problems anticipated during the start of implementation—provider mistrust in microscopy and RDT results, the indiscriminate use of medications (ACTs, antibiotics, and other antimalarials) using clinical symptoms, and a lack of focus on positive clinical outcomes and patient/caregiver satisfaction—have seen dramatic improvements.

Work done under MalariaCare to improve health facility performance data and data management has allowed health system managers to better understand and plan QA measures, and it has allowed individual health facilities to determine which steps in their case management system need strengthening. The data collected during project implementation show steady improvements in all indicator categories and provide a baseline for follow-on work by subsequent projects.

In order to solidify the gains made and facilitate further improvements, MalariaCare would recommend that, based on specific context, national and international programs consider the following: emphasize preservice training; support training of core groups of microscopy expert trainers; reserve microscopy for reference-level testing; continue to link QA improvement between the laboratory, clinical, and community services; and expand the use of a quality electronic data system. In addition, to continue reducing the overall burden of malaria morbidity and mortality, the project recommends increasing QA measures for community interventions, for malaria in pregnancy and for improving rapid triage and the management of severe malaria.

Introduction

MalariaCare was a partnership between PATH, Medical Care Development International (MCDI), Population Services International (PSI), and Save the Children. Each partner has extensive experience in designing and implementing malaria control programs in high-burden countries. The MalariaCare team offers comprehensive technical support to United States Agency for International Development (USAID) Missions and national governments to expand high-quality diagnosis and treatment for malaria and other febrile illnesses. Services include capacity-building through technical assistance, implementation support, training, policy development, and monitoring and evaluation (M&E). The partnership also provides global leadership to advance worldwide malaria control efforts by identifying and sharing innovations and best practices in malaria diagnosis and treatment.

MalariaCare works to achieve the following objectives:

- The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.
- Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.
- Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.
- Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

This final report describes accomplishments toward achieving MalariaCare’s objectives, intermediate results, and milestones during project years (PY) one through five, covering the period from October 1, 2012 through December 31, 2017. It also discusses challenges faced by the MalariaCare team and recommendations for future interventions. The report is organized by global core and country achievements. MalariaCare’s financial report is presented as Appendix A. Appendix B contains the project’s performance monitoring plans (PMPs), which present progress toward reaching specific targets in each of the countries where the project was active. Appendix C includes the MalariaCare environmental mitigation and monitoring report for PY5, and Appendix D presents the documents developed with the financial and/or technical support of MalariaCare.

The global accomplishments section describes progress toward reaching each of the project’s four objectives globally. The core achievements section describes progress toward reaching the project’s core work plan activities. Core work plan areas are:

- Project operations
- M&E
- Advocacy and communications
- Technical leadership

The section on country achievements summarizes MalariaCare’s activities and progress toward improving diagnosis and treatment of malaria and other illnesses over the life of the project in the 17 countries listed below and depicted in Figure 2. Accomplishments are described by each project objective.

- Burma
- Burundi
- Cambodia
- Democratic Republic of the Congo (DRC)
- Ethiopia
- Ghana
- Guinea
- Kenya
- Liberia
- Madagascar
- Malawi
- Mali
- Mozambique
- Nigeria
- Senegal
- Tanzania
- Zambia

Figure 2 MalariaCare implementation countries over the life of the project



Global Accomplishments toward Achieving the Objectives

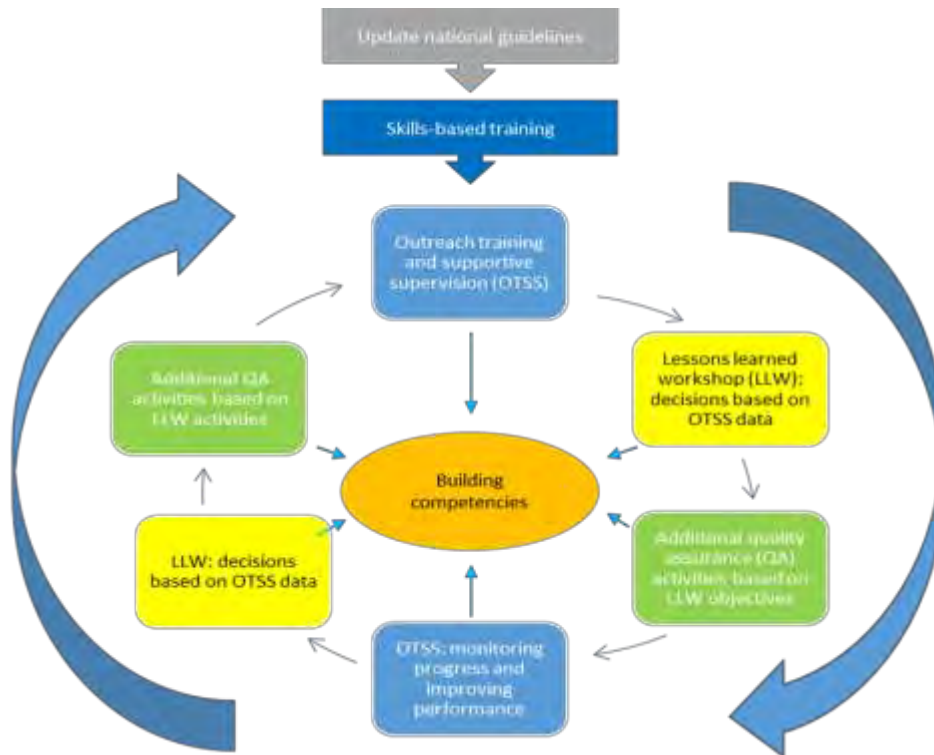
The goal of the MalariaCare project was to support countries to scale up high-quality malaria diagnosis and case management services. The objectives of the project were:

1. The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.
2. Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.
3. Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.
4. Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

To improve the quality of malaria case management, MalariaCare, in collaboration with host governments, developed and implemented a quality assurance (QA) approach, which included development and revision of guidelines, training tools, manuals, and job aids; skills-based training; supportive supervision; and working with

health management teams to institute a feedback mechanism for lessons learned across the health system (see Figure 3 below).

Figure 3. MalariaCare’s quality assurance approach



The QA approach was designed as a series of linked activities that strengthen national systems and empower local managers and providers to continually improve the quality of malaria case management. MalariaCare supported national governments to ensure that policies and guidelines were updated to align with global standards. Guidelines were disseminated during skills-based training for both malaria diagnostics and clinical case management. A portion of the trained laboratory technicians and health workers were then recruited and trained as supervisors, who went on to reinforce diagnostic and case management competencies during outreach training and supportive supervision (OTSS).

During OTSS, supervisors visited health facilities and conducted observations of facility staff performance, using a standardized checklist to identify strengths and weaknesses. To address the weaknesses, their root causes and solutions were discussed through one-on-one mentoring of individual providers and participatory development of action plans with key facility staff. In between OTSS visits, lessons learned workshops (LLWs) brought together supervisors and regional and district managers to review information from OTSS and discuss results and challenges. In order to tackle issues that could not be addressed at the facility level, regional and district action plans were developed, based on data from OTSS results and supervisors’ experiences. Action plans included activities that could be supported directly by MalariaCare, such as intensive mentoring, as well as activities that regions and districts could implement either independently, with support from higher levels, or with assistance from other implementing partners.

Project coverage

MalariaCare’s QA approach centered on strengthening case management competencies at the national, regional, facility, and community levels. Project scopes varied across countries and were developed based on discussions with the national malaria control programs (NMCPs) and United States President’s Malaria Initiative (PMI) country missions, reflecting country-level priorities and available resources. Sub-national interventions targeted PMI-focus areas, which corresponded to the high burden areas of the country, and/or areas not already covered by other interventions.

Over the life of the project, MalariaCare was active in 17 countries. In most countries, activities were conducted at multiple levels, depending on the project’s scope; only Ethiopia and Senegal activities focused solely at the national level. In 16 countries, MalariaCare worked at the national level supporting the development and revision of policies, guidelines, QA manuals and curricula; developing national systems, such as national archives of malaria slides (NAMS) or the electronic data system (EDS) to support the national QA approach; and building capacity of national staff to effectively support the lower levels (Table 1). In 13 countries, project work included activities at a regional level, working closely with regional managers to implement activities and build capacity of the regional staff in overseeing supervisors and facilities. MalariaCare supported service-level implementation, primarily through supportive supervision visits and training, in 12 countries at the facility level, and in 6 countries at the community level.

Table 1. National, regional, facility, and community level support, by country

Country	National	Regional	Facility	Community
Burma	-	X	X	X
Burundi	X	X	X	-
Cambodia	X	-	-	X
DRC	X	X	X	X
Ethiopia	X	-	-	-
Ghana	X	X	X	X
Guinea	X	-	X	-
Kenya	X	X	X	-
Liberia	X	X	-	-
Madagascar	X	X	X	-
Malawi	X	X	X	X
Mali	X	X	X	-
Mozambique	X	X	X	-
Nigeria	X	X	-	X
Senegal	X	-	-	-
Tanzania	X	X	X	-
Zambia	X	X	X	-
Total	16	13	12	6

Global accomplishments of the project toward achieving each objective

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent

Improving accuracy of malaria diagnosis using microscopy requires competent laboratory staff with the necessary skills to prepare, stain, and read slides and produce results that clinicians can trust when diagnosing and treating patients. To achieve this objective, the project conducted skills-based microscopy training, supported select staff to receive internationally recognized accreditation and provided ongoing training and support to bench practitioners through OTSS, evaluated staff using newly established (PT) panels, and piloted a virtual microscopy training course to improve the accuracy of diagnostic testing using microscopy.

Strengthened laboratory staff competency in malaria microscopy through skills-based training

MalariaCare conducted malaria diagnostic refresher training (MDRT) to strengthen the individual skills of bench practitioners to accurately detect malaria parasites, identify species, and estimate parasite density through parasite counting—three important skills needed for accurate microscopy for malaria diagnosis, as a complement to clinical services for quality malaria case management. Slide preparation techniques, biosafety, and waste management were also included in the training. The curriculum for this training was based on World Health Organization (WHO) guidelines^{1,2} and was standardized for use across all intervention countries. During this training, participants were graded on a four-level scale—A through D—which used the same criteria that WHO uses in its international External Competency Assessment for Malaria Microscopy (ECAMM) accreditation course as shown in Table 2. The goal of the MDRT is to refresh malaria microscopy skills for practicing laboratory technicians—particularly those that work at reference level or provide ongoing technical supervision. The training target for this cadre is a Level A or B accreditation, which are considered acceptable performance levels for reference level microscopists, however it should be noted that while the cut-off levels are the same, the strenuousness of evaluation is lower in MDRT. The purpose of evaluation during the MDRT is to measure learning progress through the course; the ECAMM is a stringent skills assessment.

Table 2. MDRT scoring system

WHO level standards	MDRT level standards	Parasite detection	Species identification	Parasite counting
Level 1	Level A	>=90%	>=90%	>=50%
Level 2	Level B	80%–<90%	80%–<90%	40%–<50%
Level 3	Level C	70%–<80%	70%–<80%	30%–<40%
Level 4	Level D	<70%	<70%	<30%

MalariaCare conducted malaria diagnostic refresher training at two levels—basic and advanced. The basic MDRT was intended for refreshment of latent skills in reference laboratory technicians and teaching of new standards for peripheral microscopists. The advanced MDRT (aMDRT) was intended for microscopy supervisors and other practitioners who would go on to become national and regional microscopy trainers. In some cases, the advanced

¹ World Health Organization (WHO). *Basic malaria microscopy – Part I: Learner's guide*. 2nd ed. Geneva: WHO; 2010.
² World Health Organization (WHO). *Malaria microscopy Basic Part II: Tutor's guide*. 2nd ed. Geneva: WHO; 2010.

training was used to identify high performers who would be supported to go on to obtain international-level accreditation through the ECAMM course. To further build training capacities of a successful national core group of accredited microscopists, MalariaCare would often support them to perform future MDRT courses and to provide technical oversight to the OTSS microscopy program.

During MalariaCare, a total of 1,778 individuals were trained. Of these participants, 446 were trained as supervisors. Across countries, average scores in all three competency areas improved from pre- to post-test (Table 3). Performance in parasite detection was highest, with a pre-test average score of 72 percent, rising 15 percentage points to 86 percent at post-test. Performance in species identification and parasite counting were lower with average pre-test scores of 34 percent and 17 percent, respectively. Both scores also improved following training. Participants had an average score of 54 percent on species identification at post-test, a 20-percentage point increase. For parasite counting, scores rose by 23 percentage points to an average post-test score of 41 percent.

Table 3. Malaria diagnostics refresher training (MDRT) and advanced MDRT microscopy practical pre- and post-test result, by country

Country	N	N with scores	Parasite detection			Species ID			Parasite counting		
			Pre-test avg	Post-test avg	Percentage point change	Pre-test avg	Post-test avg	Percentage point change	Pre-test avg	Post-test avg	Percentage point change
Burundi	97	97	74%	93%	19	55%	67%	12	18%	37%	19
DRC	109	101	81%	94%	13	49%	71%	22	16%	55%	39
Ghana	683	674	64%	80%	16	26%	60%	34	16%	47%	31
Guinea	41	34	71%	87%	16	30%	53%	23	11%	56%	45
Kenya	274	274	66%	82%	16	23%	44%	21	8%	33%	25
Liberia	29	29	76%	87%	11	32%	60%	28	13%	63%	50
Madagascar	59	59	76%	90%	14	36%	65%	29	6%	19%	13
Malawi	151	151	74%	87%	13	28%	51%	23	16%	36%	20
Mali	151	148	72%	87%	15	42%	48%	6	10%	22%	12
Mozambique	89	89	72%	83%	11	32%	42%	10	24%	33%	9
Tanzania	62	62	52%	78%	26	18%	39%	21	32%	32%	0
Zambia	33	32	79%	82%	3	35%	47%	12	33%	46%	13
Total	1,778	1,750	72%	86%	14	34%	54%	20	17%	41%	24

Note: Table presents the most recent training for those who received refresher training or were trained in both MDRT and aMDRT. For Ghana, all training participants are reported. Post-test scores are calculated as an average for each day after the first day of the training.

Following the training, 66 percent of MDRT and aMDRT participants scored at Level A or B for parasite detection (Table 4). However, only 13 percent for species identification and 50 percent for parasite counting scored at Level A or B. Skill in species identification remain particularly low. This skill, which is rarely used in settings where the predominant parasite is *Plasmodium falciparum*, has been difficult to develop due to lack of regular practice on the bench. Because of this difficulty, MalariaCare recommends countries consider that investment in the development of these more difficult skills be limited to reference facilities (national, regional,

and district hospitals and teaching institutions) where the use of the skill is essential; and that, at the periphery, the focus be on strengthening parasite detection skills—or on moving to the use of rapid diagnostic tests (RDTs) when parasite detection skills do not meet standards.

Table 4. Percent of all MDRT participants achieving Level A or Level B equivalent scores in microscopy for parasite detection, species ID, and parasite counting, over all five years

Country	N	Parasite detection	Species ID	Parasite counting
Burundi	97	95%	32%	46%
DRC	101	95%	51%	73%
Ghana	674	53%	14%	62%
Guinea	34	76%	21%	74%
Kenya	274	69%	1%	37%
Liberia	29	69%	7%	93%
Madagascar	59	85%	39%	27%
Malawi	151	80%	3%	46%
Mali	148	71%	5%	25%
Mozambique	89	66%	1%	40%
Tanzania	62	48%	2%	39%
Zambia	32	53%	9%	38%
Total	1,750	66%	13%	50%

Note: Post-test scores are calculated as an average for each day after the first day of the training.

Supported international accreditation in malaria microscopy

In order to build a national reference group of WHO-accredited microscopists capable of assessing and developing microscopy skills within each country, MalariaCare sponsored and prepared individuals to take the WHO ECAMM. Individuals were selected on their projected ability to perform as microscopy trainers, with the expectation that those who obtained Level 1 (L1) or Level 2 (L2) would be able to fill this role in their country's QA program. Candidates who were supported to attend the ECAMM prior to 2015—during both MalariaCare's predecessor, the Improving Malaria Diagnostics (IMaD) project, and the initial years of MalariaCare—performed poorly, with only 24 percent (25 of 106 participants) passing at L1 or L2. In response, in 2015 MalariaCare began conducting a preparatory microscopy course prior to participation in the ECAMM. Whenever feasible, additional training resources were provided, which included WHO bench aids for malaria microscopy, a WHO training CD for malaria microscopy, the WHO Basic Malaria Microscopy training manual, and access to standard reference slides for general practice leading up to the WHO ECAMM. During this course, the slides were read as if they were under ECAMM conditions and there was additional time allocated to discussing the difficult aspects of parasite counting and non-*P. falciparum* species identification that was causing difficulties for prior ECAMM attendees. The participants were allowed to move forward to ECAMM if they passed this course at L1 or L2, and they were also encouraged to continue self-study prior to the exam. The course prepared individuals for the ECAMM by simulating testing conditions with timed tests each of the five days and use of similar quality slides. Following the introduction of the preparatory course in 2015, the ECAMM L1/L2 passage rate increased from 24

to 85 percent (46 of the 54 participants) (Figure 4). The improved selection screening and intensive preparatory training were both thought to have contributed to this success rate. MalariaCare recommends that both be utilized when developing capacity among country microscopy trainers.

Figure 4. Percentage of external competency assessment for malaria microscopy (ECAMM) participants attaining each WHO competency level: unscreened participants vs. screened, IMaD and MalariaCare (n=160)

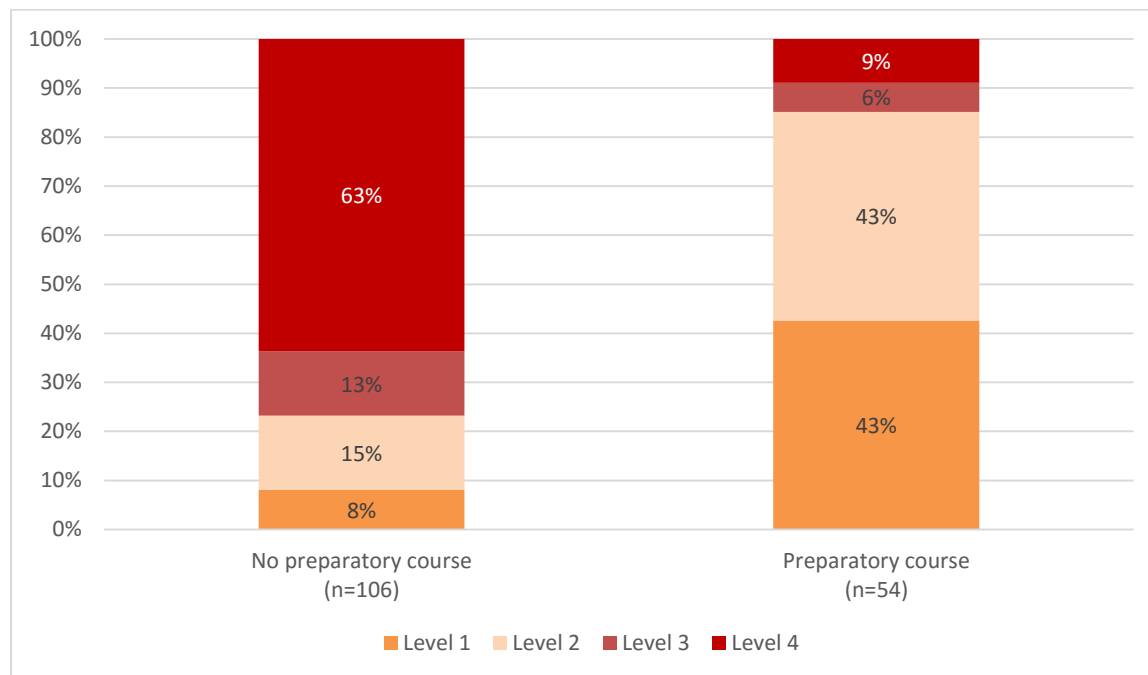


Table 5 below shows ECAMM participation and accreditation rates for each country during the MalariaCare project. Of the 63 participants sponsored by MalariaCare, 83 percent were certified at WHO L1 or L2, leaving a total of 52 WHO-accredited microscopy experts in these ten countries.

Table 5. Number of individuals attending ECAMM with MalariaCare support and number certified as malaria microscopists (attained WHO L1 or L2), by country

Country	Year(s)	Attended ECAMM	WHO-certified
DRC	2016	4	3
Ethiopia	2015	13	13
Ghana	2015	4	3
Kenya	2017	10	8
Liberia	2014	3	0
Madagascar	2016	3	3
Malawi	2014, 2015, 2017	9	8
Mali	2016	4	3
Mozambique	2017	12	10
Zambia	2016	1	1
Total	2014–2017	63	52 (83%)

Strengthened laboratory staff competency in malaria microscopy through on-the-job evaluation and mentoring

Working with the NMCPs and reference laboratories, MalariaCare established OTSS as one form of external quality assurance (EQA) for microscopy. During OTSS, laboratory supervisors assessed providers' competency in correctly preparing, staining, and reading malaria microscopy slides, and they provided mentoring on areas of weakness. Table 6 shows trends in the proportion of health facilities meeting the minimum standard of 75 percent for the eight countries that conducted OTSS with microscopy during MalariaCare implementation.

Table 6. Proportion of health facilities meeting minimum performance target (75 percent) for microscopy, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Most recent visit	Percentage point change
DRC	31	4	94%	84%	-10
Kenya (phase 3, 2 visits)	85	2	80%	95%	15
Kenya (phases 1 & 2, 3 visits)	121	3	85%	94%	9
Madagascar	12	2	100%	100%	0
Malawi (joint OTSS)	35	5	91%	91%	0
Mali	28	3	100%	100%	0
Mozambique	36	4	89%	89%	0
Tanzania	24	2	79%	96%	17
Zambia (provincial)	16	3	94%	88%	-6

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented. For Mali, baseline results were not available for the majority of facilities; instead, results for the second visit are shown.

Overall, performance was high across the facilities assessed in each country, even at the first OTSS visit, with no country having fewer than 79 percent of health facilities meeting the minimum standard target of 75 percent. The two countries with the lowest microscopy performance at baseline improved significantly over the OTSS visits. In four countries with higher scores at baseline, no change in the proportion of facilities meeting the standard was seen over time. However, in the DRC and Zambia, performance declined. It was reported that during the final visits in the DRC many of the facilities saw high staff turnover, resulting in newly assigned providers receiving mentorship for the first time. In Zambia, the decline in performance may in part be due to a change from microscopy to RDTs as primary testing modality, leading to reduced microscopy practice for lab staff.

Strengthened and developed proficiency testing schemes

One of the key interventions that helps to assess the microscopy skills of bench practitioners is the periodic use of PT panels. This intervention helps NMCPs and program managers to identify areas of weakness in performing microscopy at the facility level and to guide implementation of additional support strategies to address these weaknesses. MalariaCare supported governments in five countries (Ghana, Kenya, Madagascar, Mali, and Mozambique) to implement PT schemes.

MalariaCare took two different approaches to PT schemes, assessing either overall health facility performance or individual supervisor capacity. In Ghana, Kenya, and Mozambique, MalariaCare developed government capacity to manage the PT scheme by training NMCPs and national-level laboratory programs on how to prepare the slide sets, using an electronic database, and enter results from participating health facilities. Following this training, MalariaCare supported government staff to implement the PT scheme in 177 facilities across the three countries. In Madagascar and Mali, MalariaCare used PT panels as a supplement to the MDRT course to assess supervisors' capacity, evaluating the core national team of 6 supervisors in Madagascar, and the 11 district-level supervisors in Mali who participated in MDRT in PY4.

While it is still early to determine the impact of the PT panel schemes, facility scores in Kenya and Mozambique indicate that facilities did better at parasite detection than on the other two skills—parasite counting and species identification. Results from Madagascar and Mali were similar, with supervisors performing better on parasite detection compared to parasite counting and species identification. In Mali, supervisors' scores in parasite counting decreased between the MDRT and most recent on-site PT visit, indicating that parasite counting may be a particularly challenging skill to maintain over time.

Supported a virtual microscopy pilot program designed to strengthen microscopy skills

In the quest for solutions to continuously strengthen laboratory staff microscopy skills, MalariaCare partnered with Amref Health Africa and Global Good to pilot a malaria microscopy refresher e-learning course. The course is based on Amref Health Africa's workshop course and incorporates instructional content in five modules: 1) Introduction to malaria; 2) Blood collection, preparation and staining of blood films; 3) Blood film examination; 4) Non-microscopic methods for detecting malaria parasites and diagnosing malaria; and 5) Laboratory Quality Management Systems. A large bank of blood film images could be viewed and navigated on-screen with the virtual microscopy software. Three MalariaCare-supported countries, Ghana, Kenya, and Zambia, participated in the pilot. Across these three countries, 97 lab staff participated in the pilot—41 from Ghana, 48 from Kenya, and 8 from Zambia. This stage of the pilot was to assess whether the content was relevant to all levels of microscopists and the course format was user-friendly.

Overall satisfaction with the course was high, with 97 percent of MalariaCare participants agreeing that the delivery of the course content was effective, and 99 percent agreeing that the course was relevant to their work. In the course evaluation, participants frequently cited the content as a course strength and slide images (quality and clarity) as a weakness. They also reported technical difficulties in installing the software and opening and reviewing the slide sets. When asked what should be added to the course, items most often mentioned were instructional videos, a tally counter, content for different *Plasmodium* species, and an opportunity to receive a certification upon completion of the course. Based on this evaluation, Intellectual Ventures is in the process of making the following changes to the course: the addition of videos for sample preparation; minor additions and edits to course content and navigation, including adding images of *P. knowlesi* and providing a more thorough demonstration of how to accurately quantitate parasites; implementing a final assessment/certification test; and fixing minor software problems that led to occasional errors in loading virtual slides.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria

Increasing testing before treatment requires well-trained health workers who can properly conduct an RDT and are confident in the results. To achieve this objective, the project built RDT confidence and capacity at both the facility- and community-levels through skills-based training and on-site mentoring during supervision visits.

Strengthened provider competency in performing RDTs through skills-based training

To increase provider competency in appropriate techniques of performing an RDT and interpreting results, MalariaCare provided skills-based RDT training, targeting all health workers who performed RDTs. Depending on the country, RDT training was built into clinical case management training, supervisor training, and laboratory staff training. In many countries, MalariaCare also conducted RDT QA training, which focused solely on improving RDT capacity in health facilities. The approach to implementing RDT QA varied across countries. In some countries, clinicians were selected as trainer of trainers on RDT QA, which was then cascaded to other health facility workers. In others, OTSS supervisors conducted this training either as part of the OTSS visit or a stand-alone training. During OTSS, supervisors used the debriefing meeting at the end of the supervision visit to conduct a group refresher training on performing RDTs, targeting all health workers present in the facility on the day of visit.

All those trained as trainers were not only tasked to conduct training but also to provide continuous monitoring of RDT performance in their facility and address any gaps observed. RDT QA training was conducted in both referral and peripheral facilities, but with a larger focus on peripheral facilities where RDTs were the main source of malaria diagnosis. MalariaCare conducted RDT QA training for a total of 8,607 participants. Of the 5,357 participants with pre- and post-test scores available, scores increased an average of 22 percentage points. Table 7 below summarizes training outputs from RDT QA training focused solely on improvement of RDT competency, including participant pre- and post-test scores (where available).

Table 7. Average pre- and post-test scores of RDT QA participants, over all five years

Country	Number trained	Number with pre/post scores	Pre-test average	Post-test average	Percentage point change
DRC	651	329	47%	73%	26
Kenya	608	542	69%	84%	15
Malawi	38	38	81%	90%	9
Mali	520	70	78%	89%	11
Mozambique	2,411	14	79%	88%	9
Tanzania	4,297	4,297	49%	75%	26
Zambia	82	67	27%	96%	69
Total	8,607	5,357	64%	86%	22

Strengthened provider competency in performing RDTs through on-the-job evaluation and mentoring

In addition to focused RDT QA training, health workers received individual mentoring from OTSS supervisors on any gaps in RDT performance identified during OTSS visits. Although RDT performance started high in most

countries, improvements in meeting performance targets were met and sustained due to the uncomplicated nature in using an RDT. Once providers learned the proper procedures, they consistently performed at high levels. As a result of mentoring and training efforts, the quality RDT performance improved as shown in Table 8 below.

Table 8. Proportion of health facilities meeting minimum standard of competency (75 percent) in performing a rapid diagnostic test, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Last visit	Percentage point change
DRC	26	4	85%	100%	15
Ghana	769	3	90%	95%	5
Kenya (phase 3, 2 visits)	264	2	97%	99%	2
Kenya (phases 1 & 2, 3 visits)	322	3	82%	99%	17
Madagascar	18	2	83%	94%	11
Malawi (joint OTSS)	207	5	97%	100%	3
Malawi (clinical OTSS)	104	4	96%	100%	4
Mali	107	4	87%	97%	10
Mozambique (provincial)	53	4	94%	96%	2
Tanzania (2 visits)	179	2	90%	99%	9
Zambia (provincial)	20	3	75%	90%	15
Zambia (sub-district)	29	4	93%	97%	4

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented.

Increased testing before treatment by providers through on-the-job evaluation and mentoring

As part of each OTSS visit, supervisors reviewed a sample of 20 patient records to evaluate whether patients treated with antimalarials received a diagnostic test. Table 9 below shows the trends in testing prior to treatment between the first and last OTSS visits in each country.

Table 9. Proportion of health facilities meeting overall standard of competency (90 percent) in testing prior to treatment, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Last visit	Percentage point change
DRC	31	4	58%	68%	10
Ghana	696	3	80%	86%	6
Kenya (phase 3, 2 visits)	328	2	77%	90%	13
Kenya (phases 1 & 2, 3 visits)	517	3	54%	82%	28
Malawi (joint OTSS)	203	5	54%	74%	20
Malawi (clinical OTSS)	113	4	64%	88%	24

Mali	133	4	64%	94%	30
Mozambique (4 visits)	53	4	79%	92%	13
Tanzania (2 visits)	234	2	65%	86%	21
Zambia (provincial)	15	3	80%	73%	-7
Zambia (sub-district)	29	4	90%	97%	7

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented. Trends for Madagascar are not presented as supervisors found at least five records for patients with positive test results in only two facilities due to low malaria prevalence.

Over the course of the project, most countries saw progress against this indicator, with countries such as Kenya, Malawi, and Tanzania showing the greatest improvement. Only in Zambia was a decline seen, at provincial-level facilities during the third visit, which occurred during the peak season for malaria (February–March). This likely occurred because during the malaria peak season clinicians are more likely to diagnose patients presumptively.

Strengthened quality assurance of integrated community case management

MalariaCare worked with community health sites in the DRC and Malawi to establish a QA framework among remote providers at the community level to ensure adherence to integrated community case management (iCCM) guidelines as well as timely and accurate reporting of case data. MalariaCare supported QA of community health sites, which included integration of routine case data collection, on-site supervision and mentoring of community providers in iCCM, and strengthening of referral channels from community health sites to health facilities. In the DRC, MalariaCare supported the establishment of these sites, which included training of community providers who worked at each site; in Malawi, these sites were pre-established. Table 10 below provides a summary of outputs from MalariaCare community-level support in DRC and Malawi.

Table 10. Summary of iCCM quality assurance support

Outputs	DRC	Malawi	Total
Number of supervisors and mentors trained in iCCM supervision	84	172	256
Number of community providers trained in iCCM	142	-*	142
Number of sites established and/or supported	71	460	531
Number of supervision and mentoring visits conducted	24	2,008	2,032
Number of community oversight/village health committees oriented	124	752	876
Number of provincial/district meetings supported	3	16	19

*In Malawi, health surveillance assistants had already been trained in iCCM prior to MalariaCare's intervention.

In Malawi, where the health management information system (HMIS) is disaggregated down to the level of community health sites, 93 percent of the 132,692 fever cases were tested using an RDT, and 99.7 percent of the 92,545 positive uncomplicated cases were treated with artemether lumefantrine. Out of 505 severe cases, all were referred by the HSAs. However, only 234 caregivers (46 percent) returned the referral slip to the HSA after visiting the health facility to confirm that they had followed through on the referral and received treatment. While

performance for testing and treatment for uncomplicated cases is high, further efforts are needed to ensure that all severe cases are accessing the care they need.

Extended quality assurance of malaria case management to the private sector and the community level

A sizeable proportion of the population with malaria initially seeks help from the private sector (including pharmacies and patent drug dealers) but limited resources are available for these providers to be trained on proper case management. Further, for those countries supporting elimination efforts, surveillance must be extended to the private sector for these efforts to have an impact. MalariaCare worked to strengthen malaria case management capacity and improve data reporting among private sector providers in three countries—Burma, Cambodia, and Nigeria. MalariaCare provided case management training to private providers, which had a focus on correct RDT use, and conducted monitoring and supervision visits.

As part of the QA approach in these countries, providers reported caseload data to allow for monitoring and evaluation of provider adherence to guidelines (Table 11). Across all three countries, more than 99 percent of reported cases were treated according to national guidelines.

Table 11. Summary of caseload data across private-sector providers supported by MalariaCare

Countries	Burma	Cambodia	Nigeria
Time period	Apr 15–Nov 17	Mar 14–Sep 16	Nov 15–Jul 16
Total tested with RDTs	183,128	279,946	18,384
Malaria positivity rate	<1%	17%	85%
Percent of cases treated according to guidelines	99%	100%	101%*

*This was calculated using summary data on the ratio of cases treated with artemisinin-based combination therapies (ACTs) to the number of positive RDTs, which shows providers did provide ACTs to a small proportion of clients who either did not receive an RDT or received a negative RDT result.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test

Achieving appropriate treatment of malaria requires building competency in quality clinical case management compliance to guidelines. At the national level, MalariaCare supported the strengthening of clinical reference and training materials, conducted skills-based training in clinical case management, and/or supported ongoing mentoring for clinical providers on both non-complicated and severe malaria during OTSS.

Provided technical assistance in the development and updating of national guidelines and training materials for clinical case management

Prior to implementation of activities in 12 countries, MalariaCare reviewed the national malaria case management or treatment guidelines and accompanying training curricula to ascertain alignment with WHO guidelines. MalariaCare also worked with NMCPs, national technical working groups, and other stakeholders to revise clinical case management reference documents. MalariaCare provided technical assistance to revise guidelines in four countries, develop clinical job aids in three countries, update pre-service training curricula in two countries, and update in-service training materials in eight countries. See Table 12 for a summary of MalariaCare support.

Table 12. MalariaCare support in revision and development of clinical case management reference materials

Country	National clinical case management guidelines	Job aids	Pre-service training materials	In-service training materials
Burundi				X
DRC	X			X
Ghana	X	X	X	X
Kenya		X		X
Malawi			X	X
Mali	X	X		X
Tanzania				X
Zambia	X			X
Total	4	3	2	8

Strengthened clinical staff competency in malaria case management through skills-based training

Following revision of guidelines and training materials, MalariaCare conducted clinical case management refresher training (CCMRT) for clinical providers. Training focused on the development of technical skills in clinical patient evaluation, triaging, appropriate treatment, adherence to diagnostic test results, and management of severe malaria. A total of 16,680 providers were trained, which included supervisors and facility staff. Of the 5,310 participants with available scores, there was an average 16 percentage point increase from pre-test to post-test (Table 13).

Table 13. Summary of clinical case management training

Country	All clinical training participants		Pre-test average	Post-test average	Percentage point change
	Number trained	Number trained with scores			
Burundi	95	95	58%	73%	15
DRC	117	93	46%	67%	21
Ghana*	13,088	1,670	69%	83%	14
Kenya	88	87	80%	88%	8
Malawi	3,054	2,947	41%	76%	35
Mali	161	161	72%	85%	13
Mozambique	100	100	65%	78%	13
Tanzania	124	124	59%	80%	21
Zambia	33	33	71%	86%	15
Total	16,860	5,310	63%	79%	16

Note: Pre/post-tests varied across countries based on the country-specific training curricula.

*Ghana conducted a short update training where pre/post tests were not conducted.

Strengthened clinical staff competency in malaria case management through on-the-job evaluation and mentoring

During OTSS, supervisors used the clinical OTSS checklist module to assess provider competency in clinical case management of malaria. Supervisors observed clinical consultations with febrile patients, evaluated provider adherence to case management guidelines, and mentored staff based on performance gaps identified. Table 14 shows the progress in the proportion of health facilities meeting the minimum standard in clinical case management between the first and last OTSS visits.

Table 14. Proportion of health facilities meeting minimum standard of competency (75 percent) in febrile clinical management, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Last visit	Percentage point change
DRC	16	3	31%	56%	25
Ghana	525	3	73%	87%	14
Kenya (phase 3, 2 visits)	306	2	73%	91%	18
Kenya (phases 1 & 2, 3 visits)	325	3	62%	92%	30
Madagascar	15	2	60%	100%	40
Malawi (joint OTSS)	217	4	49%	93%	44
Malawi (clinical OTSS)	99	4	85%	87%	2
Mali	90	4	72%	96%	24
Mozambique	51	4	55%	47%	-8
Tanzania	221	2	71%	96%	25
Zambia (provincial)	19	3	79%	100%	21
Zambia (sub-district)	15	4	67%	73%	6

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented. All countries showed progress with the exception of Mozambique, which saw a 4 percentage point decrease from the first visit to the last. This may be due to high staff turnover during the last rounds of OTSS, with several facilities having newly recruited staff, who had never received prior mentoring.

During OTSS, supervisors also assessed adherence to both positive and negative test results through the review of patient records. Remarkable progress was observed in several countries in facility scores on adherence to negative test results between the first and last OTSS visits, as shown on Table 15 below, most notably in the DRC, Kenya, and Mali, where scores were lowest at the first visit. Zambia provincial facilities saw a drop of 8 percent as the third visit for these facilities occurred during the peak season for malaria (February–March), when clinicians may have been less likely to trust a negative test result.

Table 15. Proportion of health facilities meeting overall standard of competency (90 percent) in adhering to negative test results, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Last visit	Percentage point change
DRC	28	4	7%	32%	25
Ghana	577	3	72%	87%	15
Kenya (phase 3, 2 visits)	297	2	71%	81%	10
Kenya (phases 1 & 2, 3 visits)	415	3	62%	89%	27
Madagascar	17	2	100%	100%	0
Malawi (joint OTSS)	199	5	80%	95%	15
Malawi (clinical OTSS)	106	4	77%	93%	16
Mali	106	4	68%	90%	22
Mozambique	50	4	84%	90%	6
Tanzania	164	2	72%	89%	17
Zambia (provincial)	14	3	79%	71%	-8
Zambia (sub-district)	30	4	77%	87%	10

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented.

Adherence to positive test results was higher than adherence to negative test results at the first visit and showed less improvement over time (Table 16). In some countries, adherence to positive test results was low and did not greatly improve. For instance, in the DRC providers still used quinine as monotherapy instead of artemisinin-based combination therapy (ACT) as per national guidelines.

Table 16. Proportion of health facilities meeting overall standard of competency (90 percent) in adhering to positive test results, trend for subset of facilities with scores at first and most recent visit, by country

Country	Number of health facilities	Number of visits	First visit	Last visit	Percentage point change
DRC	26	4	50%	54%	4
Ghana	635	3	96%	96%	0
Kenya (phase 3, 2 visits)	317	2	87%	90%	3
Kenya (phases 1 & 2, 3 visits)	428	3	84%	90%	6
Malawi (joint OTSS)	207	5	83%	82%	-1
Malawi (clinical OTSS)	109	4	78%	88%	10
Mali	107	4	73%	82%	9
Mozambique	54	4	81%	96%	15
Tanzania	172	2	81%	90%	9
Zambia (provincial)	14	3	93%	100%	7
Zambia (sub-district)	29	4	86%	93%	7

Note: Compares scores for the first and most recent visit conducted after September 2015 when the revised checklist was implemented.

*Trends for Madagascar are not presented as supervisors found at least five records of ACTs being prescribed in only three facilities due to the low malaria prevalence.

Improved competencies in the management of severe malaria

While case management training has routinely included the management of severe malaria, the OTSS visits focused on outpatient departments, assessing only identification and referral of severe malaria cases. During project implementation, MalariaCare expanded OTSS to include management of inpatient cases in three countries—Kenya, Malawi, and Mozambique—in an effort to uncover gaps and further strengthen provider competencies in appropriate classification, monitoring, and treatment of severe malaria.

In Kenya and Malawi, severe malaria checklist modules were developed for integration into EDS, whereas in Mozambique, MalariaCare assessed adherence to severe malaria management guidelines as part of a supplemental register review during OTSS.

In Mozambique, the chart review tool assessed five key factors of inpatient management: recording of patient weight, use of injectable artesunate, dosage and timing of malaria treatment, and recording of parasite density. Over the four to five OTSS visits where supervisors provided feedback and mentoring on severe malaria, these five indicators improved by an average of 48 percentage points.

In Malawi, severe malaria OTSS was conducted across four visits. While performance on monitoring of inpatients with severe malaria improved (46 to 55 percent), initial improvements seen in knowledge and diagnosis of severe malaria and administration of injectable artesunate over the first three visits declined by the final visit, by 5 and 6 percentage points, respectively. The decline in performance was attributed to high staff turnover at the end of the government's financial year, when staff retire and new graduates replace them.

In Kenya, the checklist modules were based on the Malawi module, but added a new component on severe malaria diagnostics. The severe malaria modules were piloted in seven of the eight county referral hospitals

during OTSS. The pilot revealed a “know-do” gap, with the providers scoring significantly higher in the case scenario portion of the test than during observations of managing pediatric patient and administering injectable artesunate as observed. Based on this experience, the county health management team and NMCP intend to expand the use of the severe malaria OTSS visits and use of the checklists to other county and sub-county hospitals.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases

To support accurate diagnosis, strong laboratory QA systems and the necessary laboratory infrastructure must be in place. To achieve this objective, the project provided technical assistance in the development and updating of national guidelines and training materials for malaria diagnostics, supported the development or acquisition of slides for national slide banks, and assessed laboratory infrastructure and procured laboratory equipment and supplies.

Provided technical assistance in the development and updating of national guidelines and training materials for malaria diagnostics

A key component of a strong diagnosis QA system is an established QA framework with clear guidelines for each health facility level, cadre, and procedure. MalariaCare worked with NMCPs, national reference laboratories, and other stakeholders to develop or revise reference documents in support of the national diagnostics QA system. MalariaCare provided this support through participation in national-level technical working groups and other meetings as well as through independent review. Over the course of the project, MalariaCare provided technical assistance to revise diagnostic guidelines and QA manuals in nine countries, update training materials in six countries, and develop job aids in five countries. See Table 17 for a summary of MalariaCare support.

Table 17. MalariaCare support in revision and development of diagnostic reference materials

Country	National diagnostics QA manual/guidelines	Training materials	Bench/job aids
Burundi	X		
DRC	X	X	X
Ghana	X	X	X
Kenya	X	X	
Liberia	X		
Malawi	X		
Mali		X	X
Mozambique	X		X
Tanzania	X	X	X
Zambia	X	X	
Total	9	6	5

Developed national slide banks

One of the major components of a comprehensive QA and training program for malaria microscopy is a bank of certified, standardized malaria slides. There are few repositories for malaria slides in Africa that can provide standardized reference slides for use in QA programs and refresher training of malaria microscopists. MalariaCare continued an effort, which PMI started under IMaD, to support countries in developing or acquiring national slide banks—either NAMS or smaller PT slide sets.

Developing slide banks can be a long and resource-intensive process, particularly for NAMS, which can include more than 5,000 slides. It starts with protocol development for the collection of donor samples, identification and training of qualified staff, collection of samples, and preparation of slides, followed by expert reading and polymerase chain reaction (PCR) validation. Once the slides are validated, they are characterized and the database for slide management is finalized.

MalariaCare supported seven countries in the development of PT panels and six countries in the development of a full NAMS. By the end of the project, all seven PT slide sets, containing 84 to more than 4,000 slides, and four NAMS, containing 6,000 to more than 18,000 slides, were completed (Table 18). The main challenge in completing the slide sets was obtaining slides from all species, due to the low prevalence of species other than *P. falciparum* in the majority of MalariaCare-supported countries. To support the effective transition of the slide banks to the government for long-term use and maintenance, MalariaCare trained government staff on the use of the slide management database and, in two countries, supported trips for key government staff to observe how other institutions manage similar slide banks. Since the completion of these slide banks, five countries—Ghana, Kenya, Mozambique, Madagascar, and Mali—have used them to assess the skills of laboratory staff.

Table 18. Description of national slide banks developed with MalariaCare support, by country

Country	Status at end of project
PT slide sets	7 completed
Burundi	Completed
Guinea	Completed
Kenya	Completed
Liberia	Completed
Madagascar	Completed
Mozambique	Completed
Tanzania (Zanzibar)	Completed
NAMS	4 completed, 2 in process
DRC	Completed
Ethiopia	Completed
Ghana*	Completed
Malawi	In process; requires additional species
Zambia	In process; requires additional species

*Ghana's NAMS does not include *Plasmodium vivax*; however, the Government of Ghana considers it complete and the NAMS is currently in use.

Assessed laboratory infrastructure and procured laboratory equipment and supplies

MalariaCare provided microscopes and other materials to support capacity-building at the national level in five countries. It is important that functioning microscopes are available not only for quality diagnosis, but also to support training activities. MalariaCare conducted assessments of laboratory infrastructure in three countries. These results were then used to guide equipment procurement and distribution. MalariaCare also procured 24 microscopes in three countries, including two multi-headed training microscopes to support training efforts, and other laboratory supplies in two countries.

Cross-cutting accomplishments

MalariaCare supported several activities that cut across the four objectives and work toward the overall goal of scaling up high-quality diagnosis and treatment services for malaria and other febrile illnesses.

Built a cadre of supervisors to conduct supervision and mentoring

The effectiveness of OTSS visits is dependent on supervisors' technical skills, as well as their ability to observe provider practices and provide feedback and mentoring based on these observations. Over the life of the project, MalariaCare trained 3,244 participants in nine countries during supervisor training (Table 19), which was three to five days in length. The training content evolved over the course of implementation to include an introduction to the use of the EDS, coaching and mentoring skills, and often a field test so that MalariaCare staff could observe and improve participants' supervision skills in action prior to conducting OTSS visits. In the final years of the program, to support the transition of program activities to other implementers, MalariaCare also trained staff from other implementing partner organizations in supervision and the OTSS QA approach so that they could continue to support NMCPs to carry out OTSS after the close of the project.

Table 19. Total number of supervisors trained during supervision training and refresher training sessions

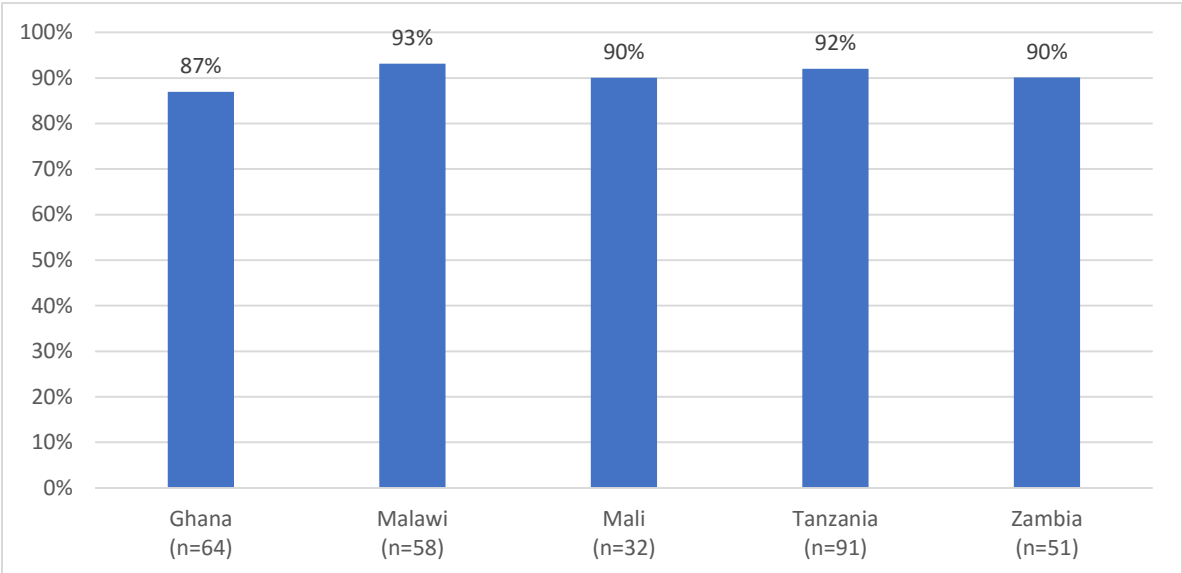
Country	Total
DRC*	60
Ghana*	1,966
Kenya	175
Madagascar	119
Malawi	113
Mali*	197
Mozambique	112
Tanzania*	315
Zambia*	187
Total	3,244

*Numbers trained may be higher than the total number of supervisors due to refresher training conducted in later years.

During the final year of the project, MalariaCare developed a mechanism to help ensure the quality of supervision and mentorship and to support improving health worker performance—a simple 17-item supervisor evaluation

checklist to guide observation of supervisors during OTSS visits. Teams consisting of NMCP members, in-country MalariaCare staff, and/or national-level supervisors were trained on how to use the supervisor evaluation checklist, which was programmed in EDS, in the following countries: Ghana, Malawi, Mali, Tanzania, and Zambia. After completing evaluations for a sample of supervisors on OTSS visits, the EDS application automatically calculated supervisor scores (i.e., the percentage of steps done correctly), which evaluators shared with supervisors along with specific feedback. The supervisors evaluated received high scores in supervision based on these evaluations, with average checklist scores ranging from 87 percent in Ghana to 93 percent in Malawi (Figure 5).

Figure 5. Average supervisor evaluation score, by country



Note: The proportion of supervisors evaluated was greater than 50 percent of all supervisors expected to participate in OTSS in the last year, with the exception of Ghana, where 15 percent were evaluated.

The evaluation found that the majority of supervisors greeted the health worker (99 percent), ensured that staff understood feedback (97 percent), properly collected registry data to assess adherence (97 percent), indicated the correct reason for not completing an observation (97 percent), identified areas of improvement that were within their scope of mentorship (98 percent), and worked with appropriate staff to resolve the problem (98 percent). These trends were consistent across countries, with 90 percent or greater in each country completing these tasks. See Table 20 for a summary of performance on each step.

However, supervisors were less likely to correctly complete the following steps: review the data from the previous OTSS visit (59 percent), and determine the status of problems identified during the previous visit and discuss with staff (77 percent). In countries where these evaluations were done between the final two OTSS visits, the results were shared with supervisors during LLWs or in orientation sessions prior to the last OTSS visit. The information from the evaluations also can be useful for NMCPs and implementing partners to determine which areas to focus on with future supervisor training and support efforts.

Table 20. Proportion of supervisors performing each step correctly (n=296)

Indicator	Percent
Reviewed data from previous OTSS visit	59%
Arrived to the health facility at an appropriate time	90%
Greeted the health worker	99%
Was attentive throughout the OTSS visit (n=275)	94%
Provided feedback and improvements to the health worker	95%
Provided feedback after all observations were complete (n=275)	87%
Provided appropriate explanation for suggested changes	95%
Ensured staff understood feedback	97%
Properly collected registry data to assess adherence (among those responsible for collecting register data) (n=185)	97%
Indicated the correct reason for not completing each observation	97%
Completed 100% of the relevant questions	90%
Determined status of the problems identified during the previous visit and discusses with staff	77%
Prioritized three problems appropriately if more than three were identified	86%
Identified areas of improvement that are within their mentoring	98%
Worked with appropriate staff to resolve the problem	98%
Worked with staff to develop SMART actions	89%

Improved data quality and use for decision-making

To strengthen mentorship and feedback processes during an OTSS visit, and to capture and use effectively the data available from the OTSS checklist, MalariaCare developed and introduced the EDS in PY3. Prior to this, supervisors in each country used paper checklists when conducting OTSS, which were then sent to a central location for data entry. The paper-based system made it challenging to implement MalariaCare’s QA approach: data resulting from the paper checklists was often incomplete and could not always be entered and analyzed in time to support discussions during LLWs or to guide decisions on targeting facilities for additional interventions. With the EDS, supervisors completed the OTSS checklist on Android tablets equipped with the application, and they submitted the results to a district health information system (DHIS2)-formatted database as soon as they could establish a mobile network or direct internet connection. Figure 6 shows screenshots of the EDS application (the checklist itself on the left, and the health facility performance summary screen on the right), and Figure 7 shows an example of the dashboard capability of the EDS database.

Figure 6. Screenshots of the EDS application: data entry screen for RDT observation module and RDT performance summary page

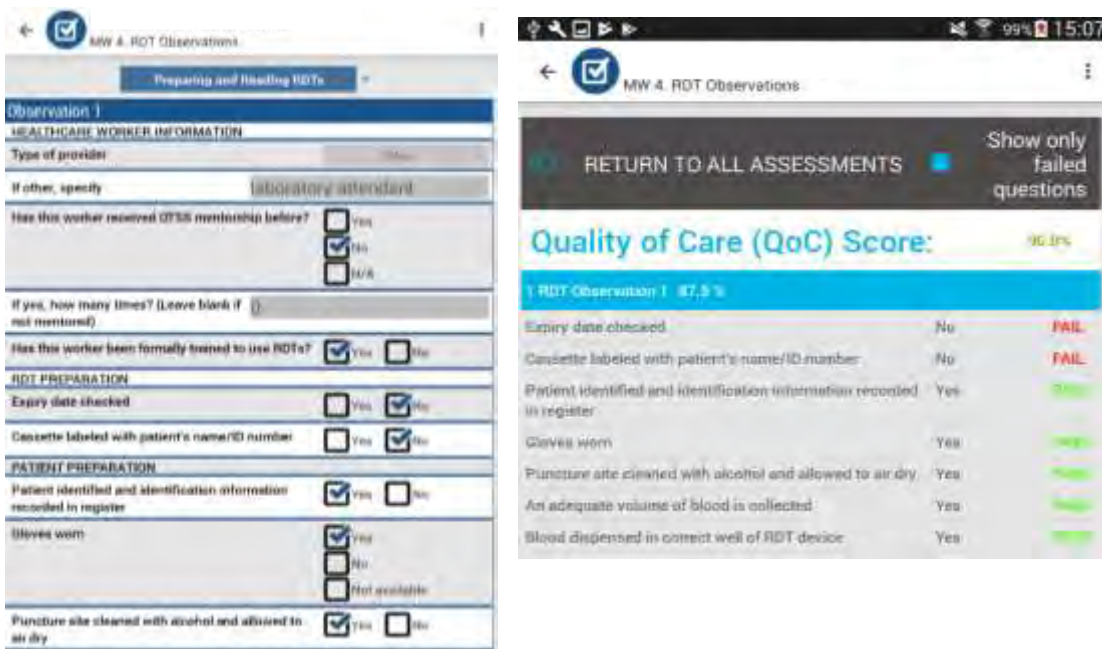


Figure 7. EDS DHIS2 dashboard

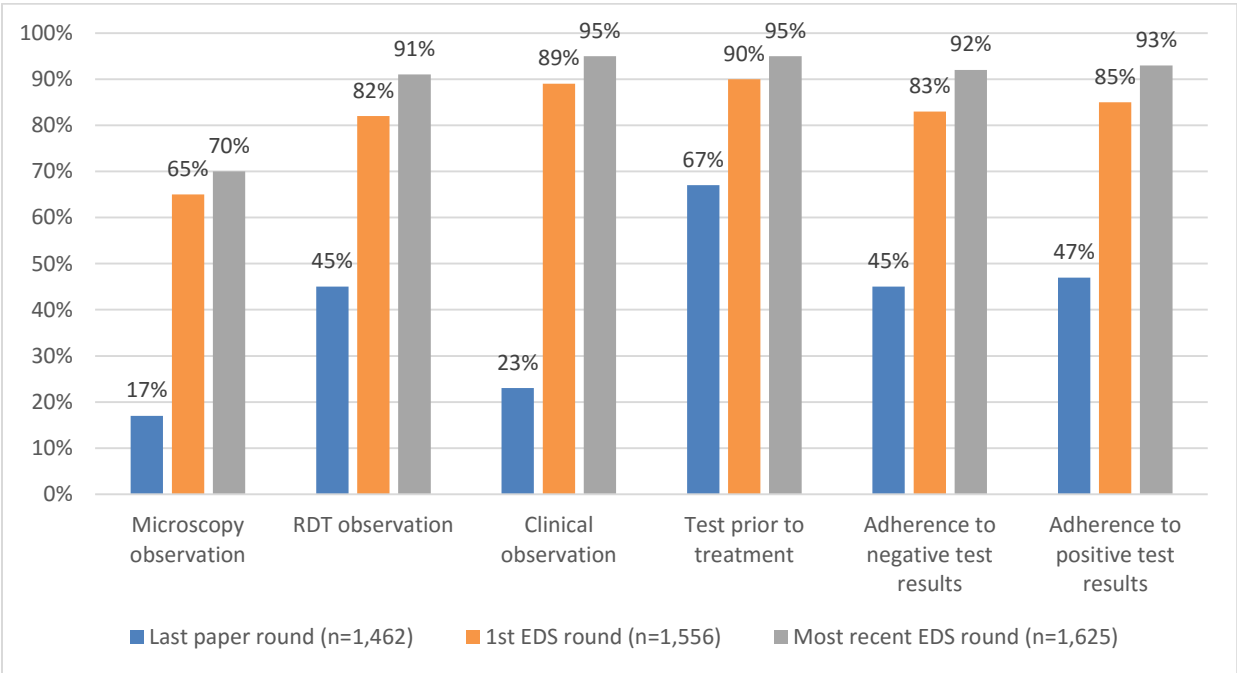


By the end of the project, 1,686 supervisors in seven countries were trained in the use of EDS for supportive supervision and went on to conduct 11,396 OTSS visits using the EDS.

As a result of the EDS, dramatic improvements in data completeness were observed, and data completeness continued to improve after each EDS round. The proportion of health facilities with sufficient data to calculate MalariaCare’s six key indicators improved by an average of 40 percentage points; by the end of the project, five

of the six indicators demonstrated greater than 90 percent data completeness (Figure 8). This outcome was likely due to a combination of two key factors: the ease of use (many supervisors expressed their preference for using EDS over paper checklists) and the feature within the application that displayed the percentage of the checklist that was complete. The relatively low completion rate of microscopy observations even after transition to EDS indicates that conducting OTSS in the laboratory may be challenged by factors other than the checklist itself, such as a lack of laboratory staff to observe or microscopy supply stock-outs.

Figure 8. Percent of facilities visited with sufficient data to calculate a score, by competency area



Note: Includes five countries: Kenya, Mali, Mozambique, Tanzania, and Zambia. Ghana and Malawi were excluded as the last visit with a paper checklist was an earlier version of the checklist and was not comparable. Also, as not all health facilities visited for OTSS performed malaria microscopy, the number of facilities included for microscopy observation score completeness are lower (last paper round, n=441; first EDS round, n=595; most recent EDS round, n=776).

The introduction of the EDS also led to a dramatic improvement in data timeliness, with the number of days from data submission to complete analysis falling from an average of five months post-visit to less than one month (Table 21).

Table 21. Number of days from the end of OTSS round until analysis shared

Visit	Number of days: mean (median [range])		
	Data submission	Analysis	Total
Last paper visit (n=2,380)	84.4 (91.0 [15.0–166.0])	73.1 (54.0 [3.0–216.0])	157.6 (145.0 [74.0–364.0])
First EDS visit (n=3,333)	27.5 (20.0 [0.0–121.0])	19.8 (16.0[0.0–71.0])	47.3 (27.0 [20.0–146.0])
Most recent EDS visit (n=3,105)	16.9 (11.5 [1.0–79.0])	12.6 (11.0 [1.0–30.0])	29.4 (28.0 [6.0–80.0])

Improved data completeness and timeliness led to greater availability of data for decision-making. Supervisors reported using the EDS directly during OTSS to provide focused feedback to health workers during facility visits. In addition, NMCPs and MalariaCare program staff used the EDS to target poor-performing facilities for additional interventions. To further support data use and the development of evidence-based improvement plans, MalariaCare conducted data-user training to provide managers at the district, regional, and national levels with the skills to use the EDS DHIS2 online platform to track facility progress following each round of OTSS visits and to identify key areas for improvement. A total of 535 staff were trained in data use, and an average of 1 to 5 government staff per region/district implementing OTSS participated in the data-use training sessions. The skills learned during the training were then reinforced during LLWs, where trained staff were further supported to update dashboards, prepare presentations, and present the OTSS results for their region or district.

Action plans developed during LLWs and data use by supervisors during health facility visits have likely contributed to improvements in each of the project's six key indicators (microscopy, RDT, clinical performance, testing prior to treatment, and adherence to positive and negative test results), as shown under the previous objectives.

However, despite MalariaCare's efforts, widespread and routine EDS data use by government staff remains a challenge. Reviews of OTSS data have largely occurred only with MalariaCare prompting and support, such as during LLWs. This is not surprising, given that establishing habits to use data takes time. Also, in most countries, only one to three OTSS rounds were conducted since EDS data use training was implemented. Important reasons for not using OTSS data, as reported by data use training participants, were forgetting how to use the EDS DHIS2 website in the three-to-six month period between OTSS rounds and not having regular access to internet.

To further strengthen the quality of malaria case management, MalariaCare recommends that the use of supervision data become institutionalized within the NMCP and health management system. For this to be successful, ownership and management of the QA approach and the EDS needs to rest with the government. MalariaCare supported this transition, as is further described below. In addition to system ownership, countries may consider other key actions, such as the revision of job descriptions for key personnel at the national, regional, and district levels and routine reporting templates to include the analysis and use of supportive supervision data; the integration of supervision data reviews into district and regional health department meetings; and the establishment or strengthening of accountability structures for ensuring the implementation of QA action plans developed at these meetings. Finally, integration of the use of supervision data with other data sources, such as HMIS, routine stock data, and community interventions, would provide a full picture of malaria case management for each locality.

Using Data to Improve Assessment for Severe Disease in Malawi



Supervisor in Malawi provides one-on-one feedback to a clinician following a patient consultation.

Photo Credit: Sarah Burnett/MalariaCare, PATH

After reviewing OTSS data during an LLW, supervisors conducted additional OTSS visits focused on increasing the proportion of clinicians checking for signs of severe disease to poor performing health facilities outside of MalariaCare support. Checking for signs of severe disease rose from 43 to 85 percent.

Transitioned key QA activities to governments and implementing partners

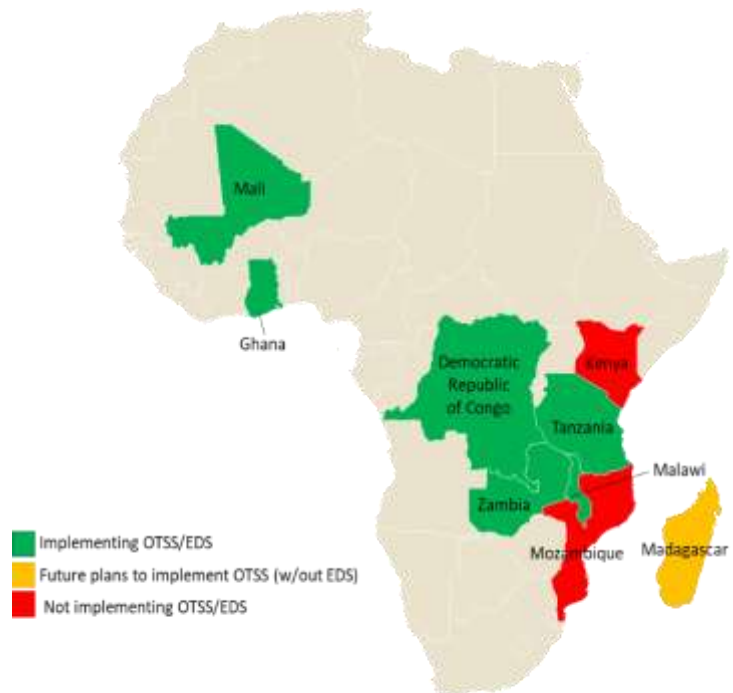
Throughout implementation, MalariaCare has emphasized strengthening local capacity and building sustainability for QA activities. As part of this effort, MalariaCare worked closely with NMCPs on the development and revision of guidelines, standard operating procedures (SOPs), tools, and job aids; co-led training with NMCPs to develop their skills in leading skills-based training as well as training on supervision; and facilitated LLWs.

MalariaCare also worked to successfully transition the operations of key QA activities to governments and implementing partners, so that these activities would continue after the close of the project. MalariaCare provided NMCPs with technical assistance for inclusion of QA activities in Global Fund applications in five countries (DRC, Ghana, Malawi, Mali, and Tanzania), which included narrative descriptions with budget guidance, or more in-depth support by participating in the application writing process. MalariaCare also actively engaged implementing partners, in consultation with the NMCPs and PMI, to include OTSS as part of their work plan activities and provided technical support for the initial implementation of activities.

MalariaCare provided an orientation to the OTSS process and trained implementing partners in supervision and the use of EDS, for both data collection and data use to drive improvements. To support sustainability of the electronic platform, MalariaCare conducted EDS systems administration training for NMCP and partner staff to train them in the day-to-day management of the system, including creating user accounts and organization units and editing checklist content. Following training, MalariaCare assisted NMCPs and partners during their first OTSS visits in four countries (Malawi, Mali, Tanzania, and Zambia), and subsequently provided remote mentoring and technical assistance in EDS management to ensure a smooth transition. For the duration of the project, MalariaCare hosted the EDS server for all countries. As part of the transition, MalariaCare facilitated the transfer of the EDS server support contracts to governments, where possible, or to implementing partners as an interim solution.

As a result of these efforts, five of the nine countries that implemented OTSS (Ghana, Malawi, Mali, Tanzania, and Zambia) have carried out OTSS using EDS independently of MalariaCare during PY5; one (DRC) has carried out OTSS partially using EDS; and one plans to implement OTSS in 2018 (Madagascar) (Figure 9).

Figure 9. Countries implementing OTSS and EDS independently of MalariaCare



Key challenges and recommendations

Over the course of five years, MalariaCare achieved significant improvement of diagnosis and treatment services for malaria. Challenges arose, solutions were developed and implemented, lessons were learned, and new opportunities identified. Highlights are presented in the discussion below.

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent

Despite improvements in MDRT training scores, few participants met the WHO-equivalent standards, with lower scores in parasite counting and species identification. To make the best use of limited resources, countries could implement a strategic training program to reinforce key skills needed at each level of the health system.

Depending on country context, training including species identification could be reserved for high-level monitoring/referral facilities while laboratory staff at facilities that offer inpatient services could receive training focused on parasite detection and counting, which are critical for the diagnosis and monitoring of severe cases. RDT use could be recommended and expanded for use at all health facility levels for identification of uncomplicated malaria cases where appropriate. This could help to increase the proportion of cases diagnosed prior to treatment while reducing the strain on laboratories, allowing them to focus on diagnosing and monitoring severe cases. As microscopy skills improve with practice, the program should include regular refresher training for microscopists to monitor and improve competency levels. The development of a national accreditation system can also provide an opportunity for monitoring and certifying individual microscopists.

Supplementary interventions can be incorporated to identify high/low performers, such as PT panels, and to improve skills, such as virtual microscopy. PT panels could be used independently or be implemented in coordination with OTSS to improve on result response rates, allow for testing on persistent problem areas, and provide opportunities for targeted mentorships during visits. Panels could be delivered ahead of a supervision visit, and individuals in the laboratory would read and mark their results on a sheet for the supervisor to review during his/her visit. Virtual microscopy is another option for improving skills, but it is recommended that further research be conducted to determine its effectiveness in improving and maintaining skills for the microscopy competency areas.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria

RDTs are an effective tool to expand access to malaria diagnostics across the health care system. Our results indicate that RDT performance is high across all levels of the system. Accordingly, countries may want to consider revising national policies to expand RDT training and support to low-level staff (e.g., nursing aides) at lower-level facilities in order to ensure that those who are actually conducting RDTs have been properly trained to do so.

With some customization, the QA approach can be expanded to reach community-level and private providers to meet the challenges of these sectors. Supervision and mentoring at the community level should be structured to be more resource-efficient by taking advantage of established connections between community health workers (CHWs) and their assigned health facilities (e.g., CHW travel to the health facility to restock supplies) to provide pooled mentoring and skills refresher training to groups. Demand for supportive supervision in the private sector

could be built by using private-sector-directed checklists and by restructuring visits to focus on those areas that private providers find most useful. This may include removing all but the key infrastructural, training/staffing, and referral questions in order to allocate the maximum amount of time for observation and mentoring.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test

Although great improvement in clinical scores was demonstrated, scores remain lower than diagnostics as assessed during OTSS. The minimum standards are well-performed, but completion of a full history-taking and a physical exam continue to be a weak area of performance across all countries. Factors such as high patient load and lack of support staff lead to insufficient time for clinicians with each patient, which contributed to this problem. Therefore, based on MalariaCare’s implementation experience, it is recommended that clinicians are trained to perform rapid and focused history and physical exams, designed to quickly assess patients for evidence of severe disease and important secondary, non-malaria diagnoses. This targeted approach can be developed into a simple job aid to be shared and reviewed by supervisors during visits. Also, newly developed patient assessment algorithms and an electronic point-of-care test platform are being evaluated and could become valuable tools in strengthening the clinical skills of providers. In countries where it was assessed, performance in severe malaria management is poor. An expansion of OTSS to include supervision and mentoring for severe malaria, using the severe malaria checklist, should be considered as one option to strengthen skills in this area. Strengthening internal quality assurance (IQA) systems in higher-level facilities can encourage better adherence to guidelines through hospital committees (as observed in Kenya and Mozambique) and associated continuing education sessions, which focus on clinical gaps identified during OTSS visits. To make sure that the newest generation of practitioners acquire and use these skills, more work also needs to be done on strengthening pre-service training curricula in the principles of quality case management.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases

Development of a NAMS is a significantly time- and resource-intensive process. While in-country development builds local capacity, it also increases the time needed to develop, validate, and operationalize a NAMS. Therefore, it is important that countries consider several cost/time factors when deciding to develop a NAMS in country versus purchasing slides from outside sources, including: 1) government staff capacity and commitment to slide development timelines; 2) cost and time implications of development delays due to staff unavailability, low donor recruitment, and sub-standard slide development; 3) importance of building local capacity to develop and maintain slides; and 4) need to operationalize the NAMS for training and PT panel needs. In many cases, instead of investing in a full NAMS (~ 10,000 quality controlled slides), it may be more efficient to purchase a national training slide set (enough to train up to 20 microscopists at one time) and PT panels from a recognized quality controlled laboratory.

The ECAMM is meant to accredit national and regional-level microscopy trainers. To ensure good use of resources for this international training, based on MalariaCare’s experience it is recommended that microscopists who attend ECAMM pass a preparatory standardized training program and hold a technical position that would support their role in leading future microscopy trainings.

Cross-cutting

Project data show that when done well (e.g., by the right staff, at the right frequency of visits), OTSS improves clinical and diagnostic performance. Supervisors need both technical capacity and the ability to carefully observe practices, collect data, and provide mentoring on poor practices. It is important to consider that mentoring is key to the process, and some supervisors are better able and willing than others to incorporate mentoring into their interactions. To best build a cadre of supervisors, MalariaCare's experiences indicate that individuals with technical knowledge and the ability to mentor others should be selected, as not all supervisors have the appropriate background to be effective mentors. National programs should consider developing clear criteria for supervisor selection and use these criteria to choose the most qualified candidates during preparatory training. After the initial selection, NMCPs may use MalariaCare's supervisor performance evaluation tool to review performance and retrain supervisors on identified weaknesses to reinforce their skills and ensure they can effectively support health facility staff.

In most countries, MalariaCare was only able to reach a fraction of the total health facilities with given funding levels. For greater impact at reduced cost, future implementers could consider piloting the following approaches:

- Targeting low-performing facilities for more frequent visits, and higher performers with fewer.
- Conducting “integrated” supervision visits with a limited malaria checklist, and then identifying low performers for more in-depth malaria-focused visits.

On-the-ground operational difficulties in implementing activities are often due to weak coordination and insufficient buy-in from local authorities. This can be addressed by strengthening regional- and district-level planning and implementation capacity. Building planning/coordination capacity at these levels accelerates transition of QA activities to the government by lowering the oversight needed at the national level to take on and carry out activities.

While government staff are gradually beginning to use the EDS to update summary dashboards and produce reports, this activity was still largely prompted by MalariaCare. Several challenges exist in data use and they vary across countries, including lack of internet access, difficulty in correctly interpreting some of the indicators, not using the data available to develop clear action plans, and competing priorities and transitions among district, regional, or national program staff. Additionally, most countries have had only one to three rounds of OTSS since being trained in data use, and thus they have not had much time to practice using the OTSS data. To increase OTSS data use for decision-making in countries where EDS has been adopted by the government, data use processes should be further institutionalized into NMCP management practices, through transitioning ownership of the EDS to the NMCP; supporting NMCPs to define specific roles and job descriptions for OTSS data use at national, regional, and district levels; and integrating OTSS and HMIS data presentation during national, regional, and district data review forums.

DHIS2 continues to have limitations in data visualization, which further complicates the use of data. For example, there is no simple method of showing a consistent health facility trend analysis, which is critical to show change over time when the same sets of facilities are not visited during each round of supervision. To make DHIS2 more simple and user-friendly, future implementing partners may want to consider working with the DHIS2 team at University of Oslo to streamline and create new features within the visualization environment that address challenges for supervision or seek out alternative visualization software that links to DHIS2 data repositories.

While waiting for system fixes, NMCPs can be supported to develop workarounds, such as Excel templates with automatic calculations, and train staff on their use.

Governments and implementing partners are just starting to take over the EDS administration, and they have varying levels of experience and expertise. Following the EDS administration training, government staff and implementing partners now have the skills to perform basic administration functions within EDS. In several countries, MalariaCare was also able to support these government staff during their first OTSS visits. However, they are still learning how the EDS can be used effectively to support supervision, and they would benefit from high-level technical assistance, particularly around data use, as they further develop the system to meet their needs. As countries and partners take on the systems administration, there is a role for future partners to provide support on troubleshooting challenges, develop additional guidance on data management and reporting, and share lessons learned and useful strategies across countries.

Beyond the direct management and implementation of QA, there are several systematic challenges that may affect sustainability of QA efforts, which should be considered in further QA approaches. Prolonged stock-outs of key commodities (ACTs, RDTs, and microscopy staining materials) may lead to a greater reliance on clinical diagnosis and treatment, rather than a test-based approach. A lack of in-service training as case management guidelines are updated may result in the deterioration of knowledge and skills required to effectively diagnose and treat febrile cases. This challenge can be addressed through on-site training and reinforcement during OTSS visits. Finally, the rapid turnover of clinical staff in health facilities inhibits the cumulative benefits of multiple exposures to OTSS by the same staff.

Core Achievements

Project operations

MalariaCare operations were supported by a finance and administration unit and the field operations team, which supported country-based planning and implementation, budget development and financial monitoring, in-country and partner communications, and the sharing of lessons learned through operations advisory group meetings.

Key accomplishments

To support project operations, MalariaCare conducted the following activities:

- Established and maintained financial tracking systems to monitor and support implementation of a program with an approved budget of \$53,531,997.
- Conducted four annual partners meetings for US-based personnel and country staff to review progress made over the past year, discuss and revise project approaches and strategies, and plan activities for the following year.
- Conducted two general close-out meetings—one meeting for a limited, US-based audience at the PATH office in DC and a well-attended session at the 2017 American Society for Tropical Medicine and Hygiene (ASTMH) conference in Baltimore to share the project experiences with the international audience attending.

Both meetings presented and discussed accomplishments, challenges, and lessons learned over the course of the project. MalariaCare country-based staff attended both meetings, and they conducted country-specific close-out meetings as activities in-country ended.

- Launched project operations in 17 countries over the course of five years (see Figure 2). MalariaCare established new offices in three countries or in-country regions where no MalariaCare partner had a presence or existing partner offices declared being unable to accommodate the needs of the project—in Ghana, Malawi, and Mozambique. In ten countries, we were able to integrate project staff into existing partner offices. In three countries—Ethiopia, Guinea, and Senegal—the project worked with a limited scope of work and required no in-country staff. Activities in these countries were implemented with short-term technical assistance provided by MalariaCare technical staff or consultants. In three countries (Burundi, Liberia, and Nigeria), limited in-country staff were appointed without any partner having a presence or able to accommodate MalariaCare staff. In these countries, MalariaCare negotiated for staff to operate from the NMCP or entered into sub-agreements with non-MalariaCare nongovernmental organization (NGO) partners to secure office space and administrative support.
- In the 17 countries where MalariaCare was active during the 63 months of implementation, MalariaCare had interventions in one country (Senegal) for one year, in two countries for two years, in seven countries for three years, in three countries for four years, and in four countries for all five years of the project. The depth and breadth of MalariaCare’s scope was greater in those countries with multiple years of interventions: for the four countries where MalariaCare was active all five years, the average total buy-in per country was \$6,055,577. For those countries active for four years, the average total buy-in per country was \$1,720,000. For countries active for three years, the average total buy-in per country was \$1,743,429. In those countries where MalariaCare was active for only two years, the average total buy-in per country was \$565,000.
- Established a field operations team to coordinate and support project activities in the project countries. Each project country was assigned a field operations backstop who maintained communications with the country team in order to support activity planning, implementation, and reporting as well as troubleshoot on budget, human resources, and administrative issues. Backstops conducted regular, mostly weekly, update calls with each country team.
- Maintained a collegial relationship and frank communications between MalariaCare and the PMI headquarters team by submitting biweekly update reports and conducting meetings accordingly, enabling the teams to solve any emerging problems promptly.
- Convened a total of 14 operations advisory group meetings with representation from all partners. The group met to review global country-level operations and helped streamline subcontract development, reporting, budgeting, and invoicing processes. Challenges and solutions to country-specific operational issues and needs were discussed and disseminated to country teams during the biweekly field operations update calls with each country team.

Monitoring and evaluation

M&E contributes to the design and implementation of project activities and allows project management to continually review project performance, contributing to global scale-up of innovations that improve case management of malaria and other febrile illnesses. Over the course of the project, MalariaCare supported the monitoring and reporting of project activities and contributed to global efforts on the development of M&E guidance for malaria case management.

Key accomplishments

In addition to supporting the M&E of country-based activities as described in the sections on global and country accomplishments and in the PMP (see Appendix B), MalariaCare achieved the following M&E accomplishments:

- Revised OTSS checklist and developed EDS application for use during OTSS. In PY2, the MalariaCare OTSS checklist was substantially improved to allow for more effective mentoring and more reliable reporting; specific sub-tasks were identified to allow for more meaningful analysis for decision-making. In PY3, the EDS application was developed and piloted in five countries (Ghana, Malawi, Mozambique, Tanzania, and Zambia); it included a revised scoring system and six summary indicators for each OTSS focus area (microscopy, RDT, clinical case management, and adherence—conducting a diagnostic test prior to treatment, adherence to a positive test result, and adherence to a negative test result).
- Refined and scaled the EDS. In PY4, the EDS was used at scale in seven countries (Ghana, Kenya, Malawi, Mali, Mozambique, Tanzania, and Zambia), with all OTSS supervision in these countries being conducted using the EDS. Based on experiences during the first stages of EDS use, MalariaCare identified several improvement areas, leading to the release of a new version of the application. Key improvements included automated data transmission when a connection with the internet existed, access to previous visit data, and the availability of a feedback module to assist supervisors giving targeted feedback to health workers.
- Supported OTSS data use in PY4 with the development of summary reporting tools, a DHIS2 dashboard, and training materials for EDS data use. Data use training was provided to decision-makers at the national, regional, and district levels on using OTSS data to monitor OTSS operations, assess program performance following OTSS, and develop district and regional action plans to improve the quality of care.
- Supported OTSS and EDS transition. In PY5, MalariaCare supported six countries (DRC, Ghana, Tanzania, Malawi, Mali, Zambia) to transition OTSS and the EDS to NMCPs and implementing partners. MalariaCare conducted EDS systems administration training in five countries (Ghana, Tanzania, Malawi, Mali, Zambia) to train NMCP and partner staff in operating the EDS. The project also provided technical support to governments and partners during their initial OTSS visits to facilitate a smooth transfer of responsibilities. As requested by the NMCPs in three countries, MalariaCare modified the EDS content by adding modules for data QA, malaria in pregnancy, and logistics and supply chain management. The project also coordinated the transfer of the EDS server support contracts to ensure uninterrupted support. The operating costs of the core EDS server, which holds data of four countries, are supported by the High Impact Health Service (*Service de Santé à Grand Impact*, or SSGI) project in Mali. In both Malawi and Tanzania, MalariaCare supported a transition to independent country-specific servers at these countries' request, managed by the NMCPs with funding and technical support from bilateral implementing partners. As a result of these efforts, six countries

(DRC, Ghana, Tanzania, Malawi, Mali, and Zambia) have conducted OTSS using EDS independently of MalariaCare during PY5. Further details on the EDS implementation are discussed in the Global Accomplishments section of this report.

- Actively participated in the Roll Back Malaria Partnership (RBM) Monitoring and Evaluation Reference Group (MERG). Over the five years of the project, MalariaCare participated in six MERG meetings. MalariaCare was an active participant, making two presentations on the development and scaling of the EDS, providing input on the development of the malaria indicators handbook for health facility surveys, and participating in the HMIS working group.

Advocacy and communications

Through its advocacy and communication activities, the MalariaCare's advocacy and communications team supported the project to advance global discussions on malaria case management and disseminate helpful information and tools to PMI staff, local service providers, and other global health colleagues to improve malaria diagnosis and treatment programs.

During PY1, the project's key communications challenge was to address the lack of awareness among target audiences in PMI focus countries regarding MalariaCare's expanded role relative to its predecessor, IMaD, and inform these audiences about the project's full range of capabilities in diagnosis and treatment of malaria and other life-threatening illnesses. Consequently, MalariaCare developed a brand identity in compliance with USAID and PMI guidelines and created a series of promotional materials such as project factsheets. Information about MalariaCare was disseminated through the project website and e-bulletins.

Once word was out about the project, focus shifted to educating stakeholders about issues relevant to malaria case management, using print materials, e-bulletins, and live webinars. Each webinar was archived on the web so that those who missed the broadcast would have a chance to hear the speakers and see their slides. The following products were created and activities conducted over the project period:

- Developed and maintained the MalariaCare website (www.malariacare.org). The website is home to all of the products listed below. Use of the site has grown significantly since its first year, 2013, when there were 4,128 views by 360 unique visitors. In 2017, the website logged 10,200 views by 4,704 unique visitors (an average of 28 views per day).

- Visits peak whenever MalariaCare e-bulletins go out, and especially before and following popular webinars.

- After the home page—where most visitors enter—the most popular page is Resources, where more than 70 materials developed by MalariaCare and other organizations are available. While the online MalariaCare Toolkit has only been available since September 2017, it has proven to be as popular a page as Resources (both with nearly 1,000 users). Other popular pages in 2017 included the program page for the DRC (813 views) and Ghana (528 views), along with web pages discussing what we do and where we work.

- Developed and used e-bulletins to promote webinars, the website, and publications. The subscriber list grew from 250 in 2013 to more than 600 in 2017.

- Organized seven webinars from 2013–2017 (see Appendix E for a list of webinar titles and presenters). Participation ranged from 40 "live" viewers to more than 100, with many more watching the archived versions. All webinars have enjoyed significant participation from Africa, both in terms of panelists and audience members.

- MalariaCare also broadcasted and uploaded the MalariaCare close-out meeting from September 20, 2017. It was designed to summarize findings and lessons over the life of the project. Examples of some of the feedback provided by webinar participants over the project period include:

“This [webinar] was a very informative meeting that provided a good overview of case management programs around the world and inspiring lessons learned.”

**MalariaCare website
Top 10 views by country, 2017***

Country	Views
 United States	4,708
 Ghana	660
 Canada	490
 United Kingdom	361
 Congo - Kinshasa	282
 Kenya	263
 European Union	254
 Tanzania	241
 Mozambique	205
 India	201

* Many US government offices and NGOs show up as visiting from the US, even though the offices are based in other countries.

Sample list of countries from which viewers accessed MalariaCare webinars

DRC	Ecuador	Ethiopia
Germany	Ghana	Guinea
Haiti	India	Ireland
Kenya	Liberia	Madagascar
Malawi	Mozambique	Nigeria
Pakistan	Senegal	Somalia
South Sudan	Switzerland	Tanzania
Uganda	UK	US
Vietnam	Zambia	Zanzibar
Zimbabwe		

Webinar participant from USAID

“The presentations and discussions were quite helpful, particularly to us in Malawi as we intend to scale up malaria diagnostics to [the] private sector.”

Webinar participant from USAID/Malawi

- Produced, and updated, 12 two-page fact sheets on our overall program and on MalariaCare country programs.
- Produced a series of 13 case studies (also called "Notes from the Field") focusing on important work in ten of our project countries.
- Developed and disseminated the MalariaCare toolkit (malariacare.org/resources/toolkit). The toolkit offers tools for use by ministry of health (MOH) partners, implementing partners, and anyone who needs tools in support of case management QA activities. Each tool was tested, revised, and finalized. Currently, 28 tools are available in three categories: 1) Improving the quality of malaria diagnosis using microscopy and RDTs; 2) Building competency in quality clinical case management; and 3) Strengthening the quality of data collection and use for decision-making. A list of the documents available in the toolkit can be found in Appendix D.

MalariaCare also provided project results, reports, images, and other documentation requested by PMI Missions and responded to requests from the public seeking information on MalariaCare’s work. We also created blog posts for PATH and other organizations.

The communications team worked closely with the technical team to develop panels and posters for ASTMH annual meetings and peer-review papers. In March 2016, the Communication Initiative Network (in part supported by USAID) highlighted MalariaCare’s 2014 publication *Barriers to Expanded Malaria Diagnosis and Treatment: A Focus on Barriers Which May Be Addressed through Advocacy, Communication, and Training Interventions* on its website and in a newsletter.

Technical leadership

MalariaCare’s technical interventions continue to improve comprehensive care of the febrile patient, with a primary focus on malaria within the context of other life-threatening illnesses such as pneumonia, diarrhea, and sepsis. Throughout the course of the five-year project, the emphasis has been on expanding practice of high-quality diagnostic testing and fostering a culture of test-based, appropriate treatment for malaria by developing and linking competencies in diagnosis and clinical management of malaria cases. To accomplish this, MalariaCare developed and implemented a comprehensive QA strategy (see full description above in Global Achievements section). It includes a training-mentoring system that operates cyclically, both to further individual knowledge and skills development and to monitor health facility and health system progress in the overall ability to perform high-quality malaria case management. This approach was designed for application in countries with a moderate to high burden of malaria, where a large percentage of cases are first evaluated in health facilities. MalariaCare focused on strengthening the capacity of government employees, through training and mentoring support in diagnostics, clinical, and data management skills and knowledge, to enable them to maintain and improve their own systems in support of case management of febrile illnesses.

In addition to MalariaCare’s primary focus on expanding high-quality diagnostic services and improving the use of these services to coordinate clinical care in the outpatient clinic, the project also focused on improving triage and management of inpatients with severe malaria, linking with community services, and in some cases addressing unusual situations like malaria outbreaks. Together these approaches have led to the following cross-country interventions:

- Developed protocols and SOPs that were used for tools and guidelines development across the project platform: developed a template for a national level malaria diagnostics and laboratory QA manual; operationalized WHO guidelines into SOPs for development and maintenance of a NAMS; developed a training program for preparation of microscopists seeking WHO ECAMM accreditation; created on-site supervision checklists for malaria diagnostics, outpatient clinical management of malaria, and inpatient management of severe malaria; developed county-level laboratory and/or case management capacity assessment tools and country-level malaria health facility assessment tools. In addition, the team provided limited technical support to the Tanzanian and Zambian ministries of health to implement artemisinin TES in accordance with the WHO’s 2009 Methods for Surveillance of Antimalarial Drug Efficacy protocol.
- Convened a total of 24 global technical advisory group meetings in order to discuss upcoming activities and various cross-country implementation planning measures, review and improve the QA strategy and OTSS checklist, plan and develop publications and other media for knowledge sharing, and discuss project close-out strategies. The group included members from the four MalariaCare partner organizations.
- Contributed to WHO and RBM Partnership (WHO, UNICEF, United Nations Development Program, and the World Bank) working groups and documents. While the technical team spent most of its time focused on implementation, they did participate in several WHO working groups and contributed to WHO guidance documents focusing on malaria diagnostics and treatment during the course of the project:
 - WHO: Regional coordination workshop on strengthening the quality management systems for parasitological diagnosis of malaria. Harare, Zimbabwe—September 2013 (two participants).
 - WHO: Technical consultation to update the *WHO Malaria Microscopy Quality Assurance Manual, V1* (2009). Geneva, Switzerland—March 2014 (four participants). The updated document—*Malaria Microscopy Quality Assurance Manual, V2*—was published by WHO in 2015.
 - WHO: Malaria RDT and fever case management in the private health sector in Africa: A consultative working meeting. Entebbe, Uganda—October 2015 (one participant).
 - WHO: Malaria RDT standards of practice: A consultative working meeting. Johannesburg, South Africa—July 2016 (one participant).
 - WHO: Informal consultation on fever management in peripheral health care settings: A global review of evidence and practices. Geneva, Switzerland—January 2013 (one participant).
 - WHO: Technical expert group on antimalarial drug resistance and containment. Geneva, Switzerland—April 2014 (one participant).
 - RBM: Case Management Working Group. Geneva, Switzerland—October 2014 (one participant).

- RBM: Behavior Change Communications Community of Practice Annual Partners Meeting (1st Annual). Geneva, Switzerland—May 2014 (one participant).
- Disseminated project work and accomplishments at international meetings. Lessons learned by MalariaCare were presented at international meetings over the last three years of the project, with topics ranging from community-level interventions with village health workers (DRC) and private drug shops (Nigeria) to training methodologies for peripheral and national-level microscopists to implementation of various aspects of OTSS (diagnostics, clinical, and EDS). The following meetings were attended and presented at during the term of the project (see Appendix E for list of titles and presenters):
 - American Society of Tropical Medicine and Hygiene (ASTMH):*
 - Philadelphia, PA, USA—October 2015 (three posters).
 - Atlanta, GA, USA—November 2016 (ten posters and two oral presentations).
 - Baltimore, MD, USA—November 2017 (seven posters, two oral presentations, and one two-hour symposium).
 - African Society for Laboratory Medicine (ASLM):*
 - Cape Town, South Africa—December 2016 (one poster).
- Published in peer-reviewed journals. The project has prepared six journal articles (see Appendix E) that have been reviewed by PMI and are being prepared for submission to a scientific journal or journals at the time of writing of this report. The publications discuss lessons learned during training of diagnostics experts and implementation of OTSS. The five OTSS-focused papers provide detailed analyses on operational aspects of OTSS implementation, mentoring on RDTs, mentoring on microscopy, mentoring on clinical care, and a manuscript detailing implementation of the EDS. While not research papers as such, the manuscripts provide a detailed and analytical analysis of the implementation of the key aspects of MalariaCare’s case management QA system, and they provide important insight that will be helpful to countries and programs implementing a QA program for malaria case management.

Country Achievements

Burma

Introduction

In Burma, PSI received pass-through funding under MalariaCare to expand malaria case management capacity in PSI’s Sun Network, a franchise of licensed private-sector general practitioners—known as Sun Quality Health (SQH) doctors—and rural community health service providers (CHSP) that serve low-income clients. In addition to malaria, the Sun Network Services include newborn and pediatric care, family planning, post-abortion care, and treatment services for HIV, tuberculosis, and sexually transmitted infection—with other funding support through the Global Fund to Fight AIDS, Tuberculosis and Malaria (the Global Fund), the Bill & Melinda Gates Foundation (Gates Foundation), and the Millennium Development Goal Fund.



Prior to the start of MalariaCare, the Sun Network supported malaria activities in 188 townships. From May 2015 (PY3) to December 2017 (PY5), MalariaCare supported expansion into an additional 21 townships at high risk for developing widespread malaria drug resistance, starting in 16 high-burden, malaria-endemic townships in PY3, increasing to 17 in PY4, and up to 21 in PY5. One township—Tanai—was replaced in PY4 by Yamethin due to political instability and associated security risks. See Table 22 for a list of intervention townships by year in which MalariaCare began support.

Table 22. List of townships by project year of MalariaCare introduction, Burma

PY3	PY4	PY5
Falam	Yamethin	Langkho
Mindat	Tangyan	Mongping
Matupi		Monghsat
Gangaw		Mongton
Ngape		
Pinlaung		
Hsihseng		
Laikha		
Nyaungshwe		
Kutkai		
Tachileik		
Taze		
Tanai*		

Loikaw	
Demoso	
Hpruso	

*Support to Tanai was not continued after PY3 due to political instability and security concerns.

During the project period, MalariaCare supported training and supervision of 432 CHSPs and 20 SQH providers. Ultimately, due to good-quality performance under the project, eight of the supported townships were transitioned to the management of the NMCP.

Key accomplishments

Over the course of project implementation, MalariaCare conducted the following activities to support QA among private-sector providers in Burma:

- Recruited and trained CHSP and SQH providers in the new townships. In preparation for implementation in MalariaCare-supported townships, the project conducted area mapping and advocacy for provider recruitment. This included facilitating town hall meetings with private providers and the community as well as meeting with township health leadership. All providers who enrolled in the network participated in an initial training on malaria case management. Following the first year, active providers participated in annual refresher training. Both the new and the refresher training included sessions on malaria diagnosis and treatment, proper waste management, improving recording and reporting of malaria cases, and implementing best practices for steady supply chain management that are in line with national guidelines and standards. Table 23 provides a summary of recruitment throughout the life of the project.

Table 23. Summary of Sun Network providers enrolled in MalariaCare townships, Burma

Provider type	PY3	PY4	PY5	Total
CHSP	132	159	141	432
SQH	16	0	4	20

- Conducted monitoring and supportive supervision for CHSPs and SQH medical professionals. Once recruited and trained, SQH and CHSPs are visited monthly by health service officers and community health service liaisons (CHSLs), respectively. The content of this support included on-site technical training, supportive supervision focused on adherence to treatment guidelines, and sustainment of knowledge, skills, and motivation of franchises through on-site mentoring. Health service officers and CHSLs also collected HMIS data, including case management data; assessed adherence to guidelines; and ensured that providers had access to a consistent supply of commodities. All data from these visits were collected using paper-based monthly client record forms, which were then entered into the central PSI/Myanmar malaria indicator system. To encourage testing before treatment and submission of high-quality data, MalariaCare provided monetary incentives to CHSPs based on testing performance and submission of correct and complete data.
- Conducted community-level active case detection. Teams of two CHSPs and one CHSL conducted active case detection via approximately two mobile trips per month, which were carried out routinely in all townships. As part of the mobile trips, providers conducted two or three health education sessions, with 40 to 50 community members participating in each session.

- Facilitated use of data for decision-making at the regional level. Quarterly coordination meetings with field office managers, HMIS staff, and program teams were held to discuss the progress toward test and treat targets on training activities, budget targets, challenges identified, and lessons learned. During the meetings, the staff discussed solutions and corrective actions, including how to encourage the provider to conduct more testing and complete the training and how to coach providers on reducing data-recording errors. For example, when positive rates had declined in MalariaCare townships, the program and field teams discussed and encouraged increased testing done through field staff.
- Procured motorbikes for CHSL to perform CHSP monitoring trips. Motorbikes were procured for 17 townships in PY4. The other four supported townships already had adequate transport available.
- Finalized and procured provider and client targeted information, education, and communication materials. Reference materials for providers included malaria treatment guideline charts, waste management guidelines for CHSPs, a waste management reference manual for SQH providers, and malaria flip charts for use during health education sessions. For clients, pamphlets for end-users were developed to encourage patients to sleep under long-lasting insecticide-treated nets, to seek treatment from a trained provider within 24 hours of onset of fever, to demand use of RDT testing, and to complete the full course of quality assured ACT treatment once prescribed.
- Procured materials to support high-quality case management. These included plastic drug boxes and raincoats to protect the drugs from getting wet and damaged during the rainy season when Sun Primary Health providers carry out home visit services, sharp boxes, disposable gloves, thermometers, and marker pens for recording the patient information on RDTs.
- In collaboration with other implementing partners, MalariaCare helped to support the Sun Network annual review forum in PY4 and PY5. In PY4, the forum—for area managers, health service officers, and health service supervisors (HSSs)—was held in Kalaw Township, Southern Shan State, in December 2015. The PSI Yangon headquarters team presented achievements and lessons learned that year. The main discussion points included the impending expansion to a new township (Tangyang), increased testing in PY4, and how to reduce the number of confirmed cases that are not treated per malaria national guidelines. During this meeting, the team learned that passive case detection alone does not lead to meeting the targets for testing. In addition, with passive case detection, migrant workers and people from high-burden pocket areas were not getting access to malaria care services beyond the mobile activities that were conducted only during the malaria season. Therefore, MalariaCare took action by implementing active case detection throughout the year via monthly mobile education and testing trips to each township. The selection of the new settlements, mobile migrant worksites, and remote villages to conduct mobile malaria services was done in discussion with respective Township Medical Officers. For the malaria-confirmed cases that did not receive treatment per the national guidelines, the operations team committed that they would conduct close monitoring of treatment performance in the future and would take action for any data-recording mistakes made by providers.
- In PY5, the forum was held in Nay Pyi Taw (capital city), with 70 percent of all SQH doctors enrolled in the Sun Network in attendance, including those SQH doctors enrolled in the MalariaCare townships. PSI facilitated discussions on the key health areas of noncommunicable diseases; malaria; maternal, neonatal, and child health; and HIV, with a focus on better studying the problems faced by providers in these areas and discussing potential solutions. For example, in the malaria discussion, attendees discussed the challenges

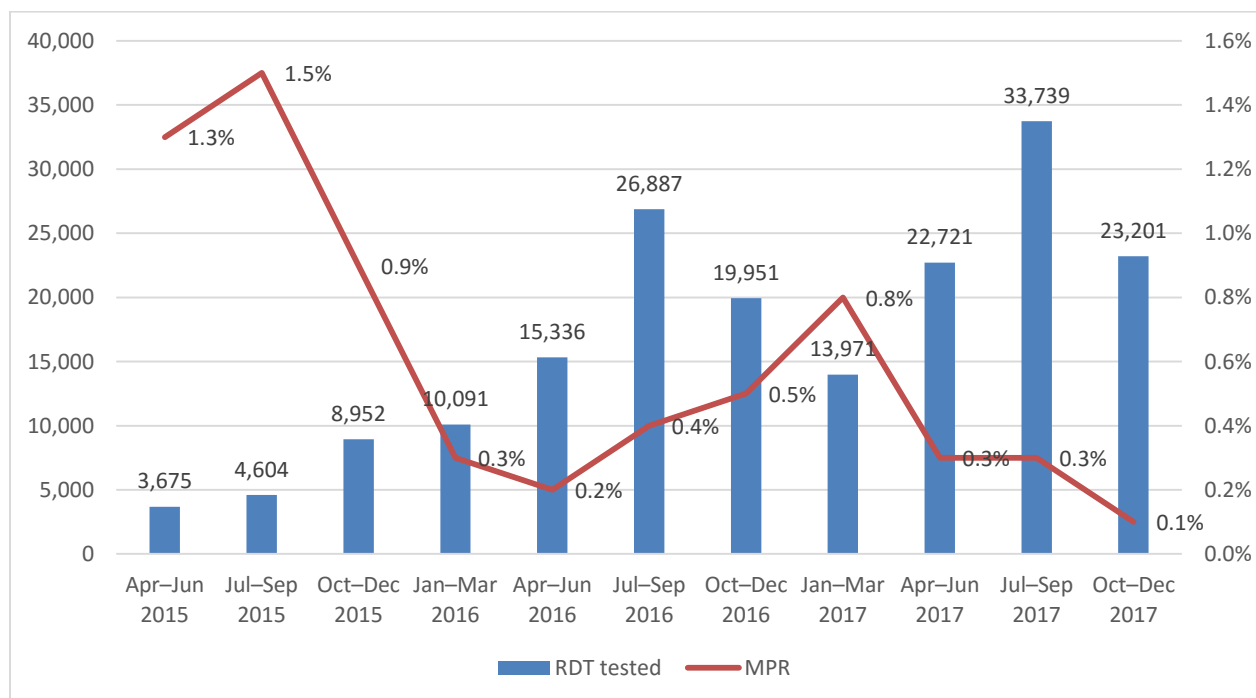
faced in completing and submitting reports, as well as any reasons for not adhering to malaria treatment guidelines. To address this, PSI/Myanmar worked closely with providers to ensure they understand the importance of correct and complete reporting through continued refresher trainings. In addition, PSI/Myanmar met with SQH providers to better understand why treatment guidelines were not followed. As a result of these actions, data recorded from January–June 2017 demonstrated that all of the providers in MalariaCare townships were treating according to guidelines and data collection errors were reduced.

Progress made on key indicators

Providers reported data on the number of RDTs tested and the number of positive cases on a monthly basis (Figure 10). Providers used RDTs to test 183,128 suspected malaria cases over the course of project implementation. Of those tested, 805 malaria cases (<1 percent positivity rate) were confirmed. Across all cases, five percent (41 cases) were not treated according to guidelines. The remaining were either treated according to guidelines (94 percent) or referred due to severe sign and symptoms (less than 1 percent).

More RDTs were administered during the periods of July–September in 2016 and 2017 as this is the rainy season in Burma. Fewer RDTs were used during this period in 2015 as the project was still expanding support to new townships. The decrease in January–March 2017 is due to a shortage of RDTs. Overall, the positivity rate of malaria decreased over time with a positivity rate of .12 percent during the final project period: October–November 2017 (Figure 10). The spike in January–March 2017 is the result of the expansion to the additional townships in PY5, which reported high positivity rates in the first few months of joining the network.

Figure 10. Malaria rapid diagnostic testing and malaria positivity rate from April 2015 to November 2017, Burma



Challenges

Challenge	Solution/recommendations
Throughout the course of the project, activities had to be put on hold in several townships due to political instability.	None of these holds led to implementation delays as activities were rescheduled as needed to adjust for changes in security stability. MalariaCare closely monitored the situation in these township and others so that the project could react quickly as conditions changed.
MalariaCare planned to initiate the integrated malaria community volunteer program in MalariaCare townships during PY5. However, as the training curriculum for this program was not finalized by the NMCP until December 2017, integrated training was not conducted.	MalariaCare went forward with refresher training focused only on malaria in PY5. Following the close of MalariaCare, PSI will begin using the integrated training guidelines for the CHSP refresher training in 2018. CHSPs will also be supplied with paracetamol and multivitamins to be distributed to non-malaria fever cases, if needed.
Unable to recruit as many SQH providers as planned.	In several townships, no private physicians could be recruited—either because all private physicians were working for other organizations or no practicing private physicians were active in the township. Further, some previously enrolled SQH providers disassociated with the program due to a low malaria caseload or because they moved out of the township. Many SQH providers also work for the government, which means that they are stationed in a location for two years at a time, after which they may move on. Despite challenges in meeting SQH targets, CHSP targets were met.

Additional recommendations

Following the transition, it will be important to continue SQH and CHSP recruitment and training to ensure that providers comply with national guidelines and standards for malaria diagnosis and treatment, proper waste management, improving recording and reporting of malaria cases, and implementing best practices for steady supply chain management, with an end goal of full transition to the NMCP. It is also important to continue active case detection as Burma moves towards elimination goals.

Given the low positivity rate, it will also be beneficial to move forward with integration of the malaria community volunteer program, which is designed to build capacity and equip community volunteers to recognize, diagnose, and treat malaria, diarrhea, and anemia per national guidelines. New and current CHSPs will receive either a new or refresher training in malaria case management, but they will also participate in an additional integrated training, which will cover diarrhea and anemia management.

Transition and sustainability

- At the close of the project in November 2017, 432 CHSPs and 16 SQH providers were active across the 21 townships. Four SQH providers left the network. Support for network providers continued in December 2017 under the Bill & Melinda Gates Foundation’s Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) grant. Starting in 2018, support of 13 townships was continued under grants as follows in Table 24. The remaining eight townships will be supported by the NMCP.

Table 24. Township support post-MalariaCare close-out, Burma

Townships	Organization / Grant
Falam	Comic Relief
Matupi	Comic Relief
Kutkai	Global Fund Regional Artemisinin-resistance Initiative (GF RAI2)
Monghsat	GF RAI2
Mongping	GF RAI2
Mongton	GF RAI2
Tachileik	GF RAI2
Tanyang	The Three Millennium Development Goal Fund (3MDG)
Yamethin	3MDG
Taze	3MDG
Langkho	3MDG
Lakha	3MDG
Nyaungshwe	3MDG
Mindat	NMCP
Gangaw	NMCP
Ngape	NMCP
Pinlaung	NMCP
Hsihseng	NMCP
Loikaw	NMCP
Demoso	NMCP
Hpruso	NMCP

MalariaCare held close-out meetings in PSI field offices at the end November 2017. Project area managers led participants in a review of project achievements against targets, lessons learned, success stories, and challenges across project years, in addition to thanking all field staff and providers for their effort and support over the course of the project. To help in transition of activities, project area managers held handover meetings with respective township hospitals and shared project documentation including volunteer profiles and project data.

Burundi

Introduction

MalariaCare began work in Burundi in September 2016 (PY4) and continued to implement activities through December 2017 (PY5). MalariaCare worked closely with the NMCP to lay the foundation for a malaria case management QA system. From September 2016 to March 2017, the project worked with the NMCP to strengthen case management and diagnostic testing among district hospitals nationwide.

The declaration of a malaria epidemic on March 14, 2017 caused the MOH to mobilize available resources around a rapid response plan and requested that MalariaCare and other implementing partners tailor activities to support its implementation. To respond to this request, MalariaCare worked with the NMCP to identify key activities in the rapid response plan that were within the scope of MalariaCare's mandate. MalariaCare agreed to support activities within three high burden provinces not supported by other partners: Gitega, Ruyigi, and Ngozi. These provinces contained 10 of the 18 malaria hyper-endemic districts in Burundi. From May through September 2017, MalariaCare provided technical support and funding for the operationalization of 40 mobile clinics within these three provinces.



From a site visit to Kayanza hospital during the epidemic response period, PMI found that some malaria cases were not confirmed by RDT or microscopy before treatment. The MOH then requested for PMI, through its implementing partners MalariaCare, MEASURE Evaluation, and the Integrated Health Project in Burundi (IHPB), to verify or obtain information on the following:

- Accuracy of diagnosed cases of malaria in pregnancy.
- Accuracy of reported deaths caused by malaria.
- Data on malaria morbidity (in pregnancy).
- Data on malaria-related mortality among referral hospitals.

From October to December 2017, MalariaCare was responsible for implementing patient file reviews within ten select referral hospitals across Gitega, Ruyigi, Cankuzo, Ngozi, Bubanza, and Bururi provinces.

Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Strengthened microscopy skills to support diagnostics QA in Burundi by training laboratory technicians in basic and aMDRT. A total of 97 laboratory technicians from district hospitals, the NMCP, and the Department of Pharmacy, Medicines, and Laboratory were trained during an initial MDRT. The average scores increased by 21 percentage points for parasite detection, 12 percentage points for species identification, and 16 percentage points for parasite counting between pre- and post-test



Participants reviewing slides during malaria diagnostics training in Bujumbura.

Photo credit: Renion Saye, MalariaCare, MCDI

(Table 25). Of these 97 participants, 14 participants (14 percent) achieved a Level A or B standard—which is equivalent to a WHO L1 or L2—for all three competency areas. The biggest barrier to meeting this standard was species identification, with only 18 of the 97 participants (19 percent) meeting the Level A or B standard. When species identification was not taken into consideration, 46 participants (47 percent) met the Level A or B standard for both parasite detection and parasite counting.

Table 25. Basic malaria diagnostic refresher training pre- and post-test results, Burundi (n=97)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	72% (73% [27%–100%])	93% (94% [36%–100%])	21
Species identification	52% (50% [9%–95%])	64% (64% [23%–90%])	12
Parasite counting	20% (25% [0%–75%])	36% (36% [0%–71%])	16

- MalariaCare then invited the 30 best performers from the MDRT to participate in an aMDRT to further hone their skills to provide microscopy training and supervision. MalariaCare planned for aMDRT participants to become laboratory OTSS supervisors, but due to the change in activities brought on by the epidemic response, OTSS activities did not occur. Of these 30 participants, 24 participants (80 percent) met the Level A or B overall standards for all three competency areas. The six participants who did not meet the Level A or B standards failed in parasite quantification. Scores improved across all three competency areas (parasite detection, species identification, and parasite counting) from pre- to post-test (Table 26).

Table 26. Advanced malaria diagnostic refresher training pre- and post-test results, Burundi (n=30)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	95% (91% [82%–100%])	100% (100% [98%–100%])	5
Species identification	78% (80% [45%–100%])	92% (93% [76%–100%])	14

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Strengthened the appropriate use of RDT performance in 389 providers during MDRT, CCMRT, and mobile clinic team orientations.
- Mobile clinic team members primarily consisted of clinicians who did not work in health facilities and routinely conduct RDTs. To ensure the appropriate use of RDTs at the mobile clinics, supervisors drawn from the high performers in the aMDRT and CCMRT conducted supervision visits. Results on the performance of the mobile teams are presented under Objective 3 below.

- Worked with the NMCP, IHPB, and MEASURE Evaluation to verify the accuracy of reported cases of malaria in pregnancy and deaths due to malaria. Information was verified by reviewing patient files from select referral hospitals across ten provinces to ascertain the proportion of cases that were tested and treated per national guidelines. MalariaCare worked with the NMCP and IHPB to select five data collection teams to conduct the patient file reviews. Each team consisted of four members: one national medical doctor, one non-local district-level medical doctor, one malaria focal person, and one medical doctor from within the referral hospital



Data collection teams reviewing and collecting data in Karusi hospital.

Photo credit: Moza Seleman, MalariaCare, PATH

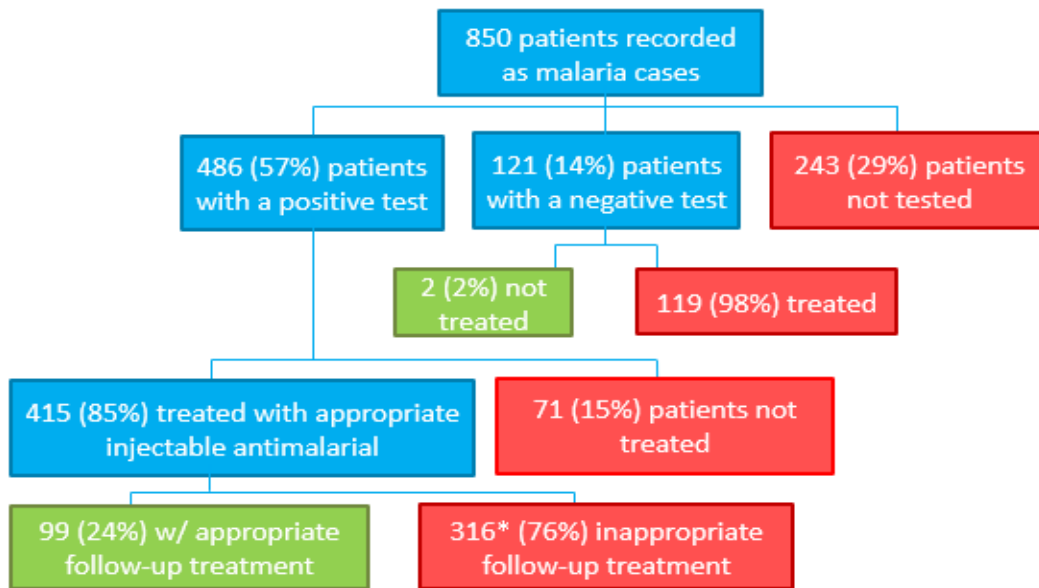
visited. Following a one-day orientation for the data collection teams, MalariaCare, IHPB, and the data collection teams tested the tools within one referral hospital. IHPB supported the five teams to conduct six referral hospital visits in Karusi, Kayanza, Kirundo, and Muyinga provinces. The following week, MalariaCare supported the five teams to conduct ten referral hospital visits in Gitega, Ruyigi, Cankuzo, Ngozi, Bubanza, and Bururi provinces. In each referral hospital, the teams used one full day for patient files reviews and returned the following day for a debrief meeting with hospital staff. These meetings provided an opportunity to discuss findings from the file reviews and provide recommendations for improvement.

Key findings from the report are as follows:

- 43 percent of discharged pregnant women and 63 percent of malaria-related deaths reported as malaria cases did not have a positive diagnostic test recorded.

- 98 percent of discharged pregnant women with a negative test result and 97 percent of those not tested were treated with an antimalarial.
 - 85 percent of confirmed cases among pregnant women were treated with an appropriate injectable.
 - 29 percent of discharged pregnant women received the appropriate follow-up medication based on trimester—oral quinine monotherapy was used for follow-up treatment in second and third trimesters in 67 percent of cases.
- The main barriers to providing high-quality diagnosis and treatment for hospitalized pregnant women, in order of frequency, include the following: incorrect follow-up oral treatment after injectable treatment for severe malaria, lack of testing prior to treatment, treating patients in spite of negative test results with antimalarials, and not providing the appropriate injectable treatment (Figure 11).

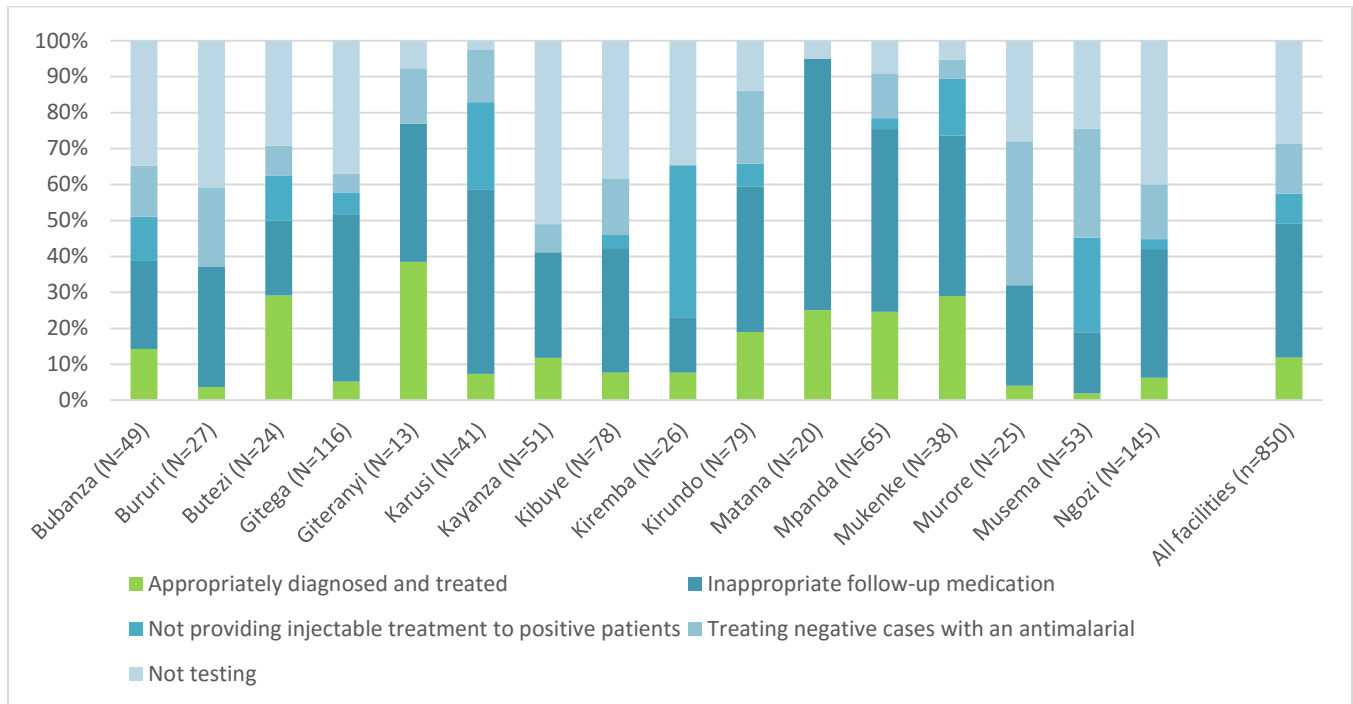
Figure 11. Proportion of discharged pregnant women with a malaria final diagnosis or treatment diagnosed and treated according to test result, by hospital, Burundi (n=850)



*60 (14%) of the 415 positive patients treated with injectable artesunate did not have their trimester recorded and are counted as inappropriately treated for follow-up medication in this composite analysis.

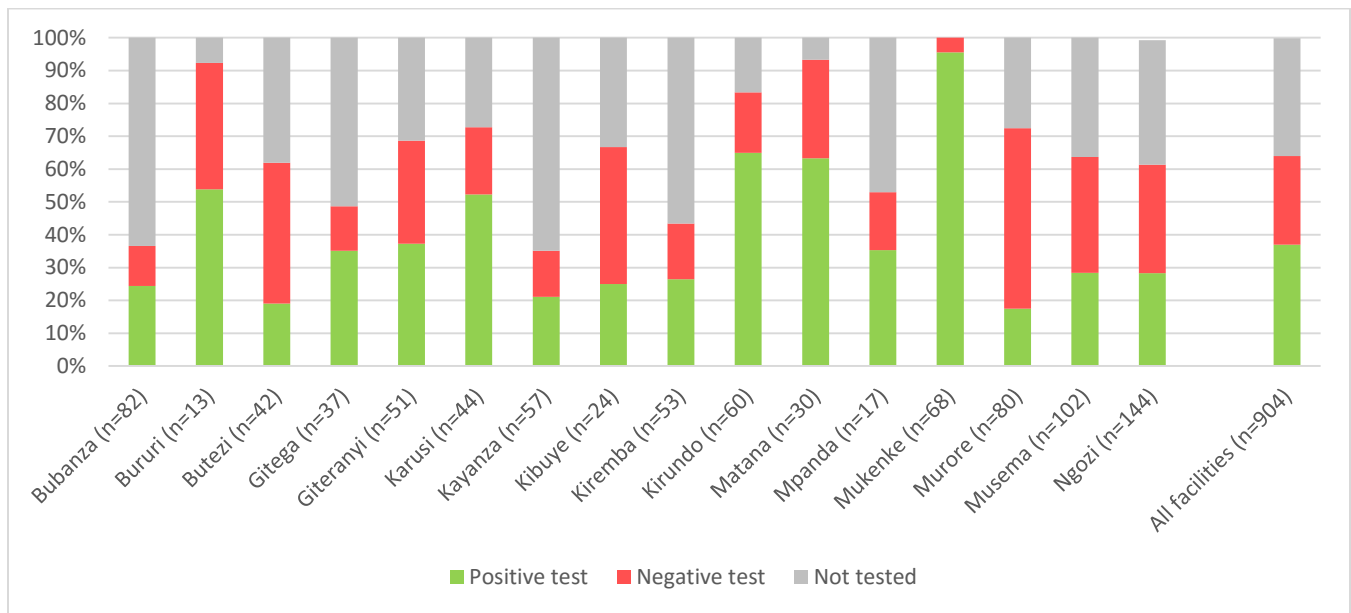
- Of all 16 hospitals, none of the hospitals had more than 38 percent and half had less than 10 percent of discharged pregnant women appropriately diagnosed and treated according to their malaria test results (Figure 12). The key drivers of inappropriate diagnosis and treatment varied by hospital. For example, in Matana nearly all inappropriately treated cases were due to inappropriate follow-up medication, while a large proportion of Kiremba’s inappropriately treated cases were due to not providing injectable treatment to positive patients. This facility-level analysis could be a useful tool in prioritizing key areas of focus for each hospital to improve performance on the malaria diagnosis and treatment pathway.

Figure 12. Proportion of discharged pregnant women hospitalized for malaria diagnosed and treated according to test result, by hospital, Burundi (n=850)



- In addition to reviewing files of discharged pregnant women, teams also reviewed the files of patients who were recorded as having died of malaria. Among the 904 reported malaria-related deaths, 335 (37 percent) had a positive malaria test, 244 (27 percent) had a negative test, and 324 (36 percent) did not have a test recorded (Figure 13). Overall performance in diagnostic testing of malaria patients is lower among reported malaria-related deaths than it is among discharged pregnant women, where 57 percent of the cases had a positive malaria test and 29 percent did not have a test result recorded. The proportion with a confirmatory diagnostic result recorded per hospital varied from 18 percent in Murore Hospital to 96 percent in Mukenke Hospital.

Figure 13. Proportion of reported malaria-related deaths with a malaria test result recorded, by hospital, Burundi (n=904)



- As a result of these findings, MalariaCare reported the deficiencies in testing and treatment of malaria cases to the NMCP and PMI and recommended more training and follow-up OTSS to ensure providers' adherence to national guidelines for the management of malaria.
- Following data collection, a comparison of the number of deaths attributed to malaria recorded in the monthly HIMIS reports collected by MEASURE Evaluation and the number of inpatient files identified and reviewed at these 16 hospitals revealed wide discrepancies. The reviewed inpatient files represented only 63 percent of those recorded in the monthly HMIS reports for the January to September period. These discrepancies could be due to poor reporting and recording processes (lack of data quality measures that ensure inpatient files match monthly reports) within health facilities or differences in how the study defined malaria-related deaths (all those with a final diagnosis of malaria recorded or treated with an antimalarial) compared to how the facility defines and records them. PMI met with the NMCP, IHPB, and MEASURE Evaluation to discuss results and is developing recommendations for future verification of these results prior to finalizing the report.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

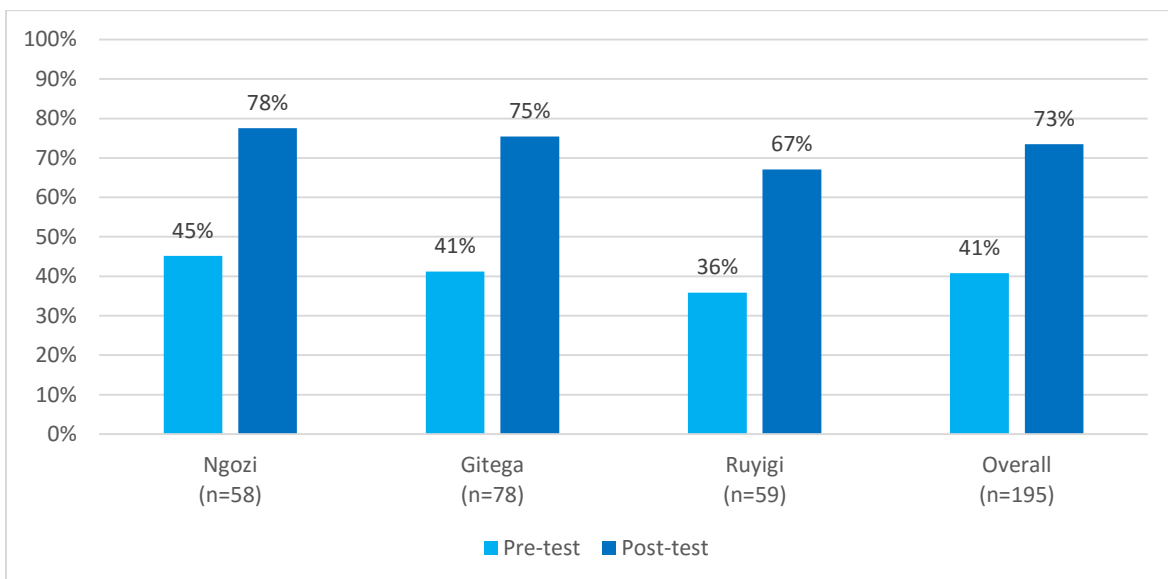
In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Strengthened the clinical case management skills of 95 clinicians from district hospitals and the NMCP through a series of three CCMRT sessions. Across the three training sessions, participant scores improved from an average of 58 percent at pre-test (median 59, range 26 to 79) to an average of 73 percent at the end of the training (median 74, range 35 to 94). On the pre- and post-tests, participants scored best on questions related to national case management policy, as well as advising patients on prevention and when to return to the health facility for follow-up. On the post-test, participants scored lowest on questions related to the

identification and management of adverse effects and complications from malaria treatment. MalariaCare then selected 37 participants based on their performance and regional location to become clinical OTSS supervisors. Of those selected for supervisor training, the average pre-test score during the CCMRT increased from 60 percent (median 59, range 26 to 79) to an average of 81 percent (median 79, range 63 to 94) at post-test. Because of the declaration of an outbreak, training of OTSS supervisors and the introduction of OTSS were suspended. However, a select group of these trained clinicians were instrumental in training and supervising mobile clinic teams during the emergency response activities.

- Supported the MOH to address the increasing malaria mortality in Burundi by training mobile clinic teams and supervisors on the implementation of mobile clinic activities. The mobile teams, composed of clinical nurses and a few laboratory technicians, were designed to provide an extension of screening and treatment coverage to populations living in malaria hyper-endemic areas, remote from static health facilities. MalariaCare trained 43 mobile clinic supervisors: three provincial medical officers, ten district medical officers, ten malaria focal persons, ten clinicians from the CCMRT, and ten laboratory technicians from the aMDRT. The training focused on supervisor responsibilities and use of the supervision tools, which help to guide the ten teams in supervising and evaluating the performance of the 40 mobile clinic teams deployed in three provinces, Gitega, Ruyigi, and Ngozi.
- MalariaCare then trained a total of 197 clinicians during three two-day orientation sessions on clinical management, RDT use, and the use of the mobile clinic checklist for the implementation of mobile clinic activities. MalariaCare instructed clinicians to test all suspected malaria cases with RDTs before treating and to refer severe malaria cases or other complicated cases to the nearest health facility. Overall, scores on knowledge of management of malaria increased by 32 percentage points, from 41 percent at pre-test (median 40 percent; range 0 to 85 percent) to 73 percent at post-test (median 75 percent; range 15 to 100 percent). Figure 14 below provides a summary of performance by region.

Figure 14. Regional pre- and post-test knowledge scores, orientation session for mobile clinic teams, Burundi



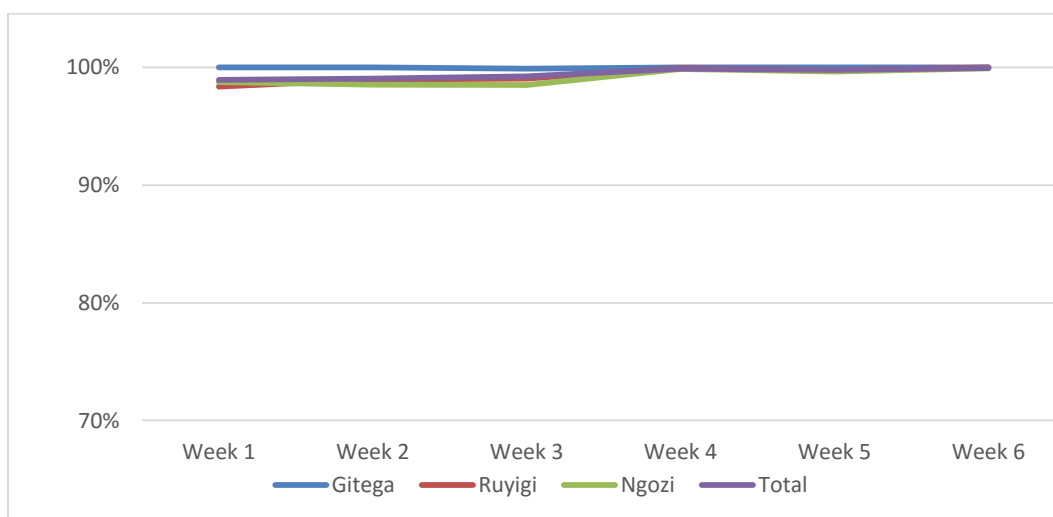
- Five (5) of the 197 trained clinicians who participated in orientation refused to sign their contracts to join the mobile clinic teams because they were unsatisfied with the daily rate provided for fieldwork within the mobile clinics. The NMCP replaced those who refused to sign the contract and those who were absent from the orientation sessions with trained clinicians to reach the 200 clinicians needed to staff the mobile clinics.
- Supported mobile clinic activities, following the training of mobile clinic teams, within three provinces (Gitega, Ruyigi, and Ngozi) for 29 working days. Table 27 provides a summary of the number of mobile clinics and staff by MalariaCare-supported province. Each mobile clinic team consisted of five staff, for a total of 200 clinicians.

Table 27. Summary of MalariaCare mobile clinic support per province, Burundi

Provinces	Number of mobiles clinics per province	Number of mobile clinic staff per province	Districts	Number of mobile clinics per district	Number of mobile clinic staff per district
Gitega	16	80	Gitega	4	20
			Kibuye	4	20
			Mutaho	4	20
			Ryansoro	4	20
Ruyigi	12	60	Ruyigi	4	20
			Butezi	4	20
			Kinyinya	4	20
Ngozi	12	60	Ngozi	4	20
			Buye	4	20
			Kirembe	4	20
Total	40	200	10	40	200

Over the six-week period, 111,401 presumptive cases were evaluated in the three regions, of which 110,830 were tested using a RDT (99 percent testing rate), see Figure 15 below.

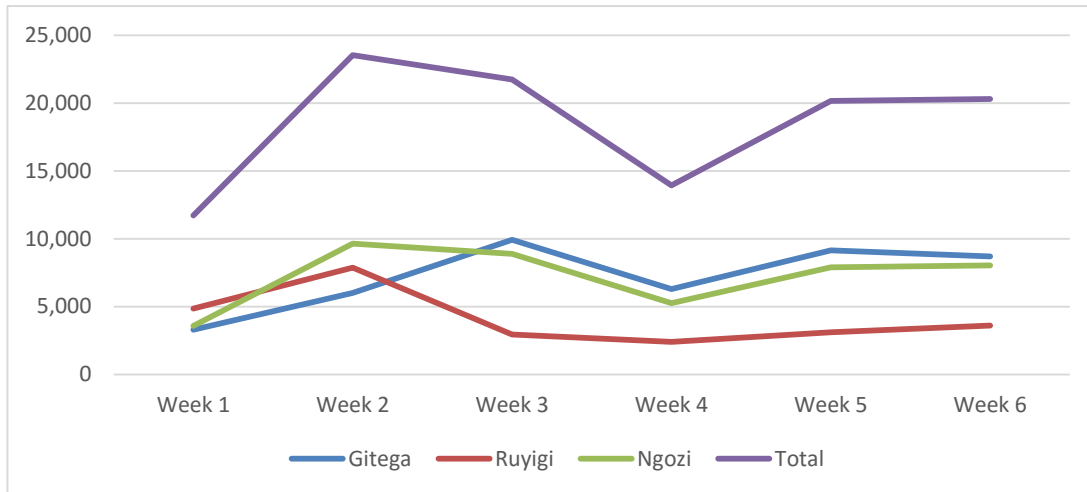
Figure 15. Percent of suspects tested, by week and region, Burundi (n=111,401)



Most of those who did not receive an RDT were seen at the mobile clinics during the first three weeks, when some of the inexperienced mobile team members were treating without testing and some mobile clinics faced stock-outs of RDTs. During the first round of supervision done during week three, supervisors identified and corrected issues with clinicians not testing before treatment. MalariaCare notified the MOH to resolve these early stock-out issues. Of those tested, 63 percent tested positive.

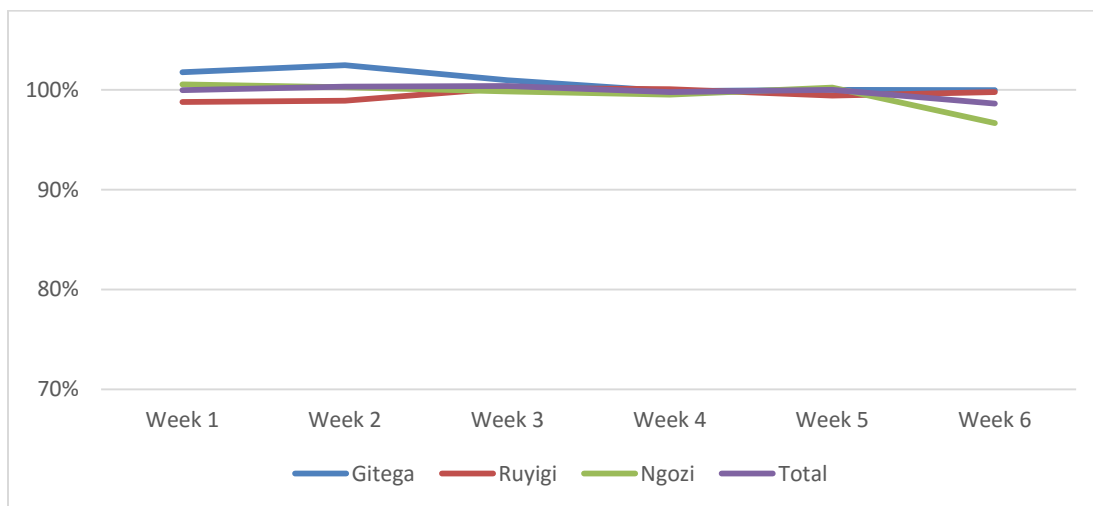
There was a drop in the number of cases evaluated during week four due to the decreased number of cases seen by mobile clinics within the catchment area (Figure 16). Mobile clinics stayed in one location until the number of patients arriving each day began to decrease before moving on to another location.

Figure 16. Total number of suspects evaluated, by week and region, Burundi



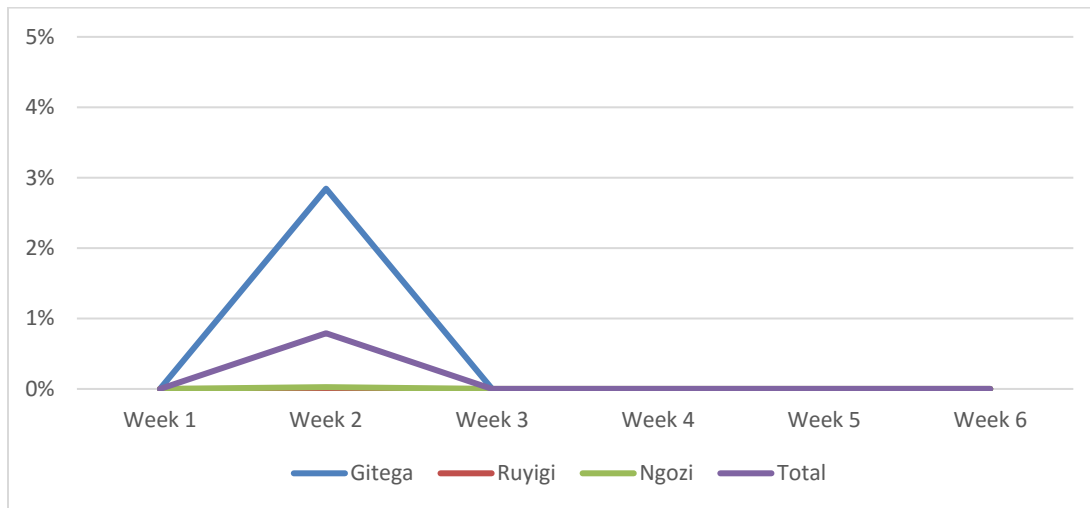
Nearly all patients who tested positive were treated with an ACT (Figure 17). More patients were treated than those that were positive in the Kiremba district of Ngozi in week one and in the Mutaho district of Gitega in weeks one and two. MalariaCare reviewed the data from these early weeks and provided feedback to the mobile clinic staff. The percentage of patients who were treated with an ACT dropped slightly in Ngozi during week six due to a stock-out of ACTs.

Figure 17. Percent of cases treated with an ACT (excluding pregnant women in the first trimester), by week and region, Burundi



Throughout the six-week period, providers adhered to negative test results, as most patients with a negative test result did not receive an ACT. The exception was during week two in Gitega, where three percent of patients with a negative test result received an ACT (Figure 18). After reviewing the data submitted for the second week, MalariaCare identified this issue and contacted the mobile clinic teams in Gitega treating negatives cases with ACT to advise on proper protocols; the issue was corrected.

Figure 18. Percent of negative cases treated with an ACT, by week and region, Burundi

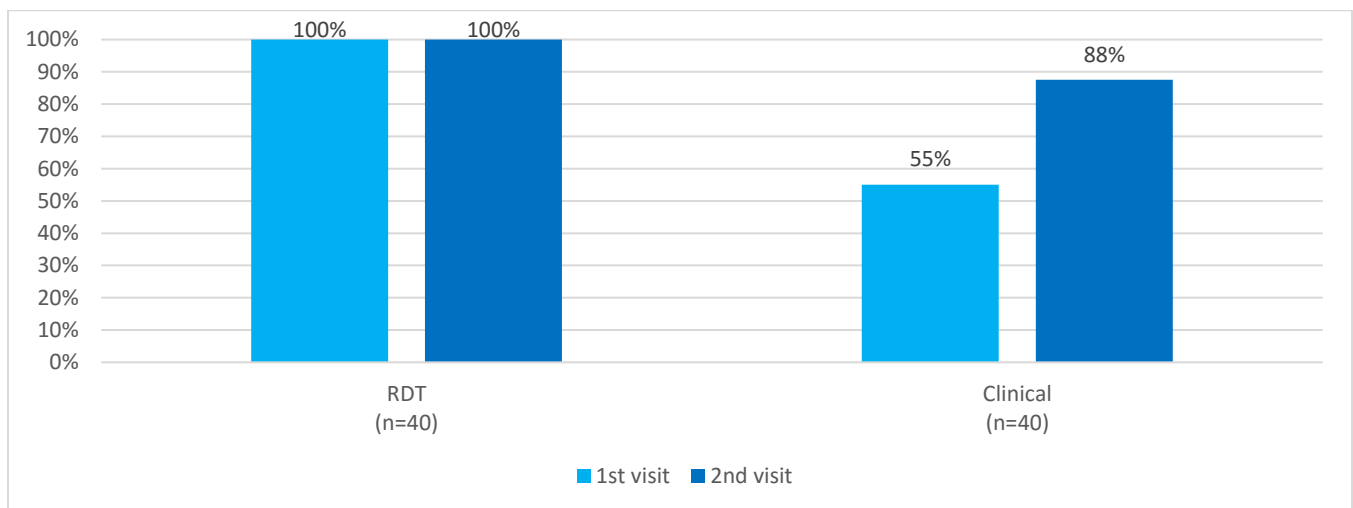


- Supported two rounds of supervision for the mobile clinic teams. For each round of supervision, each of the ten supervision teams visited 4 mobile clinics over the course of three days to reach all 40 mobile clinics with supervision. Each supervision team consisted of one district medical doctor, one malaria focal person, one clinician, and one laboratory technician. In addition, one provincial medical officer from each of the three provinces joined the teams on select supervision visits. To guide their visits, supervisors used an adapted form of the OTSS checklist tailored for use in the mobile clinics, but still containing the same checklist items for clinical management and RDT observations as other used in other MalariaCare-supported countries. Following the first round of supervision, supervisors identified the following issues:
 - Lack of experience among mobile clinic staff. This was due to the selection of mobile team members who did not work in health facilities and therefore resulted in low clinical competencies at the onset of activities.
 - Mobile clinic teams were not triaging appropriately and were testing all patients rather than testing only those with fever. This resulted in many negative tests at the onset of the activity.
 - Clinicians did not take adequate history during patient consultations, including not asking about the pregnancy status for women.
 - Lack of gloves and paracetamol within the mobile clinics to manage fever.
- MalariaCare worked with the supervisors and MOH to address these identified issues. Supervisors mentored mobile clinic staff during these initial visits on how to improve their clinical competencies and the patient consultations. To address the issue of testing all patients, MalariaCare advised all mobile clinic teams to adjust their team structure so that one staff conducted triage, one staff conducted the RDT, and three staff

provided treatment. MalariaCare also informed the MOH on the need for gloves and paracetamol to be provided to mobile clinic teams. Three weeks later, supervisors conducted their second round of mobile clinic supervision and improvements are noted below.

All 40 clinics received scores on RDT and clinical performance during both visits. The proportion of mobile clinics that met the minimum performance target of 75 percent for RDTs was 100 percent during both visits—with all mobile clinics scoring 100 percent at both time periods (Figure 19). The unusually high scores may be a result of inadequate supervisor skills due to the short supervisor’s orientation, as was requested by the NCMP during the emergency response, and supervisors not closely assessing each item on the checklist. For clinical management, the proportion of mobile clinics meeting the minimum performance target increased from 55 percent to 88 percent (Figure 19). Supervisors noted improvements in the triaging of patients, with performance on having a screening system in place for patients increasing from 75 percent during the first visit to 100 percent during the second visit. Improved performance among one minimum step helped to contribute to an increase in overall clinical scores: checking for at least one sign of severe malaria (31 percentage point increase). Despite these improvements, supervisors noted that a conducting a thorough physical exam remained weak and performance on the following steps was still low during the second visit: conducting a lung exam (average mobile clinic performance 7 percent), checking the heart rate (22 percent), and conducting a neck exam/checking for stiffness (22 percent).

Figure 19. Proportion of mobile clinics meeting minimum performance target (75%) for technical competencies, first visit versus second visit, Burundi



Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Supported an expert diagnostics consultant from Cheikh Anta Diop University (UCAD) in Dakar, Senegal, to lead a three-day workshop with the NMCP to develop the Burundi Malaria Diagnostic Quality Assurance Manual as a springboard to establishing the diagnostics QA program in the country. This guiding document, based on the WHO 2016 QA manual, will be used to support the building of a laboratory QA system for

malaria diagnostics. The QA manual received final endorsement by the Minister of Health in early April 2017, and MalariaCare provided 105 printed copies to the NMCP for distribution to health districts and district hospitals.

- As part of the workshop to finalize the diagnostic QA manual, MalariaCare also facilitated a discussion and decision by the NMCP to use single-species *P. falciparum*-specific RDTs. Despite widespread acceptance of RDTs, the NMCP was unsure whether to support use of the single species *P. falciparum* test or instead implement widespread use of a *P. falciparum*/pan-species combination RDT due to the presence of non-*P. falciparum* malaria parasites, such as *Plasmodium ovale* and *Plasmodium malariae* in some parts of the country. After discussion within the working group, it was decided that the prevalence of these other species was too low and too isolated to small pockets in Burundi to support use of the combination tests. The NMCP will continue to monitor non-*P. falciparum* prevalence and if the alternative species (*P. malariae* or *P. ovale*) exceeds five percent prevalence in a region, then they will inform WHO and discuss next steps in the use of RDTs.
- Procured 300 validated malaria slides to be used for QA of microscopy during nationally implemented training, PT, and OTSS. MalariaCare also supported a diagnostics expert consultant to train five NMCP laboratory technicians on slide bank management using the Microsoft Access database and to develop plans to use these slides to implement microscopy assessments, pre-service competency assessments, and a PT scheme.
- Printed 50 copies of the National Malaria Treatment Guidelines to distribute to district hospitals. MalariaCare distributed ten copies directly to district hospitals, but it could not distribute the remaining copies directly due to changes in planned activities related to the epidemic response. MalariaCare provided these remaining 40 copies to the NMCP for distribution.

Challenges

Challenge	Solution/Recommendations
<p>Even before the declaration of the outbreak, new permission requirements issued by the Burundi government for technical experts to enter the country led to significant delays in the scheduling of OTSS supervisor training. The appropriate permissions could not be secured for MalariaCare staff from Mali to travel to Burundi to support the facilitation of the country’s first supervisor training and round of OTSS.</p>	<p>While MalariaCare continued to follow up closely with the NMCP, MOH, and the USAID Mission to obtain the needed approvals for the two technical experts, no progress was made prior to declaration of a malaria epidemic. Once the epidemic response ends in Burundi, support for the implementation of OTSS and all associated trainings should be revisited. MalariaCare recommends that the MOH permit external technical experts into Burundi to continue strengthening the national QA system.</p>

Challenge	Solution/Recommendations
<p>Declaration of a malaria outbreak in the country interfered with the MalariaCare plan to support the NMCP to establish the national case management QA system. Implementation of project activities was suspended until the MOH, USAID, and other funders agreed upon the epidemic response plan. Ultimately, MalariaCare never implemented OTSS in Burundi because all work plan activities were revised to align with the MOH epidemic response plan.</p>	<p>MalariaCare received approval from PMI on a revised work plan that supported epidemic response plan activities, which was implemented for the remainder of the project period. MalariaCare recommends that once the epidemic response activities end in Burundi, the MOH should prioritize OTSS as an effective, more sustainable method for strengthening the quality of malaria case management to avoid future outbreaks.</p>
<p>Results from the referral hospital patient file reviews indicate that hospital staff are not following current national guidelines. Many patients were recorded as malaria cases without a test and nearly all patients with a negative test were still prescribed antimalarials.</p>	<p>To improve adherence within referral hospitals to the current national guidelines, the NMCP should disseminate current National Malaria Treatment Guidelines and Malaria Diagnostic Quality Assurance Manuals to all referral hospitals and accompany the dissemination with training and OTSS that will mentor providers on the importance of adhering to national guidelines.</p>
<p>Although MalariaCare trained two medical doctors and two laboratory technicians from each referral hospital on case management and malaria diagnostics in late 2016 and early 2017, restitution of this training within the referral facilities has not taken place, and due to staff turnover, some referral facilities do not currently have trained staff.</p>	<p>Medical doctors, laboratory technicians, and additional clinicians should be trained to reach a critical threshold of staff in each facility conversant with the most recent guidelines to achieve a positive change in case management.</p>

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care for malaria and other febrile illnesses in Burundi, the following recommendations may be considered:

- Although MalariaCare reached and treated a large number of patients within a short period through mobile clinic activities, mobile clinics are not a sustainable way of assuring quality of malaria case management. A QA system should be established, including training of staff in malaria case management and OTSS for clinicians and laboratory personnel based within health facilities. This will allow the country to continually monitor and improve the quality of care and adherence to testing and treatment guidelines. Through MDRT and CCMRT, MalariaCare developed a cadre of laboratory technicians and clinicians who could function as supervisors to conduct future OTSS visits. A list of these potential supervisors was shared with the NMCP. A system to collect and analyze supervision data and provide feedback to providers and managers should also be incorporated.
- Provide ongoing microscopy skills assessment for laboratory technicians and laboratory assistants. Regular bench practice and refresher training are important to sustain the laboratory worker's skills and maintain consistent performance over time. In addition, participants from the MDRT and aMDRT from referral facilities who did not attain Level A or B standard for all three competency areas should receive additional training to improve their skills to ensure that they are providing accurate diagnosis of malaria with parasite quantification to support clinical management of severe malaria.

- Organize LLWs at national and/or regional level as an effective method for sharing experiences and strengthening the quality of malaria case management data collection, analysis, and use for programmatic action. LLWs organized following OTSS visits allow OTSS supervisors and provincial and district medical officers to review OTSS data, discuss challenges, and create action plans for improvement. District health managers should also incorporate OTSS data into their routine monthly meetings to help identify facilities and areas of weakness to focus on during the trimester.

Transition and sustainability

- MalariaCare presented results of the mobile clinic activities to PMI, the NMCP, and implementing partners during a meeting held by WHO on September 12, 2017. MalariaCare shared results of the intervention, supervision data, and challenges and discussed recommendations for the epidemic response as well as sustainable activities beyond the response plan. MalariaCare stressed the importance of continuing with sustainable activities in Burundi that focus on building capacity and strengthening the quality of case management at all levels. The raw mobile clinic data has also been shared with the NMCP.
- MalariaCare presented the results of the malaria-related morbidity and mortality report to the NMCP, IHPB, and MEASURE Evaluation on December 21, 2017. MalariaCare provided the final report and dataset to PMI so that implementing partners could review the findings and act on the recommendations to improve diagnosis and quality of care.

Cambodia

Introduction

From PY2 through PY4, MalariaCare supported PSI/Population Services Khmer (PSI/PSK) work with the government of Cambodia to improve the performance of malaria case management by private-sector providers and to improve the quality and use of malaria surveillance and case management performance data in decision-making. There were three specific work streams: a focus on training and mentoring health care workers for improved performance, improving the quality of data input and collection of case management data, and improving the use of private-sector surveillance data at national level. Field activities were carried out in nine provinces through PY3, and then scaled back to four provinces in PY4.

Due to heavy use of private providers in Cambodia, the need to stop the spread of drug resistance within the region, and the push toward country-level malaria elimination, it was important to work with this sector to improve the quality of malaria case management services. MalariaCare supported two key networks of providers



to improve quality of malaria case management and strengthen malaria surveillance in the private sector: a plantation malaria workers (PMW) network and private-sector outlets that are part of a public-private mix (PPM) group of facilities that are authorized by the Government of Cambodia to perform testing and treatment for malaria.

The PMW network serves two malaria high-risk populations, namely plantation workers and mobile migrant workers. These workers are employed near or in the forests where malaria is most likely to be contracted and are not easily in contact with the formal health system. A PMW’s role is to diagnose workers with suspected malaria and treat those who test positive by RDT. During the life of the project, MalariaCare reached 183 PMWs across 123 worksites in six provinces.

The second network consists of the private-sector outlets—in Cambodia these comprise private health facilities and registered pharmacies—that are signed into the PPM program that operates nationally. Throughout the life of the project, MalariaCare supported 535 PPM providers across 13 provinces. Table 28 provides a summary of network coverage by PY.

Table 28. MalariaCare coverage by project year, Cambodia

Province	PY2	PY3	PY4	Network (PPM or PMW)
Steung Treng	X	X	X	PPM / PMW
Kampong Speu	X	X	X	PPM
Kampong Thom	X	X	X	PPM / PMW
Koh Kong	X	X	X	PPM
Kampong Chhnang	X	X	X	PPM
Kampong Cham	X	X	X	PPM / PMW
Mondulkiri	X	X	X	PPM / PMW
Kratie	X	X	X	PPM
Tbong Khmum		X	X	PPM / PMW
Kep			X	PPM
Preah Sihanouk			X	PPM
Takeo			X	PPM
Ratanakiri			X	PPM / PMW

Note: PPM=public-private mix; PMW=plantation malaria worker.

MalariaCare worked with the national malaria control program, called the National Center for Parasitology, Entomology and Malaria Control (CNM)—using guidelines from the Malaria Elimination and Action Framework for Cambodia 2016–2020 (MEAF)—to implement a QA case management system throughout these networks. The program worked on improving worker performance, case finding, and monitoring for antimalarial drug resistance. This QA program was supported by development of two mHealth tools: a health provider QA performance checklist and a malaria case surveillance (MCS) application—both of which allowed collection of data in a DHIS2 format. The QA performance checklist was used to monitor performance and assist in mentoring of PMW and PPM providers. The MCS application was used by these providers to provide active case reporting

information. Both data streams were uploaded to a project DHIS2 instance and downloaded to the Cambodia DHIS2 instance for monthly health facility reporting.

During the project's term, it was able to enhance the quality of private-sector fever case management, establishing a QA assessment program and allowing for customized supportive supervision visits that provided clinical guidance and on-site training. The positive results and reputation of the MalariaCare work has generated national and regional interest, and key activities are planned for continuing use and dissemination throughout Cambodia through other donor support mechanisms, such as the Global Fund and the Bill & Melinda Gates Foundation.

Throughout the three years of implementation, different objectives were set for each year, with objectives building off one another to obtain the three overall goals outlined below:

PY2 Objectives:

- To ensure QA protocols and systems are in place and adhered to by private-sector health care providers treating febrile patients.
- To consolidate multiple data points and upgrade the current malaria information system and data collection tools to provide CNM with live access to data from the private sector.

PY3 Objectives:

- To improve targeting of support to private-sector health care providers treating febrile illness through established QA protocols.
- To strengthen malaria surveillance data collection.

PY4 Objectives:

- To improve harmonization of data systems and strengthened data management within the national malaria response and across donors.
- To improve the quality of malaria case management in the private sector (private-sector outlets and worksites).

The following section outlines progressive activities and outcomes obtained during each year toward obtaining the three goals: improved performance of private-sector health care workers, improved quality of private-sector data collection, and improving the use of this data at national level.

Key accomplishments

To improve the quality of malaria case management in the private sector (private-sector outlets and worksites).

MalariaCare completed the following activities to improve the quality of malaria case management in the private sector:

- Established a QA system to assess adherence to case management guidelines by private-sector health care providers treating febrile patients. In PY2, developed a QA checklist based on global best practices in order to assess private provider competencies in diagnostic testing and fever case management. This was administered

during quality assessment visits. Upon launch, the checklist included paper and electronic-based components. In PY3, the full checklist was converted into an electronic tool, which enabled the QA coordinator and program managers to generate data in real time.


- MalariaCare recruited a team of five QA officers to perform private-sector assessments and supportive supervision using the QA checklist. They were trained in the correct use of a tablet for electronic data collection, interpersonal skills to conduct an effective QA assessment, the ability to walk a provider through a simulated malaria case scenario, and checklist upload and data extraction from the system.
- QA officers conducted an initial QA visit with each PMW and PPM provider, using the checklist to give an initial assessment score, and then classified them into one of three performance groups: Class A: score ≥ 80 percent; Class B: score 79 to 50 percent; and Class C: score ≤ 49 percent. The frequency of follow-up QA visits depended on the score, with Class C providers receiving visits monthly, Class B providers receiving visits every three months, and Class C providers every six months. Once they advanced in class, their follow-up visits were scheduled per the schedule of that new class. To enhance national ownership, CNM conducted several joint visits during the course of the project.
- Ensured QA protocols were in place to support the QA system. In coordination with the CNM, MalariaCare developed the QA and surveillance SOPs to ensure standardized assessment and data collection procedures among QA officers and assessment teams.

To improve harmonization of data systems and strengthen data management within the national malaria response and across donors.


MalariaCare completed the following to improve harmonization of data systems and strengthen data management within the national malaria response and across donors:

- Improved malaria surveillance in an effort to meet national goals for elimination. Starting in PY3, MalariaCare aligned activities with the MEAF goal “to enhance the surveillance system to, by 2017, detect, immediately notify, investigate, classify and respond to all cases and foci to move toward malaria elimination.” Over the next two years, the project worked on three surveillance strengthening activities: worked with the CNM to update provider patient registers for more accurate case recording (see Figure 20), developed the MCS application and surveillance dashboard to allow daily case reporting from each network provider, and established a national surveillance technical working group to work on improving case surveillance and drug resistance monitoring systems. The updated patient register was a significant improvement in case reporting, ensuring that case data was collected in a uniform manner across all providers in the country.

Figure 20. Paper-based daily patient register, Cambodia



Public-Private Mix Monthly Malaria Patient Register Form



Poly Clinic
 Clinic
 Consultation cabinet room
 Health care room
 Pharmacy
 Plantation/ Private company

Date:

Outlet/ Company Name: Village: Commune: Operational District: Province:

Order the number in the box x for each suspected malaria case seen (Suspected: Fever - Chills - Sweating)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Insert the correct letter: A= Tested with RDT, B=No tested- RDT Stock out, C=No tested- Patient refused D= Has danger signs																									

Only fill out the table below for patients who test positive (+) for malaria

No	Date	Patient Name	Current Address (Current patient living address)	Phone Number	Age	Pregnancy	Sex				Test result		Treatment by ACTs		Prima-quine	Other drug	Referral case with positive result									
							M	F	Pf.	Pv.	Mix	DHA-PPQ	ASMQ	1. Drug stock out			2. Pregnancy/Children under 5 years	3. Suspected Treatment Failure	4. Others							
							Year	Month	Tick	Tick	Tick	Tick	Tick	Tick			Tick	Tick	Tick	Write						
	Ex. 21 July, 2013	Ex. Mak Sarath	Ex. Chom Bork/ Spean Mean Chey/ Sen Monor rom/ Mondul Kiri	012 000 xxx	25																					
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
Total																										

Stock Update

No	Commodity	Used	In stock	Quantity requested	Quantity supplied	No	Commodity	Used	In Stock	Quantity requested	Quantity supplied
1	FDT					3	Primaquine				
2	ACT: <input type="checkbox"/> DHA-PPQ <input type="checkbox"/> ASMQ					4	Rectal Artesunate				

White color for PSK
 Blue C color for OD
 Yellow color for Provider
 Signature of Provider:
 Name of Provider:
 Date: / /

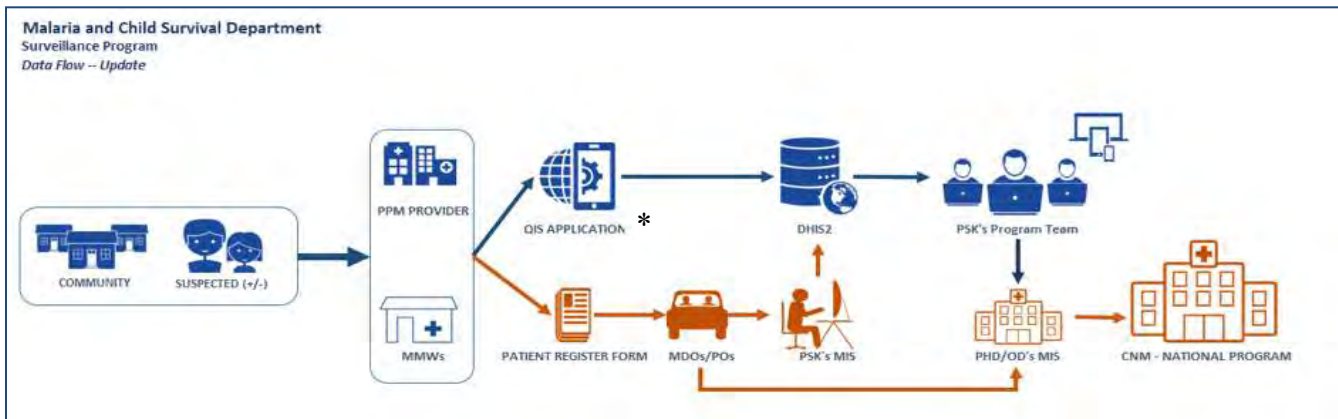
This part for Report collector fill in only

Monthly total	Code	Total	Monthly Summary	Code	Total
Suspected malaria cases			Has danger signs	D	
Tested with RDT	A		Number of patients referred	B+C+D+1+2+3+4	
No tested- RDT Stock out	B		Number of patients with positive blood test by age group	0-4 Years 5-14 Years 15-49 Years 50 over	
No tested- Patients refused	C		Number of RDT test device had been used and collected		

Monthly Summary :
 Signature and Name :
 Position :
 Date :

- Prior to the implementation of MCS, daily case data was entered onto a monthly reporting paper form and carried to both government operational district offices and PSK headquarters for manual entry into the national HMIS and PSK’s DHIS2 platform, respectively (shown in orange in Figure 21)—a process that often yielded poor-quality data and delays in reporting to the CNM of two months or more. The new electronic system (shown in blue in Figure 21), utilized the MCS application, allowed real-time case data entry (by individual patient as opposed to aggregate provider data) by providers into a cellular phone with immediate transmission to PSK’s cloud-based DHIS2 instance. The flowchart below (Figure 21) shows the changes in data flow between the paper-based system and the new electronic reporting system.

Figure 21. Malaria case surveillance (MCS) program data flow, Cambodia



*The MCS application was previously named the QIS application.

- The MCS application, following extensive consultation with stakeholders, pre-testing and design iteration, was completed in PY3. Data collection transitioned from paper to electronic-based through three phases. During the first phase in May 2016, MalariaCare rolled out the new MCS application to 100 of the private providers supported by the project. This included training providers on data entry into the application. MCS was rolled out to the remaining providers as part of the second and third phases, which were supported by the Global Fund. All providers were using the MCS application by September 2016.
- Strengthened data use at the national level. With the new registers rolled out in PY2 and the support of MalariaCare in uploading caseload and QA visit data to the system, CNM appreciated the quality of this data, which increased confidence in private-sector data. This led, for the first time, to use by the CNM of private-sector data in formulating national policy documents, including the national MEAF, and to reporting these numbers in national surveillance reports. In some districts, private-sector reporting accounted for 35–50 percent of cases (e.g., Steung Treng and Kratie).
- Supported capacity-building at the national level in managing malaria surveillance. During PY3, MalariaCare contributed to the establishment of the national malaria elimination taskforce by supporting the development of terms of reference and national guidance documents, such as the MEAF and QA and surveillance SOPs. The project team also facilitated national-level surveillance technical working group meetings. Through these meetings, MalariaCare directly supported the development of the national malaria surveillance operations manual.

Progress made on key indicators

With funding from MalariaCare, the project conducted 2,417 QA visits over the life of the project (from May 2014 through September 2016). During the three years of the project, the network of project-supported PPM providers expanded from 385 to 538; the number of PMW worksites grew from 45 to 123, reaching 183 PMWs.

As presented in Figure 22, QA teams routinely exceeded the project's target for 80 QA visits per month. Of note, fewer visits were completed in October 2014/October 2015 due to pending budget approval for the next year and in April 2015 and 2016 due to public holidays in Cambodia.

Figure 22. Number of quality assessments conducted in project supported sites, 2014–2016, Cambodia

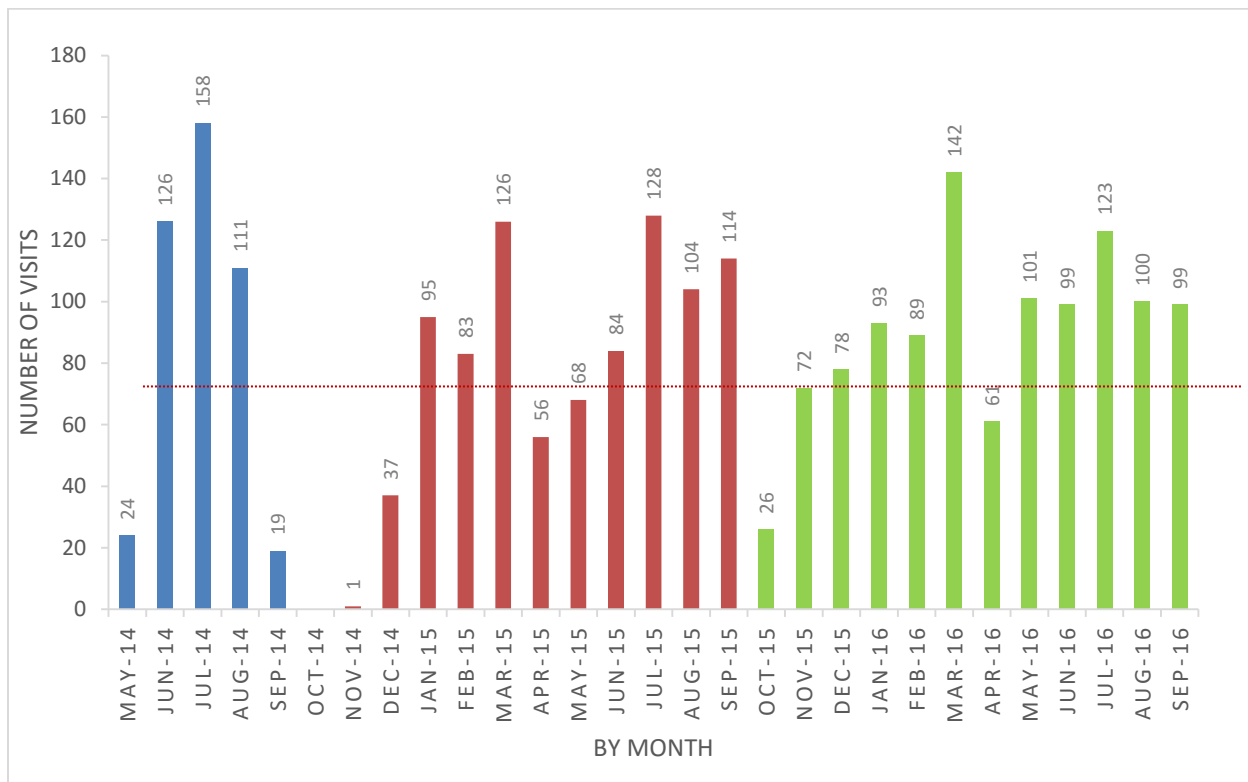


Figure 23 indicates consistent improvement in provider assessment scores across all five categories of evaluation:

- Quality of care: Ability to assess danger signs, assess symptoms and ask patient history, correct treatment according to outcome, appropriate management of negative cases or appropriate referral.
- RDT procedure ability: Demonstrated provider safety, patient safety, administration of RDT, appropriate disposal of biohazards.
- Documentation: Accuracy and correctness of patient register.
- Equipment: Appropriate storage of commodities, lighting, cleanliness and privacy.
- Workplace: Stocking all essential tools (gloves, job aids, tests, treatment, sharps bin, timer).

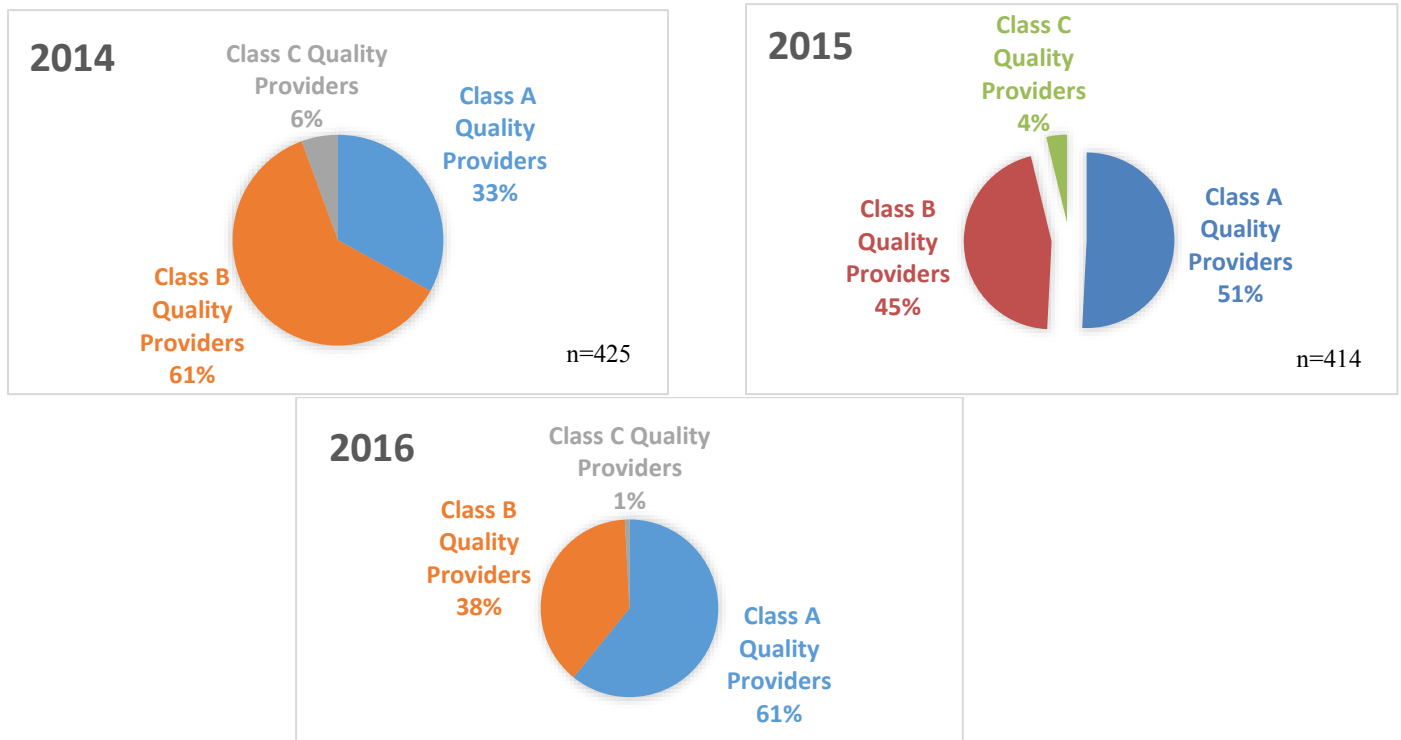
The sixth category is an overall score, calculated by the individual indicators and weighted according to importance. The target performance for each category was 80 percent. While providers improved across all categories during the life of the project, scores were typically highest on the workplace and equipment components and lowest on quality of care. Understanding this, the project team analyzed the checklist and realized that providers were being inappropriately scored lower than they should have been on their ability to identify danger signs. For example, during simulated provider-patient exchanges, providers frequently failed to verbalize their assessment of danger signs that could be assessed visually (including coma, extreme pallor, and inability to sit or stand). In many cases, they did appear to understand and perform an appropriate assessment, but because they did not verbalize their observations, they were penalized/marked down on the tool. To maintain consistency across the project, and with other regional programs, the assessment of danger signs format has not yet been altered, but providers are being trained to verbalize the assessment of the findings they are looking for.

Figure 23. Provider quality assurance assessment scores by category, 2014–2016, Cambodia



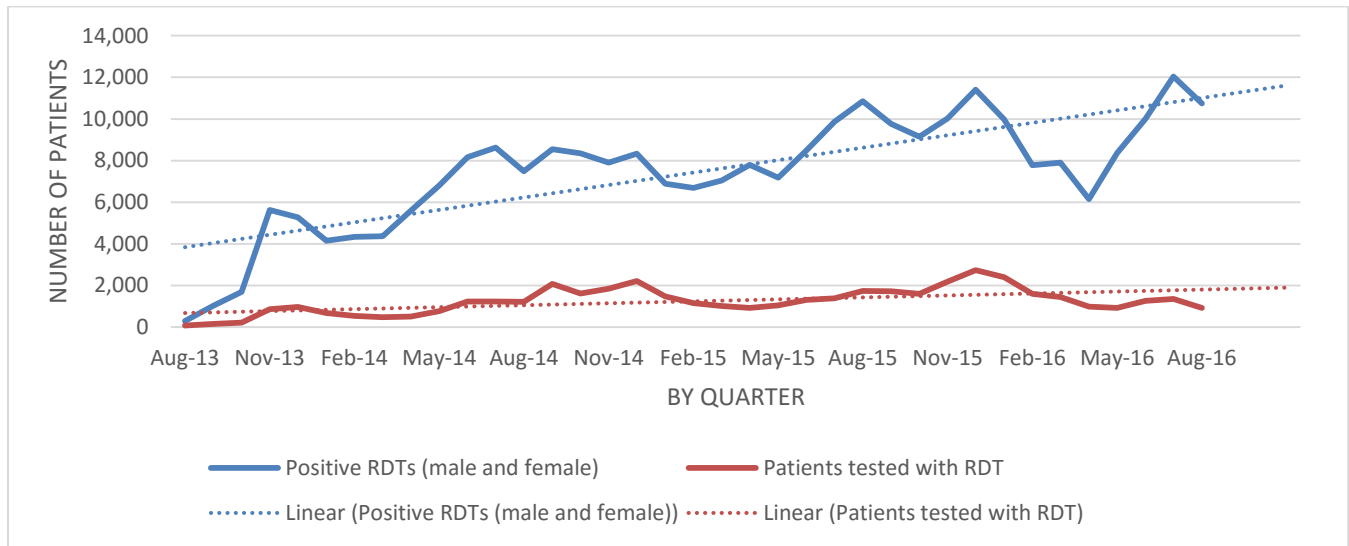
The three pie charts in Figure 24 describe the changes in relative proportion of provider class from 2014 through 2016 and show progressive improvement toward a majority of Class A-qualified providers with a 28 percent improvement to 61 percent overall. Likewise, Class C providers fell from 6 percent to only 1 percent and Class B providers moved from 61 percent to 38 percent. The improvements in provider scores are likely due to provider targeted supportive supervision, improved comfort with the process, and a better understanding of the quality components of fever case management.

Figure 24. Provider class breakdown by year, Cambodia



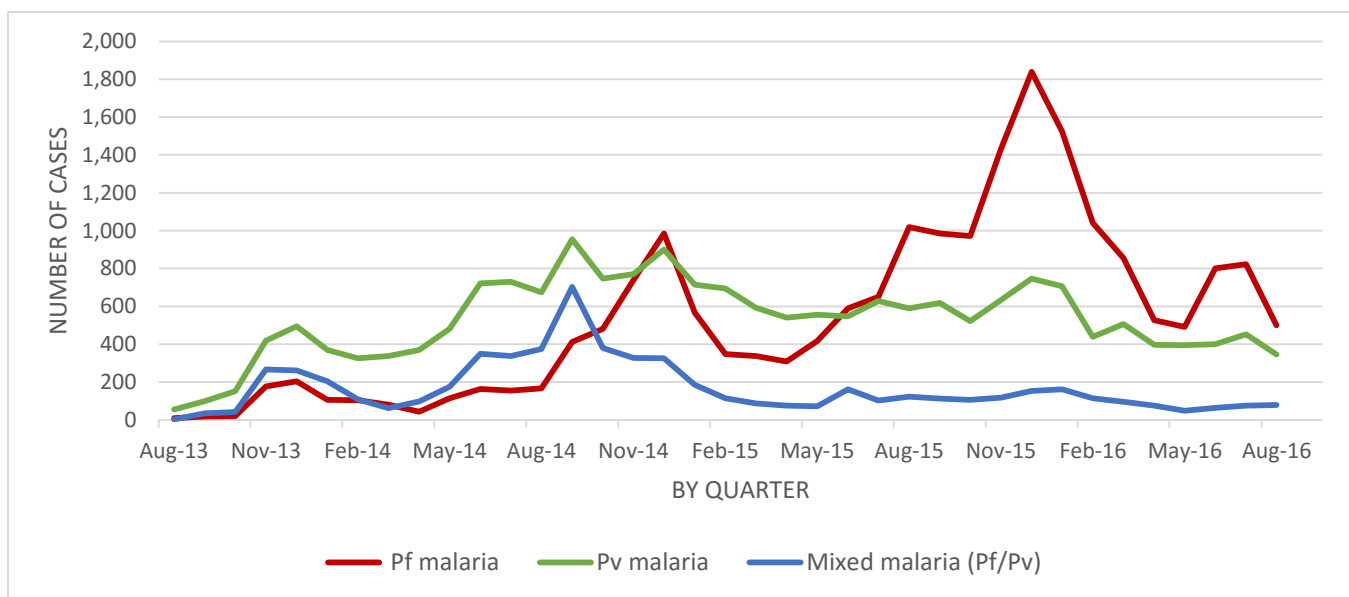
In addition to monitoring the performance of providers and ensuring an effective and positive primary health care experience for beneficiaries, funding from MalariaCare also allowed the team to contribute trusted and validated caseload data (used internally and externally by the government and other partners) to monitor malaria epidemiology and service uptake. Figure 25 below represents the increases in suspected cases receiving an RDT from project-supported providers, as well as the correlating increase in patients found to be positive for malaria. The graph clearly shows the seasonality of malaria in Cambodia, with cases $n=561$ during the rainy season months of December and January, dipping gradually into the hot and dry months of March through June, and then climbing again in August. Tracking, testing, and treatment data has also helped the project manage commodities, such as knowing when to request buffer stock. The RDT figures are slightly less consistent, with a fairly large trough in April of 2016, believed to be a result of a long holiday mid-month. Such a large drop seems anomalous, and figures in May through June seem to represent a “catch up” for the low testing rates in April. This information has been valuable for the CNM, Cambodia’s MEAF, and regional stakeholders such as WHO, international researchers, and a wide range of donors in order to better understand the epidemiology and burden on the entire health system in Cambodia.

Figure 25. Testing and treatment rates 2013–2016, Cambodia



Of great importance to the MEAF is trend data surrounding the prevalence of *P. falciparum*, *Plasmodium vivax*, and mixed infection (Figure 26). There was a dramatic uptick in *P. falciparum* cases in July 2015, which has led to sustained higher rates of *P. falciparum* over *P. vivax*. This is concerning because higher rates of *P. falciparum* likely will lead to the spread of antimalarial resistance and increased mortality rates. These data were presented to the CNM along with other stakeholder data and sparked a formal outbreak investigation. Fortunately, the overall case numbers have decreased in 2016, but *P. falciparum* remains the more common of the two infection types.

Figure 26. Malaria caseload according to species 2013–2016, Cambodia



Challenges

Challenge	Solution/recommendation
Coordination with CNM, partners, and multiple donors.	Under the current Global Fund implementation structure, CNM will lead implementation of public- and private-sector efforts in provinces designated as Tier 1 for artemisinin resistance. As such, CNM has stated that they will oversee implementation of the PPM program in provinces where the PSK currently supports 217 providers. As CNM’s approach will be different (excluding QA and real-time reporting), the team developed transition plans, including raising additional funds to support the continuation of QA and electronic reporting within CNM managed provinces.
Delays in development of national malaria information system.	Due to bottlenecks in CNM’s public-sector data management system, it was difficult to access data from the public sector, including from both the health facility and community level. To help address this challenge, the project team worked closely with CNM to plan for upcoming enhancements to the national information management system.
Sustainability of electronic reporting.	<p>As with any new technology, there were concerns about the long-term sustainability and unknown challenges related to electronic reporting. PSK addressed these concerns as follows: The team liaised with multiple stakeholders to get both advice and buy-in and presented the process and outcomes at many meetings and conferences, advocating for the use of the tools. Adoption has not yet been universal; however, with increasing evidence of the success of the program, the team is hopeful that they can contribute to a change in the way the private sector is involved in fever case management and how it reports. This technology could easily be adapted for other health areas, increasing its value and potential importance among other departments.</p> <p>PSK will continue to monitor the use and perceptions of providers using the electronic reporting application and will document the process to provide evidence for implementation by other partners. However, a full evaluation of the technology will need to be conducted after the tool has been in use through at least one cycle of peak malaria season.</p>

Underlying challenge: translating evidence into policy and implementation

Over the course of implementation in Cambodia, MalariaCare generated a wealth of valuable data on models for successful engagement with the private sector, tools for tracking malaria data, ways to improve the quality of primary care across a diverse cadre of providers, and approaches to increase collaboration and coordination at subnational and community levels. Data were shared, discussed, presented, documented, and debated. PSI/PSK, as supported by MalariaCare, was a staunch advocate for the use of open-source DHIS2 software for use as the

national malaria information system, to avoid the pitfalls and delays associated with developing a stand-alone system and to be in alignment with the numerous other countries around the world using this tool. The team shared each piece of software developed, both the concepts and the backend technology, and offered to provide training and guidance for further study or rollout. The transparency and spirit of collaboration have been acknowledged and welcomed, but unfortunately rarely led to effective collaboration. The debate over DHIS2 continues. The need for an effective QA system remains a topic of every national meeting; however, only limited progress is noticeable.

Change takes time and management, and the adoption of new tools, approaches, and methods is to be carefully weighed and considered. However, the worrying spread of ACT resistance across the country, the challenges with core Global Fund funding, frequently changing actors, and new epidemiological evidence all require attention and a coordinated response. PSK will continue to advocate for improved quality of fever case management, to strengthen the surveillance systems and, above all, to continue to demonstrate the important contribution made by a network of private providers toward malaria elimination.

Additional recommendations

It is recommended that continued support and technical guidance be provided to CNM on data and reporting systems. The current malaria information system, for example, is human resource-intensive. The future electronic information system/platform to be selected by CNM will require further technical support to ensure that the system is manageable, sustainable, and fit for the purpose.

Transition and sustainability

Expansion of a private-sector QA program throughout Cambodia.

- Because of the successes in rollout of the private-sector PPM and PMW QA program developed under MalariaCare, the CNM with Global Fund support has begun implementing a similar program in Tier 1 provinces and the Gates Foundation is supporting a similar program in Tier 2 provinces. They both are integrating the on-site facility QA assessments and DHIS2 compatible electronic checklist into their respective programs throughout the country. To ensure a smooth transition, PSK is providing ongoing support as the CNM rolls out this component under their Global Fund grant. PSK has funding from the Global Fund and the Gates Foundation to provide training to subnational staff (at operational district and provincial health department levels) on both the QA approach as well as the electronic checklist.

Integration of a QA checklist into a multifunctional clinical QA tool.

- To best support the CNM and improve use of performance data, the QA checklist was incorporated in the health network quality improvement system (HNQIS), an electronic, tablet-based tool. HNQIS is fully functional and operates using an Android application linked with the information management system DHIS2. HNQIS expands beyond the QA checklist, with a total of four modules designed to support the following focus areas:
 - Plan—Automatically schedules future assessments where support is needed most (quality of care score) and where it will have the most impact (client load) and segments outlets into four bundles by assessment status and date.

- Assess—Clinical procedures in each health area catered for by network providers through case observation or simulation.
 - Improve—Facilitates a consistent approach to provision of feedback, eliminating subjectivity regarding the areas of focus or the actual feedback provided.
 - Monitor—Facilitates the use of data in decision-making at the QA officer level. The tool is applicable for mentoring in a range of health provider networks.
- In addition, while private-sector data collected through the use of these tools are not yet integrated into the public-sector malaria indicator system, the interoperability of its DHIS2 platform would allow for smooth integration if the CNM ultimately selects DHIS2 for its long-term malaria indicator system.

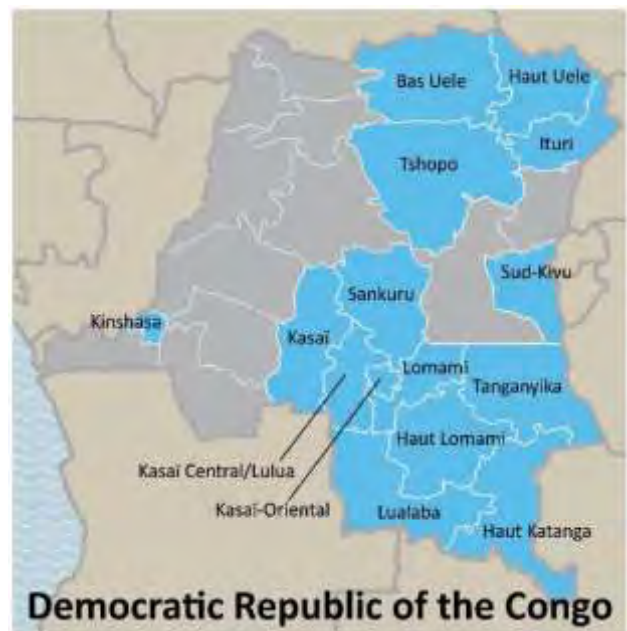
Greater Mekong Subregion QA programming.

Based on the project’s experience in Cambodia, the PSI regional malaria program has opted to use the QA methodology developed under MalariaCare to strengthen case management and surveillance in the private sector throughout the Greater Mekong Subregion. Starting in January 2016, this multi-country project—funded through the Gates Foundation—aims to contribute toward malaria elimination in Laos, Vietnam, Cambodia, and Burma.

Democratic Republic of the Congo

Introduction

MalariaCare began work in the DRC on October 1, 2012, (PY1) and continued to implement activities through September 29, 2017 (PY5). During the first two years of the project, MalariaCare supported the national malaria control program (*Programme Nationale de Lutte Contre le Paludisme* or PNLP) to implement a case management QA strategy at the national level and in five provinces and the metropolitan city of Kinshasa. In PY3, the project’s scope expanded to include rapid RDT QA training in 44 new PMI focus health zones. Following the national remapping and division of provinces, activities continued in PY4 at the national level and in 13 provinces. In the final year of the project, following the rationalization of intervention areas between PMI, the Global Fund, and the United Kingdom Department for International Development, MalariaCare concentrated its support in PY5 at the national level and in the nine provinces of Haut Katanga, Haut Lomami, Kasai Central, Kasai Oriental, Lomami, Lualaba, Sankuru, Sud Kivu, and Tanganyika.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Collaborated with the PNLP and national reference laboratory (*Institut National de Recherches Biomédicales*, or INRB) to conduct basic MDRT for a total of 64 supervisors and health facility microscopists over three sessions. Participants received reinforcement of key skills for malaria microscopy, specifically technical skills for parasite detection, species identification, and parasite counting. At post-test, improvements were noted in all test categories among the 59 participants with scores. Average scores increased by 14 percentage points for parasite detection, 21 percentage points for species identification, and 35 percentage points for parasite counting (Table 29). Of these 59 participants, 18 participants (30 percent) met the Level A or B standard for all three competency areas. Similar to most other countries, species identification remains the greatest barrier to participants meeting the Level A or B standards. When not considering species identification, 36 participants (61 percent) met the Level A or B standard for both parasite detection and parasite counting.

Table 29. Basic malaria diagnostic refresher training pre- and post-test results, DRC (n=59)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	78% (82% [18%–100%])	91% (91% [18%–100%])	13
Species identification	40% (41% [0%–77%])	61% (64% [0%–100%])	21
Parasite counting	13% (0% [0%–50%])	47% (50% [0%–100%])	34

- While a basic MDRT provides an overview of all three competency areas, the aMDRT provides for more intensive training in species identification and parasite counting. Between PY1 and PY4, 53 lab staff participated in an aMDRT (8 participants participated in more than one session), with 49 having both pre- and post-test scores. The average scores increased by 10 percentage points for parasite detection, 30 percentage points for species identification, and 46 percentage points for parasite counting (Table 30). Of these 49 participants, 37 participants (76 percent) met the Level A or B standard for all three competency areas. Participants from the advanced course were expected to lead in establishing relevant laboratory procedures within their facilities, share their knowledge with their colleagues, and, for some, continue working as laboratory supervisors in order to implement the malaria case management QA system in their province.

Table 30. Advanced malaria diagnostic refresher training pre- and post-test results, DRC (n=49)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	88% (90% [64%–100%])	98% (98% [93%–100%])	10
Species identification	58% (57% [29%–93%])	88% (91% [60%–100%])	30
Parasite counting	25% (25% [0%–75%])	71% (81% [19%–100%])	46

- Identified four high-performing laboratory microscopists from the PY4 aMDRT to attend the WHO ECAMM at UCAD in Dakar, Senegal. Two participants received WHO L1 accreditation; one received L2 accreditation; and the fourth attained L4 competency. Table 31 below provides a summary of progression in the four microscopists' performance between the pre-test at their first MDRT through their ECAMM evaluation score.

Table 31. Progression in performance from first malaria diagnostic refresher training pre-test and external competency assessment for malaria microscopy results, DRC (n=4)

Competency area	MDRT pre-test score Mean (median [range])	ECAMM evaluation score Mean (median [range])	Percentage point change in mean score
Parasite detection	91% (90% [82%–100%])	95% (96% [89%–100%])	4
Species identification	53% (56% [29%–73%])	90% (92% [83%–95%])	37
Parasite counting	31% (25% [0%–75%])	56% (57% [29%–79%])	25

- Supported a group of seven diagnostics experts to become a core group of malaria microscopy trainers that can provide ongoing microscopy training throughout the country. In addition to the four participants supported by MalariaCare, the PNLP supported an additional three to attend this four-day training-of-trainers (TOT) with Global Fund resources. Participants were drawn from the PNLP, INRB, and Haut Katanga Provincial Reference Laboratory. Of the seven, three were accredited as expert microscopists at the PY4 ECAMM, and four were selected based on their performance during an MDRT in previous years, having received either Level A or B scores. The course used the WHO's TOT protocol and provided training on technical and management aspects of laboratory services, and on on-site mentoring techniques. Participants were evaluated on four key performance areas: communication skills, presentation skills, data analysis, and report writing. A summary of participant performance is provided in Table 32.

Table 32. Diagnostics training-of-trainers pre- and post-test results, DRC

Competency area	Pre-test score Mean (median [range])	Post-test score Mean (median [range])	Percentage point change in mean score
Communication scenario 1 (n=5)*	54% (50% [50%–60%])	80% (70% [50%–80%])	26
Communication scenario 2 (n=6)*	62% (60% [50%–80%])	88% (85% [80%–100%])	26
Presentation (n=5)*	48% (40% [40%–70%])	88% (90% [80%–90%])	40
Data analysis (n=7)	61% (60% [50%–70%])	97% (100% [90%–100%])	36
Reporting (n=7)	59% (60% [50%–60%])	90% (90% [90%–90%])	31

*Some participants did not take all pre-tests on the first day of training due to late arrival. Their scores are not included in calculations for the post-test in those competency areas.

- Assured the quality of RDT use at the health-facility level in collaboration with the PNLP and INRB. MalariaCare conducted RDT QA training for health care workers in the project's 44 target health zones. During PY3, 178 provincial and health zone supervisors (a microscopist, a clinician, and two health zone management team [HZMT] members from each health zone) were trained in RDT QA and OTSS supervision skills. This training prepared the supervisors to cascade RDT QA training to individual health care workers

from ten health facilities in their health zone and to conduct future OTSS visits to these facilities with support from SIAPS, another implementing partner that works at the health zone level.

- The one-day cascade training, conducted in each of the 44 health zones, included training on kit storage and testing procedure, common technical errors, and the use of test results in clinical decision-making. The training was conducted in 29 health zones during PY3, with the remaining 15 completed in early PY4. It reached a total of 473 health care workers who regularly use RDTs in their health facilities across the 44 health zones. Due to difficulties in obtaining complete reports from each health zone, individual score data is only available for 151 (32 percent) of the healthcare workers trained. Table 33 below presents a summary of the individual participant scores for the RDT QA TOT and cascade training.



A provider reviewing the proper method for taking a blood sample for an RDT.

Photo credit: André Bope

Table 33. Rapid diagnostic test quality assurance training pre- and post-test results, DRC (n=329)

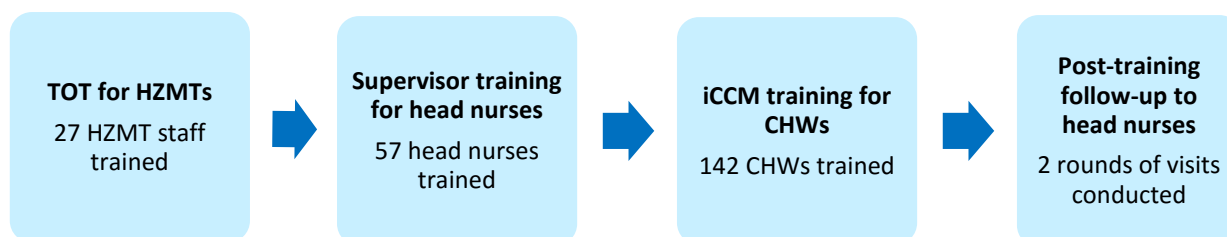
Trainees	Pretest score Mean (median [range])	Posttest score Mean (median [range])	Percentage point change in mean score
Supervisors (n=178)	46% (44% [10%–81%])	72% (71% [38%–100%])	26
Health facility providers (n=151)	49% (50% [10%–90%])	75% (80% [20%–100%])	26

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Improved access to health care for children in 71 communities by supporting the PNLP, the Haut Katanga Provincial Division of Health (*Département Provincial de Santé—DPS*), and the National Program for the Control of Diarrheal Diseases (*Programme Nationale de Lutte Contre Maladies Diarrhéées—PNLMD*) to establish 71 community health sites in remote villages in 12 Haut Katanga health zones (see Figure 27 for a summary of the steps taken to develop community health sites).

Figure 27. Steps taken to develop 71 community health sites, DRC



- Collaborated with the DPS to conduct initial assessments of each health zone in order to identify the communities where community sites would be established using the criteria laid out by the national guidelines for the development of community health sites. Once the sites were selected, 27 provincial and (HZMT members were trained on the national standards for assessment of malaria, diarrhea, and respiratory disease; use of iCCM tools; and training and mentoring techniques. The HZMTs, who going forward are responsible for training head nurse supervisors and CHWs and for overseeing the health sites, then provided community supervisor training for 57 head nurses stationed at the base health centers for the community sites and one community leader from each health zone. This training focused on reviewing national iCCM guidelines and site management tools, management and mentorship skills, and the role of community health site supervisors.
- The HZMTs then conducted iCCM training for 142 CHWs from the 71 sites (two workers per site). Over the course of six days, the CHWs were trained on assessment and treatment for malaria, diarrhea, and respiratory diseases; identification of danger signs for severe disease; proper RDT use; and referral of severe cases and administration of pre-referral treatment. The skills of the health workers and head nurses were reinforced over two rounds post-training follow-up visits at the health zone level that focused on reviewing case management guidelines, management of medicines in the health site, and use of the data collection/reporting tools. As scale up of community-level use of RDT continues, MalariaCare recommends that special attention be paid to training CHWs in biosafety and appropriate management of infectious waste, and that appropriate structures be provided at each community site.
- Upon completion of their training, MalariaCare supported the workers through the provision of iCCM kits, containing materials and data collection and reporting tools, and bicycles for use by the community health sites.
- Supported the HZMTs to provide a one-day orientation for 124 community health care site management committee members in order to build community awareness and support for the health site activities. These participants were introduced to the national iCCM management strategy and oriented to the reporting and supervision structure led by the health center head nurses so that the committee can follow up to confirm and encourage their regular supervision to the health sites.
- Conducted an assessment in a sample of 16 community health sites established by MalariaCare that had been functional for at least a year to determine the level of achievement in the implementation of iCCM, identify constraints, and make useful recommendations to guide the health zones, the province, and the national level in the implementation of community health sites. The assessment teams collected information on the coordination of iCCM activities at the provincial- and health-zone levels, the human resources involved in



Community health workers in front of their health site, Kijuba.

Photo credit: PATH/MalariaCare

implementing iCCM, supply chain management, service provision and referral mechanisms, communication and social mobilization, supervision, and M&E and the health information system. The assessment found that none of the assessed health facilities experienced a stock-out of RDT or artesunate-amodiaquine; however, artesunate suppositories, recommended as pre-referral treatment for suspected severe malaria, were not available at sites at any time. CHWs indicated that the stock-out of pre-referral medication was a determining factor in their ability to provide quality case management, their motivation, and the use of the health sites by the community. A lack of logistical and financial resources at the health-zone level and poor record keeping practices meant that fewer than 50 percent of head nurses could conduct supervision visits. MalariaCare recommends providing log books to community sites to record recommendations made during supervision visits, and to continue to work through the iCCM task force to secure additional medication, such as pre-referral treatment, for CHWs.

MalariaCare has worked with the MOH to establish more than 70 iCCM sites in Haut Katanga province. Community health workers (CHWs) at these sites are trained to provide high-quality case management for children with malaria, diarrhea, and pneumonia. Until recently, however, due to availability of only malaria commodities, testing and treatment onsite was limited to management of uncomplicated malaria—whereas children with pneumonia, diarrhea, and other severe illnesses were referred to a health facility. Through the Haut Katanga iCCM Task Force, the DPS, PMI, MalariaCare, IHP+, and PMI Expansion Project identified a means to supply iCCM sites throughout the province with oral rehydration salts and zinc to treat diarrhea, and amoxicillin to treat pneumonia. For the first time, CHWs are able to provide truly integrated case management at the community level.

- Supported the establishment and meeting costs for the first three quarterly meetings of the Haut Katanga iCCM task force, which brings together representatives from the DPS and key partners working in iCCM in the province, including UNICEF, MalariaCare, and the IHP+ and PMI Expansion projects. The task force reviewed and discussed the updated national guide for iCCM, which provides additional detail on motivation mechanisms for community workers, stages of implementing new community health sites, mechanisms for monitoring and evaluating health sites, and QA of care provided at the sites. In addition, the task force worked with PMI to obtain UNICEF support for the purchase of oral rehydration salts, zinc, and amoxicillin for community health sites, completing the iCCM package offered at the community level for the first time. Each task force partner distributed these key medications to health sites in the health zones they support.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- After supporting the PNLP and the Universities of Kinshasa and Lubumbashi to revise national guidelines and develop training materials, MalariaCare collaborated with these partners to conduct CCMRT for a total of 117 health facility clinicians and clinical OTSS supervisors through five sessions over three years. Prior to the introduction of clinical OTSS in PY3, 17 provincial-level clinicians were selected as supervisors and given training on malaria case management and supervision skills. In PY4, the 21 active clinical supervisors received additional training on the national case management guidelines using the draft national materials developed by the national malaria case management working group. Over the course of four days, participants

received training on national case management policy; diagnosis and treatment of malaria; special cases and severe malaria; pharmacovigilance; and procedures and guidelines for management of biomedical waste. A fifth day was spent conducting field visits to nearby health facilities to assess clinical case management practices through clinical observations of facility staff and record reviews. Two final sessions were conducted in PY5 for 56 clinicians and 14 supervisors. For the training conducted in PY4 and PY5, participant knowledge was evaluated through a pre- and post-test (Table 34). On average, participants made significant improvement: the average pre-test score of 46 percent (median 51 percent; range 3 to 89 percent) increased by 21 percentage points to a post-test average of 67 percent (median 67 percent; range 10 to 97 percent). Areas of weakness included clinical assessment of patients and adherence to test results.

Table 34. Clinical training pre- and post-test results, PY4 and PY5 sessions, DRC (n=93)

Trainees	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Supervisors (n=30)	55% (57% [8%–89%])	68% (69% [10%–88%])	13
Clinical providers (n=63)	42% (43% [3%–80%])	67% (66% [10%–97%])	25
Total (n=93)	46% (51% [3%–89%])	67% (67% [10%–97%])	21

Note: Scores for participants who were not present for the pre-test in PY4 are not included in this calculation. For those supervisors who received clinical refresher training in multiple years, only the last year’s scores are included here.

- Conducted OTSS supervisor training for 60 clinical and laboratory supervisors (8 of which participated in the supervisor refresher training in both PY2 and PY4) over four sessions. This training provided supervisors with an in-depth review of supportive supervision approaches and mentoring techniques, with the goal of improving the quality of on-site training and problem-solving support provided during OTSS visits. In addition, supervisors participated in practical training on the use of the OTSS checklist through a field visit to a nearby health facility to practice conducting observations and providing feedback to health care providers.
- Conducted more than 300 supervision visits to 70 provincial reference and other high-volume health facilities during 11 rounds of OTSS (ranging from an average of 2 visits in Bas-Uele, Kasai, and Sankuru to 11 visits in Haut Katanga). Thirteen provinces received support during some or all of these 11 OTSS rounds, with the largest proportion of facilities visited in Haut Katanga (30 percent) followed by Kinshasa (16 percent). Supervision in the first two years of the project focused on diagnostics at 16 health facilities in the target provinces. During PY2, MalariaCare collaborated with the PNLP and PMI Expansion Project to review and adopt a combined laboratory and clinical checklist for use in joint OTSS visits, which were initiated in PY3 during MalariaCare’s sixth and seventh rounds of visits. Due to changes in project focus provinces over the five years of implementation, and to a lesser extent due to security issues in PY5, the number of health facilities visited in each round of OTSS varied, with 42 of the 70 health facilities in total visited receiving at least four OTSS visits.
- Supported the PNLP to prepare for and implement supervision visits nationwide under Global Fund support following MalariaCare. While OTSS data continued to be collected on paper checklists through the end of the project in DRC, in PY5 MalariaCare transitioned the previous OTSS Access database to the DHIS2-based database used for EDS. This provides the PNLP access to immediate data analysis using an online dashboard function.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Revitalized the national case management working group and diagnostic and clinical sub-groups, in order to improve coordination of malaria programming and decision-making at the national level. Participants included the MOH (PNLP and Directorate of Laboratory Management, called the D8), WHO, INRB, Universities of Kinshasa and Lubumbashi, PMI, and its case management partners (PMI-Expansion Project, MalariaCare). The first activity of this working group was to conduct a review and update of the national malaria case management guidelines and develop a training curriculum and materials to be used nationwide. Through this working group, the PNLP has for the first time included nationwide case management training for health workers in its 2016–2020 National Strategic Plan, and it also included this in the 2018–2020 Global Fund grant proposal. MalariaCare also supported the national case management technical working group of the PNLP to conduct a workshop to develop the national guidelines for selecting antimalarial commodities, which was included in the 2016–2020 National Strategic Plan.
- Supported the development of a NAMS in close collaboration with the INRB. A memorandum of understanding between MalariaCare and the INRB stipulated that MalariaCare would provide all needed supplies and training, and the INRB would provide laboratory staff to collect the needed donor samples and prepare slides, conduct PCR validation, and enter all slides into the NAMS database. Following development and approval of the NAMS protocol and procurement of necessary development materials, MalariaCare provided training on NAMS sample collection and slide development for 11 INRB staff and on PCR validation for 4 staff with prior experience on conducting PCR assays. While arrangements were made early on to procure the needed *P. vivax* slides, difficulties in locating the remaining non-*P. falciparum* samples led to an extended sample collection timeline for the NAMS, which began in June 2016 and concluded in June 2017. The slides were validated by six WHO-accredited expert microscopists, who confirmed the species/density of each donor in the bank against the PCR results. Following completion of the validation, MalariaCare created a NAMS management Access database and turned the database and bank of 18,569 slides over to the INRB during the project close-out meeting in September.
- Supported the enrollment of the INRB and five provincial reference laboratories in an interim national microscopy EQA program with the United Kingdom National External Quality Assessment Service for the first two years of the project, while NAMS was being developed. Under this program, test slides were



INRB staff extracting DNA for PCR validation of a NAMS sample.

Photo credit: Daouda Ndiaye

provided eight times per year to enrolled laboratories, which examined the slides and returned their diagnoses online. Participants received a report of their results and overall performance, along with teaching information.

- Strengthened national EQA/IQA policy by supporting a national stakeholders' workshop to finalize the National Guidelines for Quality Assurance of Malaria Diagnostics in coordination with the INRB, provincial reference laboratories, the Directorate of Laboratory Management, the Provincial Bureau of Laboratory Management (called B8), and other national partners in PY3. Following finalization of the guidelines, in PY4 MalariaCare supported a national dissemination meeting and the distribution of copies to the project's targeted health zones and health facilities enrolled in OTSS.
- Supported the parasitology department at the INRB to participate in the WHO's Stepwise Laboratory Improvement Process toward Accreditation (SLIPTA) by providing key laboratory consumables and reagents; office cabinets, furniture, and internet access; and rehabilitation of the laboratory in PY3—requisite items evaluated during a SLIPTA audit.



A demonstration of the INRB's multi-head training microscope.

Photo credit: USAID/PMI DRC

- In PY4, MalariaCare continued working with the INRB to respond to weaknesses identified in the 2015 SLIPTA audit report by supporting a consultant to work with the INRB to review, develop, and document the necessary protocols and procedures to attain at least a one-star rating at the next audit. Over the course of six weeks, the consultant worked with the INRB parasitology lab staff to review and implement protocols and procedures surrounding laboratory safety, equipment maintenance and stock management, and SOPs, such as the lab communication and document management/archiving protocols.

- In addition to the support provided to the INRB, MalariaCare also supported the director of the Haut Katanga Provincial Reference Laboratory to participate in an external training on international medical laboratory quality and competence standards. This training aimed to orient him to the tools available to implement laboratory quality improvement measures and prepare for future participation in SLIPTA. Upon his return, the director used the information learned to review and implement internal quality management measures for his laboratory.
- At the recommendation of a technical expert from PMI/ US Centers for Disease Control and Prevention (CDC), procured a multi-head training microscope for the INRB and procured basic parasitological diagnostic supplies for five newly established reference laboratories in Haut Katanga, Sud Kivu, Kasai Oriental, Lulua, and Tshopo. MalariaCare also conducted an assessment of the diagnostic capacity of the seven newly established general reference hospitals in Kasai, Lomami, Sankuru, Haut Lomami, Lualaba, Tanganyika, and Bas-Uele provinces, the results of which were shared with the PNLP to improve the capacity of these laboratories in providing quality malaria diagnosis.

- Held six LLWs to review OTSS data, identify challenges and gaps in health facility performance, and identify solutions with clear, actionable steps with OTSS supervisors, provincial health authorities and PNLP. Because the data completeness continued to be a challenge in the DRC throughout the life of the project, these LLWs emphasized the importance of full completion of the OTSS checklist in order to better determine and address areas of poor performance. Following presentation and discussion of results and challenges on the first day, supervisors used the second day to develop action plans for improving upon identified weaknesses, which were presented and discussed by the plenary. Through these LLWs, MalariaCare strengthened the capacity of national and provincial health managers to analyze and use OTSS data for programmatic decision-making. As a result of this, the OTSS approach was adopted as an integral part of the 2018–2021 DRC Global Fund grant application.
- Introduced EDS to the PNLP through an abridged systems administration training for five key members of the case management and M&E divisions, focused on managing the DHIS2-based OTSS data dashboards for future supervision rounds. These staff are now able to create and manage data entry and other user accounts, add, reassign or delete health facilities, modify/delete checklist submissions if needed, and update graphs and tables to present results on key OTSS indicators. Nine PNLP staff were also trained on using tablets to enter paper checklist data directly into the EDS application. In the future, these staff can train supervisors on using the tablet-based checklist during supervision instead of paper, once funding for tablet procurement has been identified by the PNLP. Until then, the OTSS supervisors will submit completed paper checklists to the national level to enter into EDS, using tablets provided by MalariaCare.

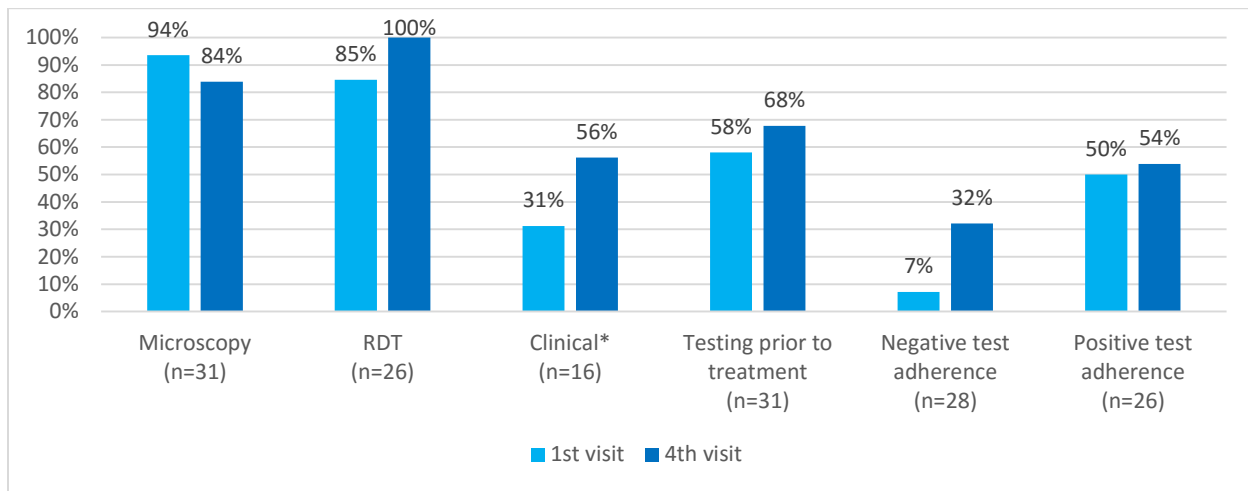
Progress made on key MalariaCare indicators

Trend analysis

The revised checklist, which was introduced in PY3, was used during 262 of the 330 OTSS visits conducted in the DRC. These visits were conducted at 69 health facilities, and only data from these visits is included in this analysis. Of the 69 facilities, 4 facilities received one visit (6 percent), 22 facilities received two visits (31 percent), 2 facilities received three visits (3 percent), and 42 facilities received four visits or more (60 percent). Figure 28 summarizes improvements among facilities that received at least four OTSS visits using the first revision of the OTSS checklist. For clinical management, the checklist was revised again for PY4 and thus scores for the visit in PY3 were not comparable to subsequent visits; therefore, the clinical results presented compare the second visit to the fourth visit. The number of facilities receiving at least four visits with the revised clinical checklist was 27 facilities (39 percent of the 69 facilities visited with this checklist).

From the first to the fourth visit, facilities showed improvement in five of the six core indicators. The greatest improvement was in adherence to negative test results, which increased from 7 percent to 32 percent of facilities meeting the target by the fourth visit, and clinical case management, which increased from 31 percent to 56 percent of facilities meeting the target. The proportion of facilities meeting the target for microscopy decreased from 94 percent to 84 percent. When investigating individual health facilities that indicated a drop in performance, many of these facilities reported suffering from high staff turnover.

Figure 28. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus fourth revised checklist visit, DRC



Note on data completeness: The proportion of facilities with data for both the first and fourth visits was greater than 60 percent for all indicators except for clinical scores (59 percent).

*Comparable clinical scores were not available for the first visit due to an error in the checklist. The results presented thus compare performance for the second versus fourth visit.

For clinical case management, increased performance on two minimum standard steps helped to contribute to an increase in overall clinical scores:

- Correct diagnosis and checking for at least one sign of severe malaria, where average facility performance improved from 69 percent to 97 percent.
- Correct prescription per test result and diagnosis, where average facility performance improved from 52 percent to 85 percent.

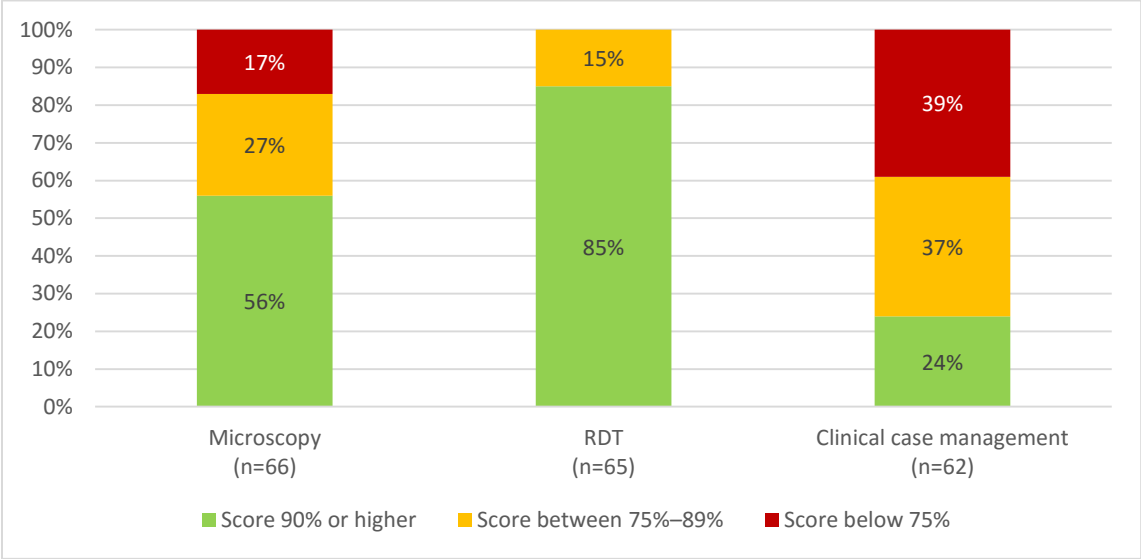
For RDTs, the greatest improvements in the minimum standard steps were:

- Recording the results correctly in the register (23 percentage point increase in average facility performance).
- Waiting the correct amount of time per manufacturer’s instructions before declaring the test result (17 percentage point increase).

Most recent visit

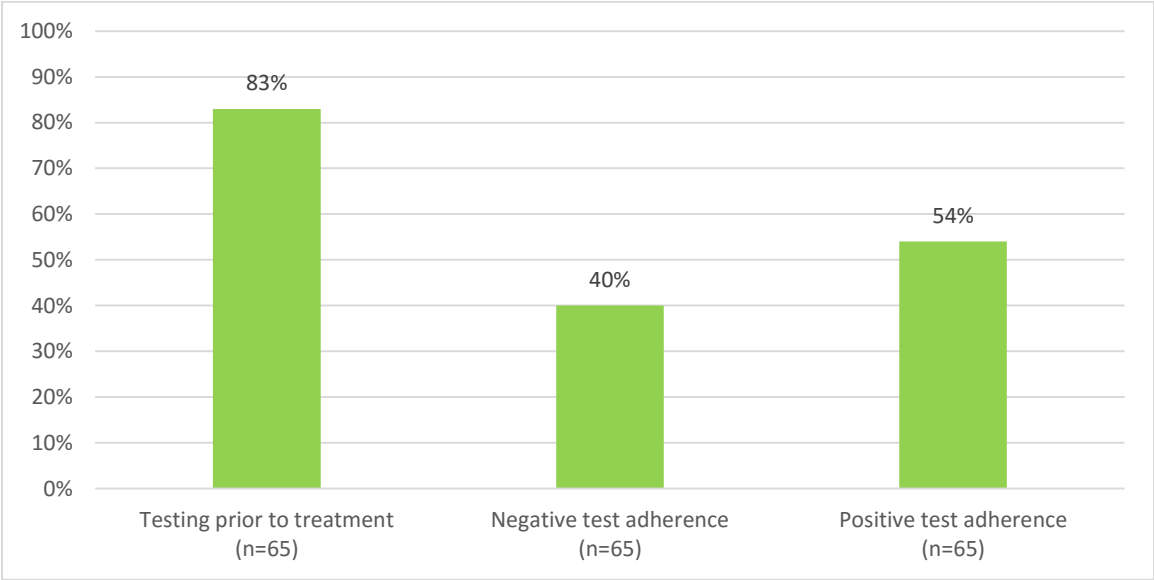
When reviewing the most recently available scores for all facilities (regardless of the number of visits received), the proportion meeting minimum targets for technical competencies (Figure 29) was similar to that of the fourth visit among those receiving at least four visits. For adherence measures, results between these two groups were similar except for testing prior to treatment: 83 percent of all facilities met the target at the most recent visit (Figure 30, n=65), compared with 68 percent of facilities with trend data during the fourth visit (n=31). This discrepancy is due to the fact that the facilities that happened to be visited more frequently tended to have started from a lower baseline.

Figure 29. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, DRC



Note: Scores were available for more than 89 percent of health facilities.

Figure 30. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, DRC

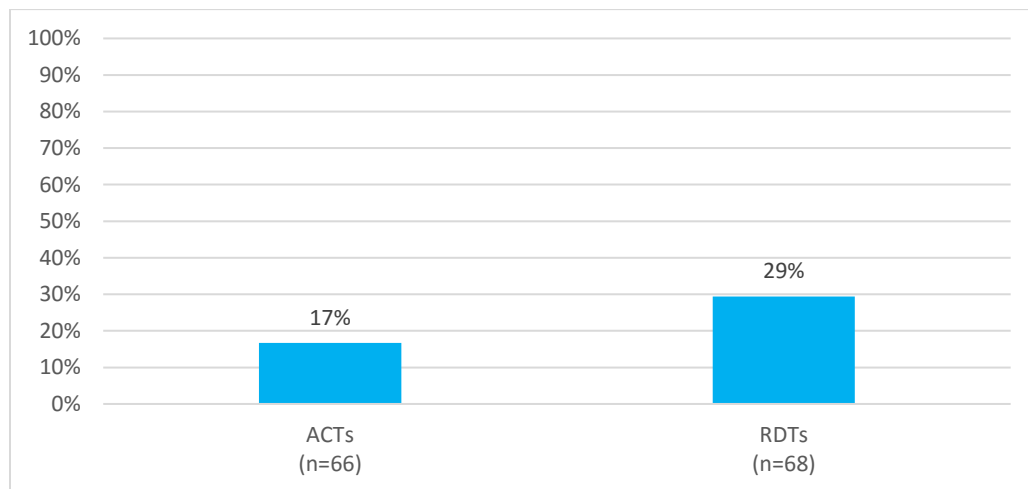


Note: Scores were available for 94 percent of health facilities.

While OTSS seems to have contributed to improved adherence among health facilities over the course of several visits, performance was much lower compared to other countries. This may have been partially attributable to the national guidelines for case management not being updated until 2016. In LLWs, supervisors also noted that many clinicians were resistant to change. As these revised guidelines are now fully disseminated in the DRC, performance on these three measures is expected to show further improvement. Stock-outs may also have been a contributing factor. Of the health facilities that did not meet the testing prior to treatment target, 7 facilities (64 percent) reported a significant RDT stock-out (n=11), versus 13 health facilities out of the 54 that did meet the

target (24 percent). Similarly, nine (30 percent) of the facilities that did not meet the target for positive test adherence (n=30) reported a significant stock-out of ACTs, compared to three (9 percent) of those facilities that did meet the target that did (n=35). Figure 31 presents the proportion of facilities reporting a significant stock-out (i.e., lasting more than seven days) in the past three months prior to the OTSS visit, for all health facilities.

Figure 31. Proportion of health facilities reporting a stock-out of ACTs or RDTs lasting more than 7 days in the past 3 months during the most recent visit, DRC



Note: Data was available for more than 95 percent of facilities visited.

Challenges

Challenges	Solution/recommendations
The number of project staff compared to the geographic scope and scattered locations of health zones led to increased activity costs due to longer travel times for implementation.	MalariaCare worked in collaboration with other PMI partners to reduce costs by coordinating activities to share transportation costs. Also, having one full-time staff member sitting in Lubumbashi greatly reduced this challenge.
While corrections made during OTSS visits help resolve on-site gaps, there were systemic challenges in analyzing, sharing, and using the data collected during OTSS in a timely manner for further activity planning.	Transition of the OTSS database from Access to EDS has enabled MalariaCare to train PNL staff to access and analyze OTSS data outputs independently, allowing better use of OTSS data for planning and decision-making.
NAMS development was a longer than expected process, taking five years from drafting of the protocol to official handover of the bank. Integrating NAMS development work into the normal work of INRB staff was burdensome.	MalariaCare and the INRB maintained a flexible timeline for slide development, and the slide bank was finalized just prior to project close-out.

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in the DRC, the following recommendations may be considered:

- Strengthen laboratory services:
 - Support the PNLP and INRB to implement the national malaria diagnostics QA system. The national cadre of expert trainers and the NAMS can be mobilized to implement training and EQA in the country’s laboratories. It is also recommended to improve the quality of service in the new provincial laboratories by providing materials and equipment where gaps exist.
 - Stock-outs of microscopy reagents, such as Giemsa stain, have been regularly identified as a challenge over the life of the project. In those facilities where reagents are available, the quality is often poor because technicians at the periphery do not always master the techniques to reconstitute quality reagents and may procure reagents of doubtful quality. PNLP provision of microscopy reagents of good quality to regional distribution centers, as the main distribution point, could improve the quality of these supplies in the majority of facilities.
- Strengthen clinical care:
 - Clinician adherence to a diagnostic test result remains the most challenging area for improvement. Disseminating the updated national guidelines for malaria case management nationwide and implementing training for clinicians at all levels will help to improve performance on this indicator. This training should focus on adherence to test results and the management of severe malaria (as appropriate for each level).
 - MalariaCare, as one of the first partners to implement the national iCCM guidelines in the DRC, faced a lot of challenges setting up the sites—identifying communities in need, selecting CHWs, training and supervising over vast geographic areas, and ensuring availability of commodities. Through collaboration with the national and provincial authorities, MalariaCare strengthened overall support to the health-zone level. For example, treatment for diarrhea and pneumonia is now available at community health sites, but it is still missing in lower level health facilities. PNLP and the provincial health authorities should capitalize on the momentum gained at the community level to reinforce and further expand iCCM sites.
 - Identify areas for coordination between case management and supply chain management implementing partners to strengthen health facility staff management of testing supplies and drugs—quantification based on consumption data, timely ordering with sufficient lead time, adding buffer stocks, and better monitoring of inventory and alerting relevant staff of any stock-outs in a timely manner.
- Strengthen implementation of the OTSS approach:
 - It is necessary to identify more cost-effective QA approaches to achieve wider impact. OTSS is effective, but expensive. In order to widen the impact of QA approaches, innovative and cost-effective approaches need to be found. For example, reducing the number of supervision visits for those health facilities with very high performance, seeking areas for integration and collaboration, and considering the use of virtual training and/or mentoring could permit the expansion of activities and increase the number of facilities that can be enrolled in OTSS.
 - Strengthen and maintain the quality of supervisors:

- The PNLP could use the NAMS to create a decentralized PT plan for laboratory supervisors. Laboratory experts at the provincial level could assess supervisors regularly using PT to identify weak performers and recommend them to the national level when MDRT is being organized.
- Any new supervisor should receive training in data collection and completion, interpersonal communication, and mentoring.
- Clinical supervisors should receive additional training on clinical mentoring and identification and management of severe malaria so that they can conduct targeted mentorship during OTSS. These individuals can also be used to support rollout of case management training for providers nationwide.
- Strengthen capacity at the level of the provincial health bureau to take ownership of and implement key QA activities:
 - Because OTSS conducted by national or provincial supervisors may not reach zones with security problems, identifying and strengthening local capacity to organize OTSS activities in such areas with minimal need for external assistance could allow for regular supervision to occur, even if not of the same standard as would otherwise be possible.
 - Decentralizing OTSS planning and implementation to the provincial level and introducing mobile money payment of per diems for supervisors could lead to lower costs due to decreased need for long-distance travel for central technical and administrative oversight.
- Strengthen the implementation of community health sites:
 - Improve and reinforce motivation systems for CHWs:
 - Monitor the World Bank’s Health System Strengthening for Better Maternal and Child Health Results (PDSS) project’s approach, in which certain health centers are going to contract with community health sites in a performance-based payment scheme to increase non-monetary incentives for CHWs. If the approach is successful, it could be scaled up to other health zones.
 - Involve CHWs in other activities, such as bed net and s campaign activities, where they will have an opportunity to share experiences and learn from one another.
 - In accordance with national iCCM protocol, a combination of head nurses and health zone staff are responsible for completing supervision. Since this is a resource- and time-intensive activity, any future redesign should consider other, more cost-effective approaches, such as group supervision of CHWs at the facility during pooled restocking of inputs. A CHW internship program at the facility that they are affiliated with would also be a good way to supervise these workers while mentoring them during a brief stay in the facility.

Transition and sustainability

- MalariaCare held a national level close-out meeting on September 11, 2017, to share and discuss project experiences and outcomes, challenges encountered during implementation, lessons learned and best practices, project data, and how activities would be continued following project close-out through other partners. A total

of 52 individuals participated in the meeting, including representatives from USAID/PMI, the PNLP, INRB, PNLMMD, provincial health teams, and other implementing partners.

- The PNLP was particularly interested in discussing how to perpetuate the knowledge gained over the life of the project and disseminating the tools developed, appropriate management of the NAMS and other materials received, and how coordination between the PNLP and implementing partners can be further improved.
- At the national level, the INRB and PNLP have adopted the national diagnostics QA framework and MalariaCare's OTSS approach. The PNLP has leveraged current Global Fund support to continue to implement supervision nationwide in the coming year. MalariaCare trained PNLP staff on OTSS data entry and analysis using the new EDS database and provided ongoing technical assistance as needed through project closure. The OTSS approach (diagnostic and clinical) has also been written into the Global Fund concept note to request for funding through 2021.
- The 71 community health sites established by MalariaCare are set to continue functioning following project closure. The CHWs trained by MalariaCare continue to provide health services to their communities using the equipment provided by the project, and USAID provided three-to-four month stock of drugs to the community sites. In addition, the provincial and HZMT supervisors will continue to support the sites through regular supervision, as prescribed in the national iCCM guidelines. Eight (8) of 12 health zones will receive support from the PDSS project, through which health centers will contract with the CHWs to purchase their services.

Ethiopia

Introduction

From PY1 to PY4, MalariaCare supported the Ethiopian Public Health Institute (EPHI) to implement key activities linked to strengthening the national malaria diagnostics QA program—building malaria diagnostic QA capacity through training of microscopist trainers, developing a NAMS, and training EPHI personnel to perform PCR malaria speciation assays.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Supported the Ethiopian MOH to form a core group of microscopy experts at the national and regional levels who would be responsible for planning, implementation, and monitoring of the malaria diagnostics QA

program. In PY4, thirteen (13) microscopists were selected for further development as expert trainers and to obtain WHO accreditation through ECAMM. In order to prepare this group for WHO testing, MalariaCare joined with EPHI and ICAP to develop an ECAMM preparatory training program that included planned study of WHO microscopy reference materials and a five-day pre-ECAMM preparation course (using a WHO training slide set). All of the 13 participants passed the three skills components (parasite detection, species identification, and quantitation) at the WHO equivalent aggregate score of L1 (n=10) or L2 (n=3).

- As in other supported countries, parasite counting proved to be the most challenging skill to master; however, this group performed well with a mean score of 71 percent (range 47 to 97 percent), which is significantly better than observed among their peers when tested in similar programs in other countries. In addition, performance in species identification was also significantly better than what has been seen during refresher training in other countries, with a mean score of 93 percent (range 68 percent to 100 percent)—this may be associated in part with the increased familiarity with *P. vivax* in Ethiopia.
- Following the pre-ECAMM course, the participants—five from the national level (EPHI and ICAP) and eight from the regional level (Adama, Bahir Dar, Tigray, Nekemte, and Dessie)—attended a WHO ECAMM session held in Adama, Ethiopia. All participants passed the ECAMM with L1 (n=8) or L2 (n=5) accreditation. According to WHO, this level of accomplishment was unsurpassed by prior WHO accreditation cohorts in Africa, and it seems to validate the quality of the pre-ECAMM preparation work, suggesting the potential for replication in other countries.



Participants from the Malaria Microscopy Refresher Training and WHO External Competency Assessment of Malaria Microscopy courses in Adama, Ethiopia (Oromia State).

Photo credit: International Center for AIDS Care and Treatment Programs

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Supported the final steps in the development of the Ethiopian NAMS. In PY2, MalariaCare supported one EPHI molecular scientist to travel to a malaria diagnostics laboratory at UCAD in Dakar, Senegal, to learn how to perform a PCR *Plasmodium* species identification assay. During PY3, the project supported a molecular scientist and trainer from UCAD to provide on-site training at EPHI for three Ethiopian PhD research staff on basic molecular techniques and perfecting the *Plasmodium* species assay.
- In PY4, final validation of the NAMS slides was performed by six WHO-accredited L1 microscopists at the Research Institute of Tropical Medicine (RITM) in Manila, the Philippines. Two slides per each of the slide

bank’s 34 donors were read by each of the six microscopists in a blinded manner; readings that were within \geq 70 percent agreement were used to determine the final diagnosis. The species identified were then confirmed by PCR speciation assay at EPHI, and a final designation of infection type (none/single species/multispecies)—and, if positive for *P. falciparum*, an aggregate density count (*P. falciparum* parasites/ μ l)—was applied to each donor sample.

- As a part of operationalizing the slide bank, made up of more than 8,500 slides for use in a national PT scheme, MalariaCare assisted EPHI to update a NAMS user database. Important reporting functions were added that will enable categorizing use of each slide during PT as either easy, moderate, or difficult. In addition, to reduce data entry error, the project worked with the MOH to develop a list of more than 950 end-user health facilities that includes standardized facility names and identifying coordinates (latitude and longitude). This will improve data completion and EPHI’s ability to track individual health facility performance over multiple PT rounds.

Challenges

Challenge	Solution/recommendations
The involvement of multiple projects, partners, and individuals with differing priorities in the development of the Ethiopian NAMS made it challenging to track progress, identify gaps, and finalize activities according to the planned timeline. Significant delays in validation of the NAMS were due to EPHI’s apprehension in using external validators from RITM rather than its own WHO-certified L1 experts.	Frequent communication between the USAID Mission and EPHI assisted MalariaCare to navigate negotiations around validation protocols, delays in submission of slides for validation, and review and reconciliation of the validation report for finalization of the NAMS database.

Additional recommendations

- In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Ethiopia, the following recommendations may be considered:
- High-density *P. falciparum* donors are missing from the Ethiopian NAMS and would be difficult to obtain domestically due to low prevalence. However, EPHI has a large number of validated *P. vivax* donors, and it is recommended that EPHI engage in slide swaps with one of the other four countries with WHO-validated slide collections that may have limited *P. vivax* slides:
 - Amref Health Africa—Nairobi, Kenya.
 - University of Lagos—Lagos, Nigeria.
 - Kintampo Health and Research Institute (KHRC) —Kintampo, Ghana.
 - UCAD—Dakar, Senegal.
- It is recommended that WHO-accredited L1 and L2 microscopy trainers be monitored through frequent PT, and if their competencies fall below the level of performance needed in the workplace over the next three years, they should attend MDRT. All experts can be considered for re-certification in three years’ time.

Transition and sustainability

The finalization of the Ethiopian NAMS has created an opportunity for EPHI to implement a number of activities outlined in its national diagnostic QA plan. EPHI is now equipped with the capacity to roll out a national competency assessment for malaria microscopy (NCAMM), conduct PT for health facilities conducting malaria microscopy, and organize refresher training for supervisors and national and regional reference laboratories. EPHI plans to build on its existing slide bank and intends to serve as an Africa regional source for *P. vivax* samples.

Ghana

Introduction

MalariaCare began work in Ghana officially in October 2012 (PY1) and continued to implement activities through September 29, 2017 (PY5). MalariaCare worked closely with USAID/PMI, the NMCP, and the Institutional Care Division (ICD) and Clinical Laboratory Unit (CLU) of the Ghana Health Service to strengthen and expand malaria case management and QA activities across the continuum of care—from regional health facilities down to the community level. In Ghana, MalariaCare worked to achieve the following objectives:

1. Scale up and improve access to and availability of quality malaria diagnostic services, with a focus on the lower health facility level.
2. Scale up and improve access to and availability of quality malaria treatment, with a focus on the lower health facility level.
3. Improve the accuracy, reliability, and availability of health information management systems.
4. Strengthen technical management ability at regional level for implementing programs and activities.

MalariaCare worked closely with the CLU to implement and support diagnostic capacity strengthening interventions in all ten regions through all five years of the project. During PY1 and PY2, clinical case management activities were focused on the seven regions of Ashanti, Brong-Ahafo, Eastern, Northern, Upper East, Upper West, and Volta. Following the closure of the Focus Region Health Project (FRHP) in February 2014 (PY2), MalariaCare assumed responsibility for FRHP's existing malaria activities and further improved case management capacity within the three regions of Central, Western, and Greater Accra, pending the start of a new bilateral project. Consequently, during the first quarter in PY3 all ten regions received MalariaCare support for diagnostic and clinical case management QA activities. Following the start of Systems for Health, clinical activities in Central, Greater Accra, Northern, Volta, and Western regions were transferred to this new bilateral starting the second quarter of PY3, or January 2015. MalariaCare continued to support clinical case management QA in the regions of Ashanti, Brong-Ahafo, Eastern, Upper East, and Upper West through the end of the project in September 2017.



Key accomplishments

Objective 1: Scale up and improve access to and availability of quality malaria diagnostic services, with a focus on the lower health facility level.

Over the five-year life of the project, MalariaCare improved the quality of malaria diagnostic services through multiple activities focused at the national, regional, district, and community levels. Due to the scale of implementation in Ghana, all accomplishments are summarized in Table 35 below, with details on key accomplishments provided in the narrative below.

Table 35. Summary of accomplishments in improving malaria diagnostic services, Ghana

Training	Purpose	PY	Participants
National-level MDRT	Reinforce key skills for malaria microscopy, specifically technical skills for parasite detection, species identification, and parasite counting.	PY2, PY3	42 national- and regional-level laboratory OTSS supervisors (3 sessions)
MDRT	Reinforce key skills for malaria microscopy, specifically technical skills for parasite detection, species identification, and parasite counting.	PY2, PY3, PY5	641 laboratory staff from regional and district levels (26 sessions)
MDRT for laboratory training institutions	Update instructor knowledge and competency in malaria diagnosis: quality control of stains, record keeping, microscope maintenance, and quality of reagents and supplies. Curriculum review to update materials to conform to the updated national guidelines.	PY3	44 instructors and laboratory technicians from the University of Development Studies and University of Cape Coast
RDT QA training	Prepare supervisors for cascade training on new multi-use buffer RDT kits.	PY3	41 regional laboratory supervisors
Orientation to national PT scheme	Prepare supervisors for implementing pilot of national PT scheme.	PY4	6 national and 6 regional laboratory supervisors received training on the PT approach
Laboratory supervisor refresher training	Reinforce mentoring skills, provide guideline updates on diagnosis and treatment of malaria, and review the laboratory OTSS checklist.	PY4	41 regional laboratory supervisors from 9 regions

Note: MDRT=malaria diagnostic refresher training; PY=project year; OTSS=outreach training and supportive supervision; RDT=rapid diagnostic test; QA=quality assurance; PT=proficiency testing.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following key activities:

- Strengthened national laboratory EQA/IQA policy by supporting the NMCP to revise and distribute the national guidelines for laboratory diagnosis of malaria and the national malaria microscopy and RDT QA manual. Additionally, MalariaCare collaborated with the CLU to redesign the national laboratory register to more efficiently capture critical data. The revised register is used in laboratories nationwide.
- Trained a cadre of 42 national and regional malaria microscopy experts during the national-level MDRT. During the training, participants read well-characterized slides and were given feedback throughout the course to improve their skills. In addition, participants prepared and stained blood films, reviewed RDT QA (including how to prepare high-quality test results and monitor for problems with test kits), and were trained to work with clinicians to improve appropriate use of test results.

- Based on slide reading performed over the course of the MDRT, average scores for the 42 supervisors increased by 13 percentage points from pre-test to post-test for parasite detection, 30 percentage points for species identification, and 41 percentage points for parasite counting (Table 36). At the end of the training, 11 of the 60 participants (18 percent) met the Level A or B standard for all three competency areas. Despite the increase in average performance on species identification, this competency area was the greatest barrier: only nine participants (21 percent) attained L2 or above. In comparison, 34 participants (81 percent) met the Level A or B standard for parasite detection, and 38 participants (90 percent) met the Level A or B standard for parasite counting.



Regional malaria diagnostic refresher training participants from Northern Region.

Credit: Richard Kpabitey, MalariaCare Ghana

Table 36. Most recent malaria diagnostic refresher training pre- and post-test results, national- and regional-level supervisors, Ghana (n=42)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	73% (73% [45%–100%])	86% (86% [60%–100%])	13
Species identification	39% (38% [0%–100%])	69% (73% [39%–92%])	30
Parasite counting	23% (25% [0%–75%])	64% (67% [8%–100%])	41

Of the 641 laboratory staff participating in the regional-level MDRT, 632 had both pre- and post-test scores. Average scores increased by 17 percentage points for parasite detection, 34 percentage points for species identification, and 30 percentage points for parasite counting (Table 37). Sixty-three (63) participants (14 percent) met the Level A or B standard for all three competency areas. Similar to the national- and regional-level supervisors, species identification was the weakest competency area; if this criteria were removed, 225 participants (36 percent) would have attained Level A or B on both parasite detection and quantification.

Table 37. Malaria diagnostic refresher training pre- and post-test results, health facility lab staff, Ghana (n=632)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	63% (64% [0%–100%])	80% (81% [0%–100%])	17
Species identification	25% (22% [0%–100%])	59% (60% [0%–100%])	34
Parasite counting	16% (0% [0%–100%])	46% (43% [0%–100%])	30

- Supported the revision and distribution of RDT training materials to accommodate the temporary shift from single-use buffer RDT kits to multi-use buffer kits in PY3. Laboratory supervisors from the regional level were trained on the use of the new RDT kits and then cascaded the update training to RDT providers in their regions in PY4 and PY5 during case management training (reported under objective two). Clinical/M&E OTSS supervisors were also instructed to review procedures for using the new RDTs during their visits, beginning in PY4.
- Strengthened national EQA/IQA capacity through development of a national PT program for malaria microscopy in collaboration with the CLU. This is implemented in health facilities with microscopy infrastructure to assess and improve the skills of a large number of malaria microscopists. Prior to laboratory OTSS, panels consisting of ten malaria slides were shipped to each facility, with instructions to have laboratory staff read the slides and document their findings on an electronically generated answer form prior to the OTSS visit. During OTSS, supervisors read the slides themselves and provided feedback and mentoring to lab staff based on the answers they reported. The scheme was piloted by the CLU in 28 health facilities in Ashanti region in August 2016 (PY4), and later it was scaled up nationwide by the CLU during both rounds of laboratory OTSS in PY5, reaching 34 health facilities twice.
- Developed a national-level expert microscopist accreditation program with the NMCP and CLU, which is designed to assess microscopist capacity to accurately and consistently identify malaria infection at low density counts, and to correctly identify *P. ovale*, *P. malariae*, and mixed infections. Following the recommendation made in a CDC technical assistance trip report, in PY4 MalariaCare discussed and agreed with the NMCP and PMI to shift focus from implementing the NCAMM to introducing and scaling up the national PT scheme described above. The reasoning for the switch in emphasis was that with available resources, it was more cost-effective to focus on improving the competencies of all microscopist cadres through actually on-site mentoring versus using a centralized training mechanism such as the MDRTs.
- Supported expert accreditation of four high-performing laboratory microscopists at the WHO ECAMM in Nairobi, Kenya, during PY3. Three participants received WHO L2 accreditation and one L4 competency. All participants obtained WHO L1 scores on parasite detection and obtained WHO L1 or L2 scores on species identification (two each), and three of the four participants obtained L2 scores on parasite counting.
- Supported Ghana participation in a multi-country pilot of a virtual malaria microscopy e-learning training course. The product, developed by Intellectual Ventures and Amref Health Africa, was packaged on a USB drive, designed to provide for approximately 40 hours of self-study, and used a combination of didactic teaching modules and use of a “virtual microscope” to improve both knowledge and practical microscopy reading skills. MalariaCare recruited 46 laboratory OTSS supervisors from Ghana to participate in the pilot in PY5. Of the participants, 41 responded to a survey after completing the course. They reported that they found the delivery of the overall course content to be effective, and that the information and images helped to improve their microscopy skills. Feedback from 154 participants from 19 countries is being used to update the course material for anticipated worldwide availability in 2018.

- Supported the NMCP and KHRC to complete the final steps in operationalizing the malaria microscopy slides that were developed during IMaD into a validated and functional national malaria slide bank. In PY3, MalariaCare supported KHRC to perform PCR species validation of samples from 38 infected donors. In accordance with the WHO’s two-step protocol for slide bank validation, MalariaCare then supported microscopic visual validation by six WHO L1 microscopists (two slides/microscopist/donor). In PY5, MalariaCare worked with KHRC and the NMCP to write a NAMS operational manual, which outlines SOPs for managing the slide set for malaria microscopy training and use in the PT scheme. The resulting slide bank contains 6,084 high-quality, well-characterized slides from 44 donors of malaria species endemic to Ghana, high and low parasite densities of *P. falciparum*, mixed infections, and negative samples. Currently, the slide bank is hosted at KHRC under the guidance of the NMCP and CLU.



Ghana’s malaria slide bank is housed at the Kintampo Health Research Center (KHRC).

Photo credit: David Dosoo, KHRC

- Built capacity at the CLU to manage the implementation of laboratory OTSS nationwide. In PY1, MalariaCare worked closely with the CLU to review and update the laboratory OTSS checklist, develop the budget for rolling out supervision visits nationwide, and coordinate with the regions to schedule supervision visits. MalariaCare provided funding and technical assistance for three rounds of supervision visits during PY1 and PY4, while a government-to-government funding mechanism between USAID and the Ghana MOH was being negotiated and finalized. The CLU directly implemented two rounds of OTSS in PY5 with data management technical assistance provided by MalariaCare. Over five rounds, the CLU received technical assistance from MalariaCare to conduct 830 visits to the more than 405 laboratories enrolled in OTSS.
- The visits were used to reinforce weak areas identified during previous visits, train and mentor staff on microscopy and RDT skills, and provide feedback on identified issues and challenges within facilities. During all rounds, supervisors used paper checklists to collect data, which was entered at the central level into a Microsoft Access database capable of producing regional performance reports. (At the time of publication, the CLU was still tasked with verifying the data quality of final results, and thus results are not shown here.) Program quality was maintained by ongoing oversight over OTSS supervision teams by MalariaCare technical advisors and national supervisors from the Ghana Health Service each round.

Objective 2: Scale up and improve access and availability to quality malaria treatment with a focus on the lower health facility level.

Over five years, MalariaCare improved the quality of malaria treatment services through multiple activities focused at the regional, district, and community levels. All accomplishments are summarized in Table 38 below, with details on key accomplishments provided in the following narrative.

Table 38. Summary of accomplishments in improving malaria treatment services, Ghana

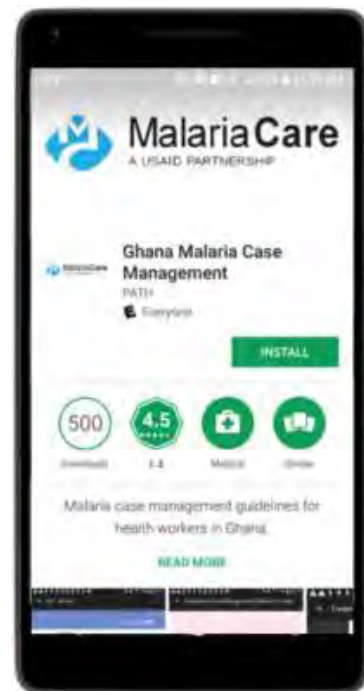
Training	Purpose	PY	Participants
Case management update seminar	Update clinical providers on the revised national case management guidelines.	PY2, PY3	10,323 health care workers nationwide
Symposia on updated national guidelines	Update clinical providers on the revised national case management guidelines.	PY2, PY3	761 doctors and physician assistants
Case management/RDT training	Provided review of management of uncomplicated and severe malaria, malaria in pregnancy, RDT use, and appropriate biohazardous waste disposal prior to entry into workforce.	PY4, PY5	985 newly hired physician assistants, clinical nurses, midwives, and medical doctors
National guideline update for pharmacists	Build pharmacist capacity in stock management in order to strengthen the health supply chain management in private and public health institutions, and review national policy surrounding test-based treatment of malaria.	PY2	1,697 pharmacists
Triage and management of complications for severe malaria	Build clinician capacity in triage and management of complications from malaria, practical sessions on the inpatient ward, and group discussions of cases.	PY5	189 clinical staff from two referral hospitals per focus province (total 10 hospitals)
RDT and triage for severe malaria training	Build clinician capacity in triage and management of complications from malaria, practical sessions on the inpatient ward, and group discussions of cases.	PY3	191 providers from the Cape Coast Teaching Hospital, Komfo Anokye Teaching Hospital, Korle Bu Teaching Hospital, and Tamale Teaching Hospital
Update training on revised national guidelines	Ensure medical school lecturers are equipped with the most up-to-date knowledge of the national guidelines.	PY4	267 lecturers from the University of Cape Coast, University of Science and Technology, University of Ghana, and University of Development Studies medical schools
Curriculum update workshop	Ensure medical school curricula are teaching the most current national guidelines for malaria diagnosis and treatment.	PY5	57 lecturers from the five medical schools
iCCM training-of-trainers (TOT)	TOT for cascade of training on updated national iCCM guidelines.	PY2	83 national and regional officers; 652 district-level supervisors
iCCM cascade training	Update community-level providers on the updated national iCCM guidelines.	PY2, PY3	2,169 CHOs and community-based agents
CHO internships at district hospitals	Improve the quality of care provided by CHOs in management of malaria and other febrile diseases.	PY2, PY3	134 CHOs
Clinical/M&E supervisor training	Create a cadre of clinical and M&E supervisors with expertise on the national clinical case management guidelines, RDT, EDS, and supervision skills.	PY2, PY3, PY4, PY5	1,877 regional and district-level clinical and M&E supervisors from 9 regions
Targeted mentoring	Improve adherence to mentoring on adherence to malaria diagnosis protocols, documentation, identifying other causes of febrile illness, and documentation and reporting during additional supervisor mentoring visits to health facilities outside of OTSS.	PY3	144 providers in health facilities in Ashanti and Upper East regions

Note: PY=project year; RDT=rapid diagnostic test; iCCM=integrated community case management; CHO=community health officer; M&E=monitoring and evaluation; EDS=electronic data system; OTSS=outreach training and supportive supervision.

In support of strengthening capacity in malaria treatment, MalariaCare conducted the following key activities:

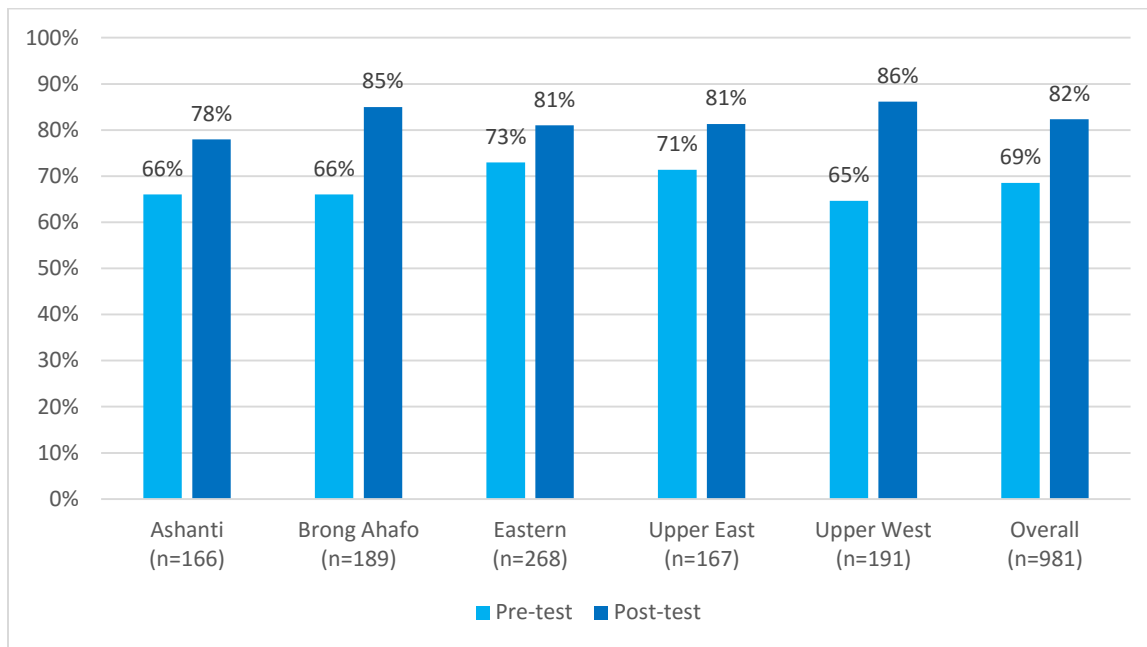
Case management training

- The format of case management training in Ghana varied each year based on the skill level of target participants, from one-day workshops to a two-day update course to review the updated national guidelines. In addition to stand-alone training, supervisor training for clinical, M&E, and community-level supervisors all included case management components as relevant to each cadre. Following the update of the national guidelines in PY2, MalariaCare supported the distribution of fever case management algorithms and updated seminars on the revised guidelines to 10,323 health care workers, including staff in teaching hospitals, over more than 145 sessions. MalariaCare also coordinated with the NMCP and Medical and Dental Council to organize nine one-day continuing medical education (CME) symposia on the updated national malaria guidelines in PY2 and PY3—which drew more than 760 participants.
- In PY4 and PY5, MalariaCare performed a practical clinical update training for 985 newly hired physician assistants, clinical nurses, midwives, and medical doctors entering into their first position after graduation from training school. This course covered the management of uncomplicated and severe malaria, malaria in pregnancy, RDT use, and appropriate biohazardous waste disposal. Participant knowledge increased from an average pre-test score of 69 percent (median 72 percent; range 0 to 93 percent) to a post-test average score of 82 percent (median 84 percent; range 8.5 to 100 percent). See Figure 32 below for a summary of performance by region.



The Ghana Malaria Case Management Android application—developed by MalariaCare during PY4—serves as an easy-to-access reference library for current national malaria case management guidelines, malaria treatment algorithms, and an RDT job aid that can be accessed offline on an individual health care worker’s smartphone.

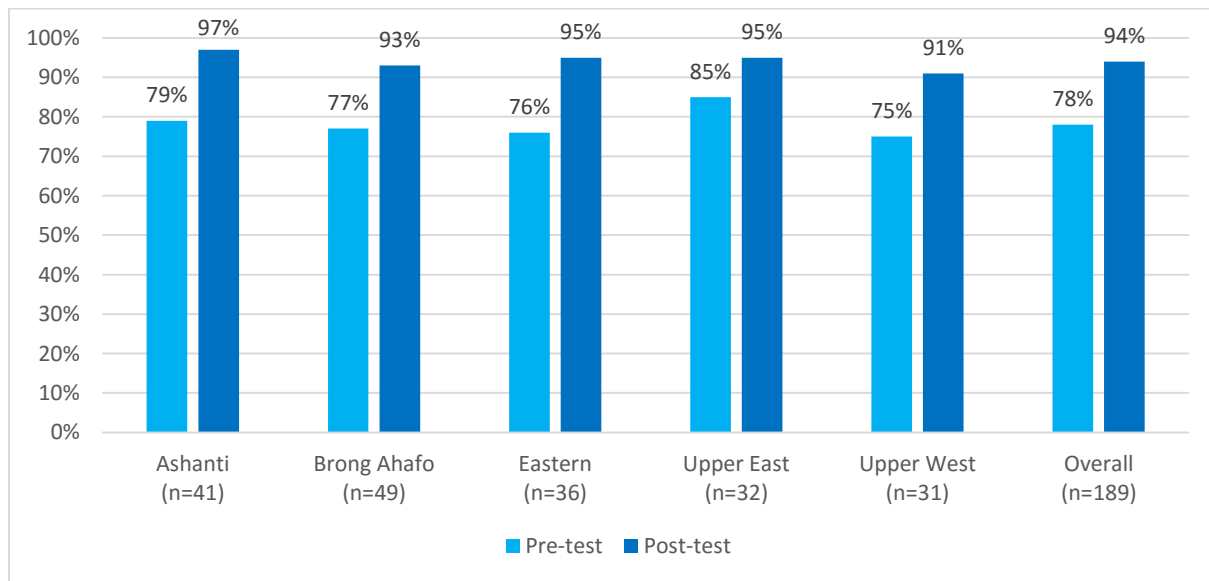
Figure 32. Average pre- and post-test performance in malaria case management training for newly hired clinical staff, Ghana (n=981*)



*Scores from four participants are not included because they did not take both the pre- and post-test due to late arrival or early departure.

- A training course on severe malaria was performed in PY5 for 189 clinical staff from two referral hospitals in each of the five focus regions. The course had presentations on triage, management of complications, practical sessions on the inpatient ward, and group case discussions. The participant scores improved from a mean of 78 percent at pre-test (median 80 percent; range 39 to 100 percent) to 94 percent (median 98 percent; range 60 to 100 percent) at post-test (See Figure 33 below).

Figure 33. Average pre- and post-test performance at severe malaria training for referral facilities, Ghana (n=189)



- Ensured that new clinicians enter the workforce with up-to-date knowledge and are current on the national guidelines for malaria case management by providing support to Ghana’s medical schools. In earlier years, MalariaCare trained lecturers and teaching hospital staff on the updated national case management guidelines. In PY5, 57 lecturers from the five medical schools participated in workshops to update their teaching materials based on the latest national case management guidelines. The meetings were co-facilitated by specialists from the pediatric, internal medicine, and obstetrics and gynecology departments and included modules for malaria policy recommendations, the epidemiology and natural history of malaria in Ghana, diagnosis and management of uncomplicated and severe malaria, malaria in pregnancy, RDT use, and biohazardous waste disposal. The lecturers are now equipped to provide training to medical students on the latest guidelines, enabling them to provide quality malaria diagnosis and treatment when entering into medical practice following graduation.

Community-level interventions

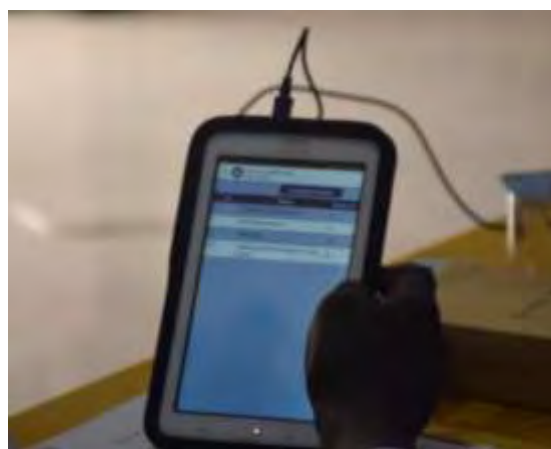
- Improved access to quality malaria diagnosis and treatment at the community level, beginning with supporting the update of the national iCCM guidelines to include the use of RDTs by community-based agents and the integration of all community-level interventions aimed at reducing morbidity and mortality in children under five. In PY2–PY3, MalariaCare supported countrywide training on the updated guidelines as well as the NMCP’s nationwide pilot of OTSS at the community level by assisting in the design of an electronic interface for data entry, providing support for analyzing the data collected, and supporting supervisors to conduct the OTSS visits in 16 districts. Following the pilot, the Ghana Health Service agreed to institutionalize community-level OTSS; however, since then funding has not been available to continue with implementation.
- Improved the quality of care provided by community health officers (CHOs) in management of malaria and other febrile diseases through the development and pilot of an internship program for CHOs at district hospitals. Interns underwent practical sessions in the outpatient clinic and were trained on history taking and physical examination; management of fever and other conditions related to malaria, acute respiratory infection, diarrhea, ear-nose-throat, genitourinary, and skin issues; and evaluation for malnutrition and anemia. An assessment of the program conducted in PY4 found that CHO adherence to a negative diagnostic test result for malaria increased from 78 percent prior to the internships to 100 percent after the program; feedback from participating CHOs indicated that the internships had a positive impact on their approach and confidence in managing febrile illnesses.

Clinical and M&E OTSS

- Created a cadre of 1,877 regional and district-level clinical and M&E supervisors. Over its five-year period of implementation, MalariaCare conducted 39 sessions of clinical/M&E OTSS supervisor training. This started in PY2 with a TOT for a core team of 36 regional supervisors on the updated national case management guidelines and supervision skills. The best performers served as master trainers for future cascade training to regional- and district-level supervisors. In PY3, MalariaCare updated its supervisor training curriculum to put greater emphasis on supportive supervision and mentoring skills, including topics such as communication, the supervision process, and on-the-job training. Beginning in PY4, supervisors were also trained to enter

supervision checklist data using the MalariaCare-developed EDS application on Android tablets. This system, which allowed for real-time data submission to a cloud-based database, dramatically improved turnaround time for OTSS data entry and analysis, as well as completion rates.

- Developed a clinical/M&E mentoring tool that is used nationwide during supportive supervision visits. In PY1, MalariaCare collaborated with the NMCP and ICD to review and update the clinical checklist used during the ProMPT project for use during clinical/M&E OTSS going forward. Following the update and beginning in PY2, MalariaCare then supported the NMCP and regional health management teams (RHMTs) to plan and carry out over 11,000 visits to more than 3,100 health facilities over the course of seven rounds of joint clinical/M&E OTSS. Five regions (Ashanti, Brong-Ahafo, Eastern, Upper East, and Upper West) received support for all rounds, and over the course of the project all regions in Ghana were supported with the exception of Greater Accra. During each round, supervisors aimed to cover at least 80 percent of all facilities in their districts, except for the final round where supervisors were asked to target the lowest-performing 50 percent due to budgetary limitations. In order to improve the quality of data collection, MalariaCare implemented piloted use of the EDS in September 2015 (PY3) with visits to 98 health facilities in ten districts. During the second OTSS round of 2016 (PY4), EDS was implemented throughout the country, leading to significantly improved tracking of each facility moving forward.



Supervisors were trained on using tablets to enter checklist data directly into the electronic data system during project year four.

Photo credit: MalariaCare Ghana

- MalariaCare staff evaluated a sample of clinical, data management, and RDT supervisors during the final OTSS round conducted in PY5. Of the 360 supervisors estimated to have conducted supervision, MalariaCare evaluated 26 clinical supervisors, 22 data management supervisors, and 24 supervisors that conducted RDT observations (a combined 20 percent of all supervisors). Evaluations were conducted by MalariaCare technical staff using the EDS tool and focused on pre-OTSS preparation, adherence to SOPs on conducting health worker observations, completeness in filling out the OTSS checklist, and the ability to facilitate the development and dissemination of an action plan with the facility. The average performance score was roughly the same across all supervisor cadres, with clinical supervisors receiving an average score of 84 percent, and RDT and data management supervisors receiving an average score of 88 and 89 percent, respectively.



A laboratory technician conducts a malaria rapid diagnostic test (RDT) during a supervision visit at Gushiegu District Hospital, Northern Region.

Photo credit: Robert Alibo, MalariaCare Ghana

The evaluation revealed that nearly all supervisors (99 percent) greeted the health worker, provided feedback and improvements to the health worker, ensured staff understood feedback, completed all relevant checklist questions, identified areas of improvement that were within their mentoring, and worked with appropriate staff to resolve problems identified. However, similar to findings during supervisor evaluations in other countries, a smaller fraction of Ghana supervisors across all cadres reviewed data from the previous OTSS visit (53 percent), prioritized three problems appropriately if more than three were identified (68 percent), and determined the status of the problems identified during the previous visit and discussed with staff (68 percent).

Objective 3: Improve the accuracy, reliability, and availability of health information management systems.

Over five years, MalariaCare worked closely with the NMCP and the Policy Planning Monitoring and Evaluation Division (PPME) to improve the accuracy, reliability, and availability of health information by supporting M&E capacity-building at the district and health facility levels. All accomplishments are summarized in Table 39, with details on key accomplishments provided in the narrative below.

Table 39. Summary of accomplishments in improving health information systems, Ghana

Training	Purpose	PY	Participants
Malaria data management training	Improve data quality and data management skills of HIOs.	PY2, PY3, PY4	607 district HIOs
Electronic data system (EDS) data-user training	Build capacity for national, regional, and district staff to use EDS dashboards to analyze and present OTSS data for decision-making.	PY4	23 NMCP and regional staff; 333 district HIOs, clinical supervisors, and district managers

Note: PY=project year; HIO=health information officer; OTSS=outreach training and supportive supervision; NMCP=national malaria control program.

In support of strengthening HMIS capacity, MalariaCare conducted the following activities:

- Supported the development and distribution of national M&E and health information management policy and job aides. MalariaCare supported the NMCP and PPME in the development and distribution of the M&E section of the Ghana Malaria Strategic Plan (2014–2018), which serves as the main reference for monitoring implementation. The project also supported the Ghana Health Service to develop and distribute SOPs on health information management to district health management teams (DHMTs) nationwide. During this reporting timeframe, MalariaCare is also supporting the NMCP in development of a malaria data management job aid for facility-level health information officers (HIOs) and data managers.
- Increased the capacity of 607 HIOs to carry out various data management responsibilities through the implementation of malaria data management training using the updated Ghana Health Service SOPs on health information management. The workshop focused on basic data quality standards, conducting data quality assessment and report writing, the current priority indicators and source of information, conducting data quality audits, and strategies for incorporating evaluating the quality of decision-making data in their everyday work.
- Collaborated with NMCP and PPME to develop data quality checklists for M&E supervisors to use during joint clinical/M&E OTSS visits in PY1. Following adoption of the OTSS checklists, M&E OTSS visits were

conducted jointly with clinical OTSS visits. In addition to providing coaching on malaria reporting and routine systematic M&E issues, supervisors also conducted data verification exercises on select malaria indicators captured in Ghana's health information system, called DHIMS2.

- During the seven rounds of OTSS over the project lifespan, M&E supervisors provided on-site mentoring to data managers at more than 3,100 health facilities.
- Provided electronic data use training on using EDS data and dashboards for decision-making. The training included reviewing and editing data, building graphs and tables, using data to evaluate individual health facility performance, and using the OTSS data dashboards in the EDS DHIS2-based database. Participants were supported to use the EDS dashboards to create data presentations for their districts to share at LLWs.

Objective 4: Strengthen technical management ability at the regional level for implementing programs and activities.

In support of strengthening technical management capacity for implementing programs and activities, MalariaCare conducted the following activities:

- Supported the NMCP and PPME to conduct two rounds of national data quality audits in PY3 that assessed the quality of malaria data reported by health facilities, including data recording, aggregation, validation, verification, and entry into DHIMS2. During the audit, ten newly created districts were found lacking in basic information technology infrastructure necessary to appropriately report into DHIMS2—MalariaCare responded by providing desktop computers and supported further training on use of the health management system.
- Played a leading participant role in multiple NMCP subcommittee meetings, including the case management working group, malaria in pregnancy working group, and M&E working group through all project years. During these meetings, MalariaCare representatives provided activity updates and contributed to the revision of policy documents and work plans. Participating in these working groups encouraged stronger collaboration and harmonization of activities with the NMCP and other implementing partners, as well as helped to meet national-level M&E technical assistance needs and supported the NMCP and ICD to strengthen malaria M&E systems. The project also actively participated in planning and implementation of World Malaria Day activities in Ghana.
- Supported and participated in the Regional Health Services Annual Performance Review meetings. These meetings were used to review the performance of the health sector over the previous year.
- Strengthened RHMT program planning and management skills through yearly, one-day, joint work planning sessions with the each of the project's five focus region RHMTs to review and obtain buy-in for planned activities, and to develop joint activity implementation plans to ensure that the RHMTs were aware of and available for MalariaCare activities over the course of the coming year. Increasingly, these meetings were used to work with RHMTs on their activity planning and implementation skills, for transition, eventually, of activity support from implementing partners to the regional government.
- In PY1 and PY2, worked with RHMTs to develop tools and a planning guide for malaria program management supervision of DHMTs. The tool was used by regional OTSS teams to evaluate the structure and

performance of a district supervision team during visits. Use of the tool was discontinued with the introduction of EDS, as the transition made real-time monitoring of data submissions by individuals possible.

- Collaborated with DHMTs, RHMTs, and the NMCP to develop and publish annual malaria bulletins, which share information on project activities and general malaria case management activities, celebrate milestones and achievements, deliver training trips, and highlight current issues in malaria management in the country. Three annual bulletins were published and distributed in MalariaCare’s project regions.
- Following each joint clinical/M&E OTSS rounds, LLWs were conducted to discuss OTSS data for decision-making, share lessons learned, agree on how to follow up on action plans to ensure that the gaps identified during OTSS visits are addressed, and plan for the next round of clinical/M&E OTSS. In addition, these workshops were also used to foster closer relationships with the RHMTs in order to discuss and address challenges identified at the facility level, such as poor data management, stock-outs of malaria commodities, and needs for refresher training for staff and regular supervision. In total, 24 LLWs were held for supervisors and RHMTs over the course of the project’s five years.

Using OTSS data for decision-making

At a lessons learned workshop, the district team from Busia South in the Upper West region saw that OTSS data indicated most health workers performing RDTs were not trained. Resources were quickly mobilized to organize RDT training for the untrained staff.

Progress made on key MalariaCare indicators

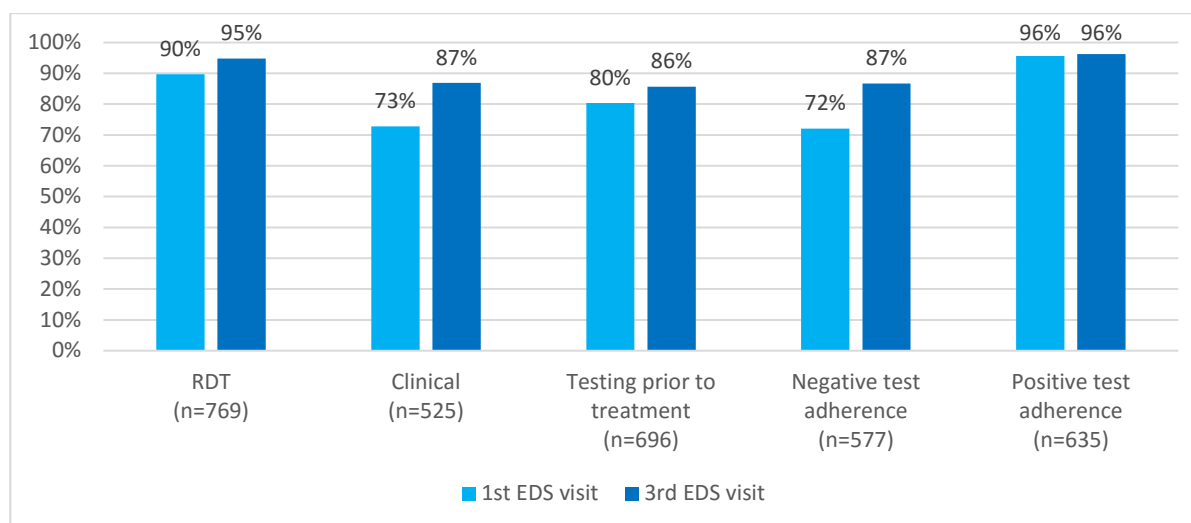
Trend analysis

Figure 34 and Figure 35 summarize improvements among facilities that received at least three clinical and M&E OTSS visits using the EDS tool. Of the 2,008 facilities ever visited using EDS, 985 (49 percent) had three visits, 682 (34 percent) had two visits, and 341 (17 percent) had one visit.

Because laboratory supervision is conducted separately from clinical/M&E OTSS in Ghana and uses a previous version of the laboratory OTSS checklist, microscopy performance is not included in the following analyses. A description of the laboratory OTSS activity is included under objective one in the previous section.

Of those facilities visited at least three times, facilities showed improvement in four of the five core indicators (Figure 34), with the last indicator—positive test adherence—not surprisingly continuing to perform at the baseline of 96 percent. This consistently high performance was likely aided by the low levels of ACT stock-outs (at least 90 percent of facilities did not report a significant stock-out of ACTs at both time points) during the reporting period. The greatest improvement was seen in adherence to negative test results, which increased from 73 percent to 86 percent of facilities meeting the target by the third visit.

Figure 34. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus third EDS visit, Ghana



Note: For RDT, testing prior to treatment, and positive test adherence scores, the percentage of facilities with scores at both the first and third visit was greater than 64 percent; for clinical, 49 percent; for negative test adherence, 59 percent.

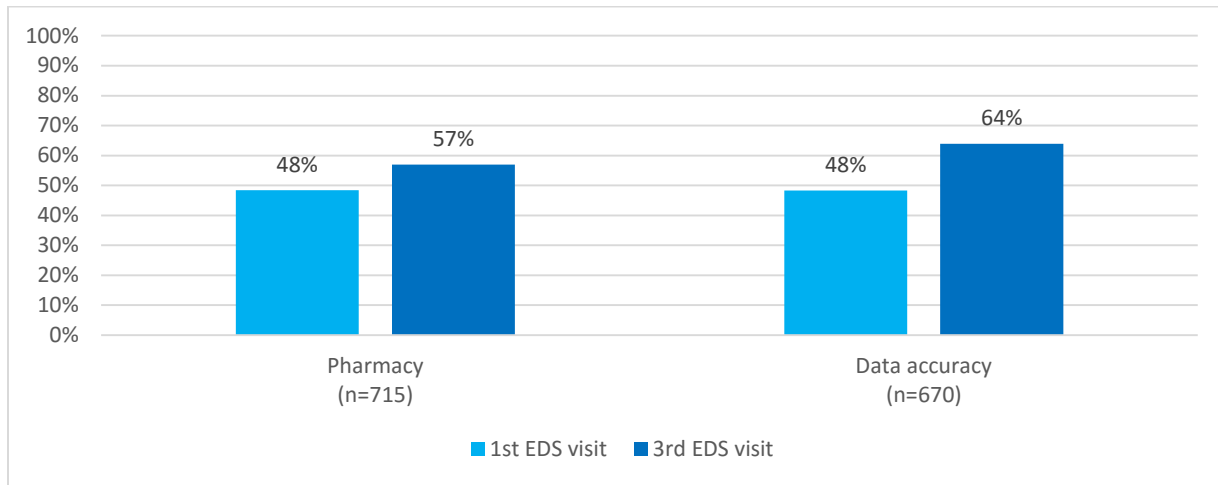
For clinical case management, performance on taking a clinical history and conducting a physical exam helped to contribute to an increase in overall clinical scores. Notably, average facility performance improved for the following:

- Conducting a skin exam and checking for rash or dehydration (from 52 percent to 66 percent).
- Checking for altered consciousness (from 44 percent to 57 percent).

For RDTs, the greatest improvement among the minimum standard steps was waiting the correct amount of time per manufacturer’s instructions before declaring the test result (seven percentage point increase).

Starting in PY4, two new OTSS team members—a pharmacist and a district HIO—began supporting health facility visits. Using specially designed checklists, the pharmacist evaluated the state of the pharmacy and observed prescriptions being dispensed while the HIO compared malaria health data recorded in patient registers with those entered into Ghana’s HMIS, called DHIMS2. Of the 2,002 facilities visited since then, 965 facilities received three visits. Improvements in both areas were seen among these facilities, with the greatest improvement seen in data accuracy. The proportion of facilities where the four DHIMS2 malaria indicators [uncomplicated malaria suspected; uncomplicated malaria suspected tested; uncomplicated malaria suspected tested positive; and outpatient department malaria cases prescribed ACTs] matched those recorded in the registers (within 10 percent) increased by at least 10 percentage points between the first and third visit. The proportion of facilities with all indicators matching between the DHIMS2 and the registers increased from 48 percent during the first visit to 64 percent during the third (Figure 35). For the pharmacy observations, the greatest improvement was seen in the direct observation of the first dose of an antimalarial in the facility (if the patient is under five years).

Figure 35. Proportion of facilities obtaining perfect pharmacy observation and data accuracy scores, first versus third EDS visit, Ghana

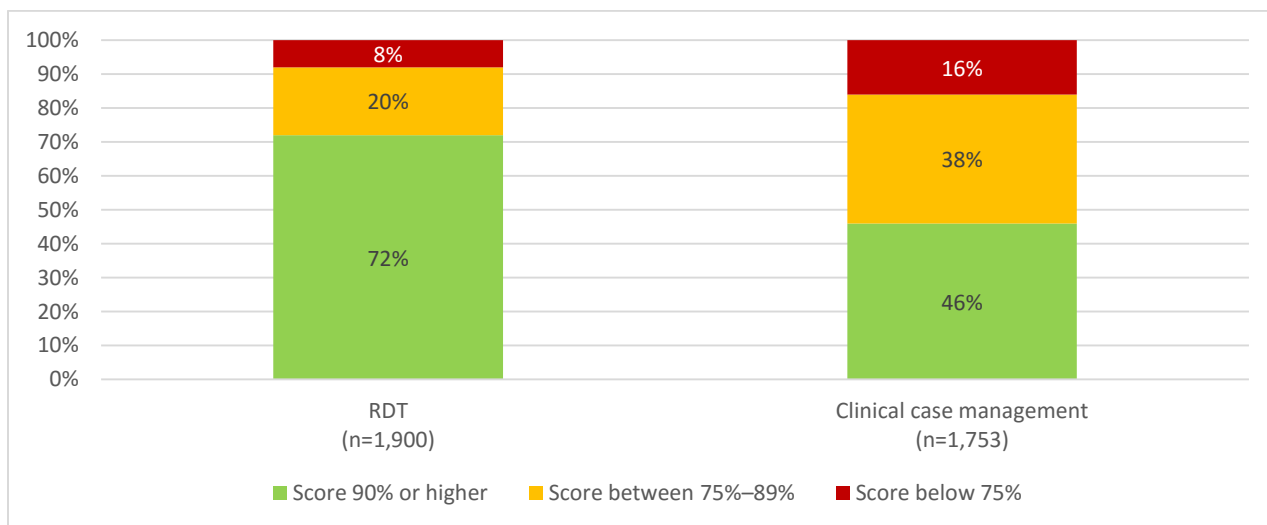


Note: The percentage of facilities with pharmacy and data accuracy scores at the first and third visit was greater than 69 percent.

Most recent visit

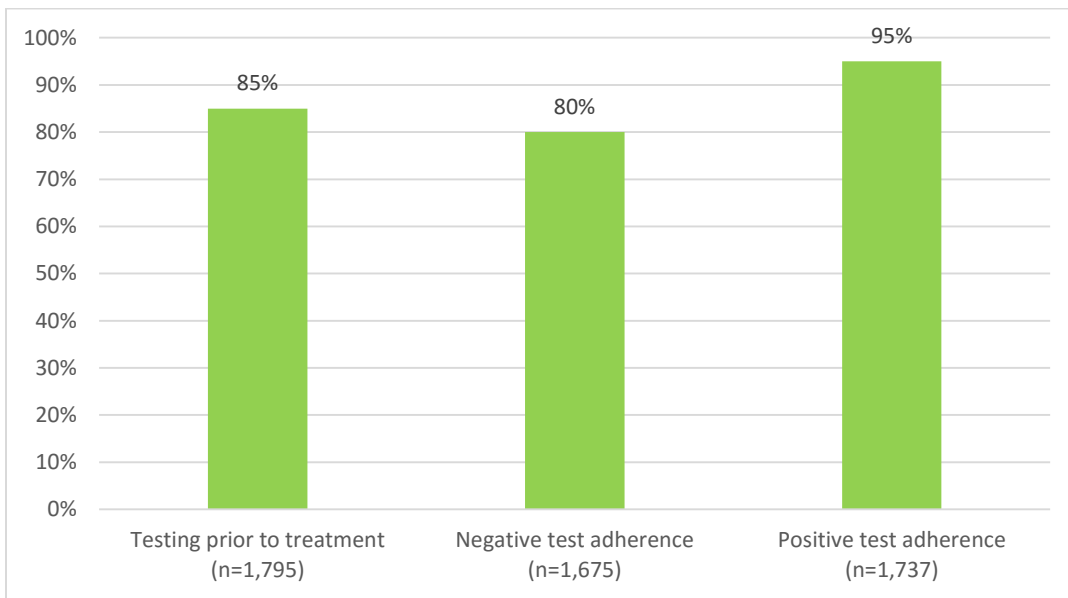
When reviewing the most recently available scores for all facilities (regardless of the number of visits received), the proportion meeting minimum targets for technical competencies (Figure 36) and overall targets for adherence (Figure 37) was similar to that of the last visit for the trend analyses. For all indicators, the proportion meeting these targets was 80 percent or greater. However, only 46 percent of facilities met the overall target (score of 90 percent) for clinical competencies, suggesting that additional visits or other QA efforts should be conducted for this area.

Figure 36. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Ghana



Note: Scores were available for more than 83 percent of facilities visited.

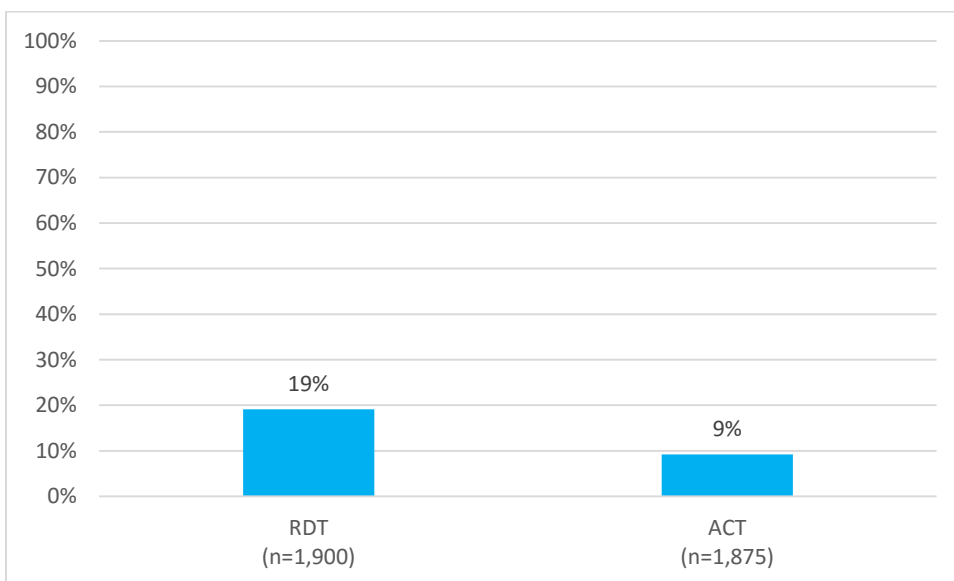
Figure 37. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Ghana



Note: Scores were available for 82 percent of facilities visited.

Although MalariaCare’s mandate does not include the management of commodities, the OTSS checklist collected information on RDT and ACT stock-outs. Figure 38 presents the proportion of facilities reporting significant stock-outs of RDTs and first-line ACTs. Among facilities with data, RDT stock-outs appear to be more common than those for ACTs (19 percent and 9 percent, respectively). These stock-outs may help to explain why the proportion of facilities meeting the overall performance target for testing prior to treatment is not as high as positive test adherence performance.

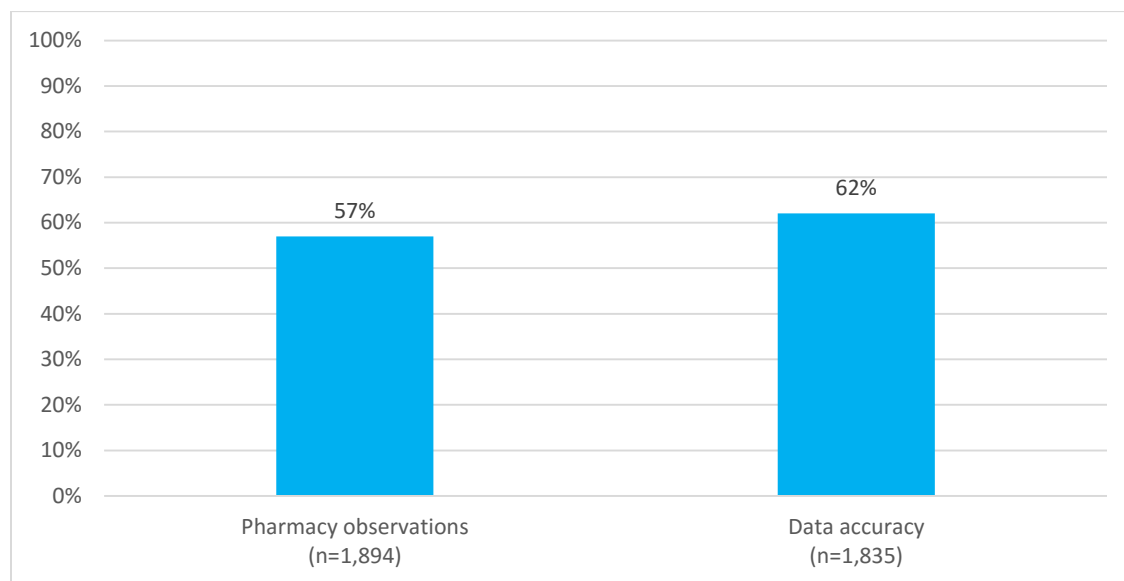
Figure 38. Proportion of health facilities reporting stock-outs of RDTs, and ACTs lasting more than 7 days in the 3 months prior to the most recent OTSS visit, Ghana



Note: Scores were available for more than 93 percent of facilities visited.

Figure 39 shows the proportion of all facilities that received perfect pharmacy and data management scores. The relatively lower proportion of facilities that met project targets (as compared to RDT, clinical, and adherence scores) suggests that additional work is needed to build on the gains made in strengthening prescribing practices and HMIS accuracy.

Figure 39. Proportion of facilities obtaining perfect pharmacy observation and data accuracy scores during the most recent OTSS visit, Ghana



Note: Scores were available for more than 92 percent of facilities.

Challenges

Challenge

Stock-outs of key malaria commodities (RDTs, ACTs) limit the impact of mentoring and the ability to adhere to global recommendations for testing all malaria suspects and providing appropriate treatment.

Low clinical case management performance of health care workers.

Solution/Recommendations

OTSS supervisors were instructed to document RDT stock-outs accurately and support laboratory officers to strengthen monthly stock monitoring. The national level should ensure a good logistics and supply chain management system and support information flow about stock-outs between NMCP, facilities, and procurement partners using OTSS data when available and appropriate.

MalariaCare built regional- and district-level capacity with a focus on improving comprehensive history taking, physical examination skills, testing suspected malaria cases, and treatment in adherence to test results through training at multiple levels of the health care system and OTSS supervision.

Challenge	Solution/Recommendations
Performance on parasite counting and species identification also generally poor.	These skills are important for reference centers. The CLU/NMCP should support full implementation of the PT scheme to determine which facilities need more support, then target further OTSS visits and if necessary MDRTs to support steady and consistent quality at these facilities. If needed, individualized training programs can be organized through the national core group of trainers and the local laboratory directors. In order to build and maintain quality reference level skills, regular MDRTs should be held for regional and district trainers on an annual basis.
Different RDT brands may have slightly varying directions that could lead to confusion among health workers on proper usage.	MalariaCare recommends providing job aids and instructions for each brand/type of RDT procured in the country to ensure providers have guidance for proper procedures, regardless of current RDT type being supplied.
Delays in establishing the planned government-to-government funding mechanism hindered implementation of laboratory OTSS over the project's five years, which consequently stalled other planned activities that were to be implemented alongside laboratory OTSS.	MalariaCare worked with PMI to fund the implementation of three rounds of laboratory OTSS.

Additional recommendations

MalariaCare identified a number of best practices and lessons learned, and the project developed several innovations, some of which evolved into best practices that may be considered in future designs.

- Annual joint work planning meetings, malaria technical working groups and similar coordinating mechanisms proved to be an excellent tool for obtaining the buy-in and commitment of all key stakeholders. Specific recommendations:
 - Project team—including technical and M&E member—join regional health team annual planning meeting. Invite district representatives to secondary meeting at regional level to assist with planning annual malaria QA activities at district level.
 - Support biannual case management (treatment and diagnostics) and M&E working group meetings at national level.
- An integrated approach to improving overall clinical performance that includes pre-service and post-training updates on clinical care and severe malaria could continue to build upon the gains made in improving overall clinical performance. Specific recommendations:
 - Work with pre-service training schools to update their malaria case management curriculum every three years and/or immediately after national guidelines updates.
 - Continue one-day clinical management refresher course for new training school graduates.

- Triage and severe malaria training for reference-level staff should continue at the regional level on an annual basis.
- Programs should consider including a dual focus on both strengthening health services and creating links between health facilities and community-based care, for example through CHO internships, in order to break down barriers to access and strengthen the quality of health services provided. Specific recommendations:
 - Develop a triage and severe malaria course focused on CHOs—to be given prior to departure from training schools and at least once every two years for those already working out in the field.
- OTSS and mentorship of health care workers is an effective approach for reinforcing knowledge and skills acquired through group training while empowering the individual to take an active stake in his or her own performance and professional development. MalariaCare recommends that the NMCP continue to strengthen the mentoring capacity of supervisors to build on gains made over the past five years. Data can be used to identify and target the lowest-performing health facilities for continuing OTSS visits. Specific recommendations:
 - Further develop the supervision of OTSS supervisor program—with the intention that each supervisor receives an annual check-up visit to assess the quality of his or her work.
- Longer-term training initiatives (such as the collaboration with the medical schools) requires considerable investment but also leads to longer-lasting, system-wide improvements that benefit future care and treatment of patients. MalariaCare recommends that PMI and the NMCP continue to identify areas for close collaboration with medical schools, accreditation bodies, and other institutions.
- QA activities for private health facilities, pharmacies, and drug stores have not been effectively integrated into national/regional/district planning and implementation, even though, according to the 2016 Ghana Malaria Indicator Survey, 51.2 percent of children with fever seek care from a private-sector source. MalariaCare recommends that the NMCP engage private-sector health facilities and, together with them, identify approaches for integrating quality improvement strategies into their system. Specific recommendations:
 - Continue to support the Pharmacy Council in providing continuing education symposia.
 - Consider performing OTSS in private-sector clinics/physician offices.

Transition and sustainability

- In late PY5, MalariaCare conducted a national close-out meeting. The meeting was attended by representatives of the regional health directorates, medical schools, NMCP, PMI, and other implementing partners. Presentations and discussions focused on sharing successes, innovative strategies, lessons learned during implementation, and how activities would be continued following the close of the project. On the diagnostics side, the CLU, NMCP, and KHRC are fully equipped to continue implementing the national malaria diagnostics QA program through OTSS and using the NAMS to implement PT and MDRT.
- MalariaCare transitioned the EDS to the NMCP in PY5 by training six staff from the NMCP to act as system administrators for the EDS over three days. In addition, 11 RHMT and ICD staff received a one-day training on basic program administrative functions in the system. These key staff are now overseeing the implementation of the joint clinical/M&E OTSS QA approach nationwide, with supervisor training completed

in September 2017 and supervision visits following. For the first round, supervisors from MalariaCare-supported regions are using tablets to enter checklist data, while the Systems for Health regions are entering data on paper checklists, and then submitting the checklists for entry into EDS at the district level. In the next round of supervision, the NMCP will pilot inpatient and malaria-in-pregnancy modules for inclusion in the EDS, and plans to request Global Fund support to procure additional tablets for the non-MalariaCare-supported regions in 2018.

Guinea

Introduction

During PY1 MalariaCare worked with the PMI Mission in Guinea to develop a work plan. It started implementation in PY2 supporting the development and implementation of a malaria case management QA strategy with a focus on strengthening diagnostic services at the national and regional levels. From the onset, the project included preparation for the transfer of these activities to StopPalu, a five-year bilateral project. MalariaCare



implemented activities until late in PY2 when the Ebola virus outbreak required a diversion of the country's resources for health toward fighting that epidemic. Following resolution of the crisis in December 2015, MalariaCare resumed its malaria diagnostics capacity-building work in PY4, and in PY5 supported a malaria laboratory expert to conduct an evaluation of diagnostics activities implemented by StopPalu.

Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Reinforced the microscopy skills of a cadre of 45 microscopy experts. Key national and regional laboratory microscopists were selected to participate in one session of MDRT in both PY2 and PY4. Over the course of five days, participants reviewed and practiced basic microscopy skills with an emphasis on proper malaria slide production, parasite detection, species identification, and parasite quantification. Participants were also trained in the proper use of RDTs and clinical use of the diagnostic test results. Practical pre- and post-tests were conducted to evaluate overall performance and to identify gaps in knowledge. Passing scores for each indicator are consistent with WHO guidelines (*WHO Malaria Microscopy*



Slides created during malaria diagnostic refresher training practical sessions.

Photo credit: Daouda Ndiaye

Quality Assurance Manual, V2, 2015). Twenty-five laboratory microscopists were trained in PY2, and 20 participants were trained in PY4. Of these 45 participants, 6 (13 percent) met the Level A or B standard for all three competency areas at post-test. Similar to other countries, species identification remains the greatest barrier to participants meeting the Level A or B standards. When not considering species identification, 25 (56 percent) of the 45 participants trained in either year met the Level A or B standard for both parasite detection and parasite counting. Due to late arrivals, only 37 of the 45 (82 percent) participants have both pre- and post-test scores (see Table 40 for a summary of change in performance from pre-test to post-test). A comparison of results between the PY2 and PY4 MDRT sessions indicate that microscopist performance following the Ebola outbreak remained about the same as it was prior to the diversion of national resources.

Table 40. Basic malaria diagnostic refresher training microscopy practical pre- and post-test results, Guinea (n=37)

Competency area	Average pre-test score (median [range])	Average post-test score (median [range])	Percentage point change in mean score
Parasite detection	54% (71% [0%–91%])	69% (82% [0%–100%])	15
Species identification	23% (21% [0%–67%])	44% (39% [0%–100%])	21
Parasite counting	9% (0% [0%–50%])	46% (50% [0%–100%])	37

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Collaborated with the NMCP and StopPalu in PY2 to develop a harmonized supervision checklist that integrates laboratory and clinical components to be used during the implementation of the national malaria case management QA supervision scheme.
- Built the capacity of 38 clinical and laboratory supervisors through three sessions of OTSS supervisor training in PY2 and PY4. This training provides supervisors (10 of which participated in both the PY2 and PY4 sessions) with an in-depth review of supportive supervision approaches and mentoring techniques with the goal of improving the quality of on-site training and problem-solving support provided during OTSS visits. As part of the training, participants conducted test visits at nearby health facilities in order to practice implementing what they had learned about conducting observations and providing feedback to health care providers, and to familiarize themselves with the checklist in a real-time setting prior to embarking on OTSS visits. In both years, participant knowledge was evaluated through a pre- and post-test. Average performance on an assessment that evaluated knowledge of the OTSS approach and elements of providing mentorship increased from 54 percent (median 55 percent; range 10 to 85 percent) at pre-test to 83 percent (median 85 percent; range 50 to 100 percent) at post-test.
- Supported the rollout of a malaria case management QA scheme in close collaboration with StopPalu and the NMCP. MalariaCare implemented one round of laboratory-focused OTSS and two rounds of joint laboratory/clinical OTSS to two national and seven regional hospitals during PY2. The first laboratory-only OTSS visit occurred under MalariaCare support and was also used to distribute malaria diagnostics bench aids and SOPs to health facilities. Given the limited time available in country, additional bench aids

were provided to the NMCP for further dissemination. During the first, laboratory-only round of visits, supervisors found that each facility had at least one staff member who had received formal training in RDTs, and eight of the nine facilities had at least one microscopist who had received formal malaria microscopy training in the previous year. In addition, 8 of 19 (42 percent) observed laboratory staff performed at 90 percent or greater with respect to RDT use; the overall average score was 76 percent. Fifteen (15) of 23 (65 percent) observed laboratory staff performed at 90 percent or greater with respect to malaria slide preparation, staining, and reading; the overall average score was 93 percent. In PY2, MalariaCare also supported a diagnostics expert to provide technical assistance and oversight during two additional rounds of joint clinical and laboratory OTSS, which were implemented by StopPalu.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Supported the NMCP in implementing a PT scheme to develop and maintain high-quality microscopy skills for laboratories nationwide in PY4. To support the implementation of the PT scheme, MalariaCare procured 20 standardized malaria slide sets of 15 slides each for use in ongoing training and PT by the national program. The slides sets, consisting of varying malaria parasite species and densities, were prepared by UCAD in Senegal under WHO protocols for slide banking. Species identification of slide bank donors was confirmed by PCR (conducted at UCAD) and parasite densities were validated by six WHO L1 microscopists from the RITM in Manila, the Philippines.

Following delivery of the slide sets, a consultant master trainer from UCAD provided a one-day training on the implementation and long-term care of the slide sets and their management using a Microsoft Access database. The training was provided to five participants, one from StopPalu and four from the NMCP. The MalariaCare consultant also provided a one-day training on malaria microscopy diagnostics QA to the same participants. A slide management database (Microsoft Access) and SOPs for slide management were handed over to the NMCP, and a brief tutorial was provided.



Handover of the slide set and bench aids to Dr. Timothée Guilavogui (left), NMCP Deputy Director.

Photo credit: Daouda Ndiaye

- Conducted an assessment of the malaria diagnostic capacity within StopPalu's focus areas. The main objectives were to assess reference laboratory capacity, evaluate StopPalu and the NMCP's structures and coordination mechanisms for diagnostic activities, observe the implementation of diagnostics QA activities within health facilities supported by StopPalu, and identify potential refinements to StopPalu's QA approach that could result in improved malaria diagnostics outcomes. The consultant conducting the assessment met with StopPalu, NMCP, and the National Institute for Public Health (*Institute National de Santé Public*, or INSP) staff and joined supervisors on OTSS visits to eight

health facilities in order to observe the quality of supervision visits and conduct an evaluation of malaria diagnostic capacity at those health facilities. The assessment found that joint OTSS is being implemented in the PMI focus regions on a quarterly basis, laboratory staff at the assessed facilities exhibit good competency, and that the INSP has strong capacity in functioning as the national reference laboratory. The assessment also identified weaknesses in management of laboratory reagents and microscope/equipment maintenance, in communication for activity planning, and in sharing results and reports for use in decision-making. See Table 41 for a summary of key findings of the assessment.

Table 41. Key findings from 2018 health facility assessment, Guinea

Assessment indicator	Number of facilities
Essential infrastructure (8 facilities assessed)	
Open 24 hours a day	7
Access to electricity (Electricité de Guinée or solar)	8
Access to water (public supplier or well)	8
Microscopy (6 facilities assessed)	
Microscopy performed	6
Giemsa stain used	6
Giemsa stain in stock	2
Parasitemia calculated in parasites/uL	6
Has at least one functional microscope	6
Has microscope repair kit	0
Internal slide rechecking and/or Giemsa QA in place and documented	5
RDT (8 facilities assessed)	
RDT kits available	8
Staff training (8 facilities assessed)	
At least two staff received refresher training in last 12 months on RDTs	8
Any staff received refresher training on supply management	0
At least two staff received refresher training in last 12 months on malaria microscopy (of 6 health facilities assessed)	6
At least two staff received refresher training in last 12 months on malaria microscopy QA (of 6 health facilities assessed)	6
Any staff received refresher training on laboratory equipment maintenance/repair (of 6 health facilities assessed)	0

Key challenges

Challenge	Solution/recommendations
Due to resources constraints, MalariaCare was unable to establish an in-country team. This made the implementation of activities somewhat challenging.	MalariaCare worked closely with StopPalu in Conakry and enlisted its support in making local arrangements for training and assessment logistics. Additionally, the MalariaCare consultant who supported all project activities in Guinea was instrumental in making on-the-ground arrangements, such as carrying the supplies needed for training activities and arranging for the printing of manuals and bench aids from Dakar, Senegal.

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Guinea, the following recommendations may be considered:

- It is recommended that future OTSS diagnostic supervisors be selected based on their practical microscopy skills, ability to mentor, and their availability to provide ongoing TOT and conduct OTSS at the central and regional levels. Performance during prior MDRT and supervisor training could be reviewed and used as a criterion for selection of supervisors and trainers. It is specifically recommended that MDRT post-test scores of Level A or B be used as a criterion for continuation.
- Supply management for key microscopy reagents and microscope maintenance is weak, and it could be improved through the following steps:
 - Identify a focal person at the NMCP who will coordinate diagnostic activities between NMCP and partners, particularly USAID/PMI and Global Fund.
 - The designated NMCP diagnostic focal person should participate in weekly NMCP stakeholder meetings at the central level.
 - The supply chain management system issues surrounding microscopy commodities and antimalarial medications should be regularly discussed during all NMCP meetings as a regular agenda item, and the NMCP and the Central Pharmacy of Guinea (*Pharmacie Centrale de Guinée*, or PCG) should establish communication channels to discuss stock issues and improve the stock reporting system with the addition of supervision reports on stock-outs observed in facilities. In order to fix the issues, regional malaria focal persons (RMFPs) should include following up on stock-outs and tracking issues as a regular part of work.
- Implementing partner supervision data and activity reports are not shared widely or regularly, limiting the ability of decision-makers to use these resources for planning.
 - The NMCP and regional/prefectural management teams should establish and distribute a standard protocol and expectations for implementing partners to share reports.
 - The NMCP should consider organizing an annual supervision meeting with implementing partners, where all supervisors, partners, regional lab chiefs, and the PCG are invited to participate and discuss supervision findings.

- Supervision data should be used to estimate more exactly the number of malaria diagnostic tests (microscopy and RDT) performed and number of positive results in all PMI zones. This will help to estimate the number of suspected and confirmed cases for programmatic planning and supply/treatment stock management.
- The NMCP should consider preparing and sharing annual technical reports with all partners, the regional level, and supervisors.
- Supervision visits are being implemented regularly and well, using high-quality supervisors. However, there is room for improvement in planning rounds of supervision and the time taken for PT during supervision visits.
 - The number of supervisors seems reasonable but will not permit them to reach all health facilities. We recommend to keep a focus on improving the competency of the laboratory technicians in order to increase the number of Level A or B-accredited staff who can be trained and used as supervisors.
 - Supervisors should be reevaluated every two-to-three years in order to maintain their level of performance and competency.
 - The central level should consider communicating regularly with supervisors and documenting these communications, particularly during planning for OTSS. Supervisors should be notified of upcoming OTSS rounds at least one month before the visits begin.
 - To shorten the time burden of implementing PT during supervision, we recommend adjusting the number of slides used for PT down to six slides (four positive and two negative), and weighting the score calculation to emphasize parasite identification, followed by parasite detection and species counting.
 - We recommend that the existing national reference documents (SOPs, bench aids, QA manual, and OTSS checklist) be reviewed every two years to determine if any revisions or updates are needed.
- The NMCP collaborates with the INSP, which since 2016 has been playing the role of national reference laboratory and provides human resources to oversee national epidemiological surveys, serve as trainers and supervisors, and participate in NMCP thematic groups as full members. The INSP facility is used to stain and read slides for several national survey activities. WHO provides EQA support to the INSP by providing them with routine slide panels to assess competency and performance; however, the results are not shared with the NMCP. We recommend that the NMCP and implementing partners work to officially support the INSP to play the role of national malaria reference laboratory (NMRL) in the following ways:
 - Train INSP staff on data collection, storage, and management, as well as supply chain management.
 - A staff member from INSP should be designated as the focal point for malaria diagnostics. This person can serve on the NMCP's diagnostic platform committee and participate in all NMCP stakeholder meetings at central and regional levels. It is recommended that this individual undergo in-depth training on supply management and microscope maintenance.
 - INSP can be used as a country reference lab and coordinate all QA in Guinea, including QA for new supplies and reagents.

- NMCP and implementing partners should consider identifying funds to support at least two INSP staff to participate in the ECAMM.

Transition and sustainability

- At the end of the MDRT and slide management training in PY4, the MalariaCare consultant formally transferred MalariaCare’s training and supervision resources to StopPalu and the NMCP. The NMCP can now use these materials to continue providing MDRT and supervision skills training in the country, either directly or through an implementing partner. Additionally, the NMCP has the capacity to use the slides as PT panels for malaria microscopists at the central and regional levels.

Kenya

Introduction

MalariaCare began implementation in Kenya at the start of PY3 in October 2015 and closed out activities in November 2017 (PY5). The project focused on strengthening public health sector case management services in more than 900 health facilities in the high prevalence region of western Kenya.

Over a period of 15 months, MalariaCare used a phased approach to implementation—beginning activities in groups of two to three counties at a time until the eight targeted counties were enrolled (Table 42). Counties were assigned by phase based on performance, location, and number of health facilities. Performance was determined through a health facility assessment conducted at the start of the program, but the project also phased the counties by grouping together neighboring counties, taking into consideration the number of health facilities in each county to manage the workload across phases.



Table 42. MalariaCare implementation timeline, Kenya

Phase	Counties	Implementation Start
One	Kisumu, Vihiga, Migori	August 2015
Two	Kakamega, Homabay	February 2016
Three	Busia, Siaya, and Bungoma	November 2016

To support project activities, MalariaCare established a central office in Kisumu with a staff of three technical advisors, two finance and administrative staff, and two drivers. In addition, three regional coordinators worked out of satellite offices in Kakamega, Homabay, and Migori counties, for a total of ten country staff to support activities.

Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Improved basic malaria microscopy skills at the facility level. MalariaCare supported basic MDRT for 160 health facility laboratory staff. Priority for this, training was given to staff from higher-level facilities who had not participated in a malaria microscopy training within the last two years. Participant scores improved from pre- to post-test in all three competency areas—parasite detection, species identification, and parasite counting (Table 43). Although only one participant met the Level A or B standard in all competency areas at post-test, 59 percent met the Level A or B standard for parasite detection and 43 percent met the standard for parasite counting. Only one percent met the standard for species identification.

Table 43. Basic malaria diagnostic refresher training pre- and post-test results, Kenya (n=160)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	64% (67% [0%–94%])	80% (83% [35%–98%])	16
Species identification	22% (22% [0%–70%])	41% (40% [7%–83%])	19
Parasite counting	7% (0% [0%–50%])	35% (33% [0%–93%])	28

- Strengthened diagnostic capacity of OTSS laboratory supervisors. MalariaCare conducted aMDRT for a total of 96 county- and sub-county OTSS supervisors, which included 20 supervisors who were trained in PY5 to replace supervisors who had been transferred, left the government employment scheme, or were not performing well. Scores improved across all three competency areas (parasite detection, species identification, and parasite counting) from pre- to post-test (Table 44). Although only three participants met the Level A or B standard for all three competency areas, 81 percent met the Level A or B standard for parasite detection. In addition, 26 percent met the standard for parasite counting, and 3 percent met the standard for species identification.

Table 44. Advanced malaria diagnostic refresher training for outreach training and supportive supervision supervisors, pre- and post-test results, Kenya (n=96)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	68% (72% [0%–93%])	86% (87% [60%–100%])	18
Species identification	26% (29% [0%–60%])	47% (47% [17%–80%])	21
Parasite counting	11% (0% [0%–75%])	29% (27% [0%–80%])	18

- Strengthened diagnostic capacity of county malaria reference laboratory (MRL) staff. In an effort to support the MOH’s decentralized QA scheme for the reference level and to ensure that all staff at the county MRLs

are adequately trained, MalariaCare facilitated a five-day aMDRT for 20 microscopists from county MRLs. The aim of the course was to refresh and measure county MRL staff skills and essential knowledge in malaria microscopy and RDTs. Participants were assessed on parasite detection, species identification, and parasite counting. As these microscopists work at the reference level, the training target for all participants was to achieve the equivalent of a WHO L2 or higher at post-test for parasite density and counting—skills that have greater relevance for the treatment and monitoring of severe disease. Eighty-five (85) percent met the standard for parasite detection, none met the standard for species identification, and 45 percent met the standard for parasite counting. See Table 45 for a summary of scores from pre-test to post-test.

Table 45. Advanced malaria diagnostic refresher training for county malaria reference laboratory staff, pre- and post-test results, Kenya (n=20)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	69% (67% [41%–100%])	83% (84% [48%–98%])	14
Species identification	17% (20% [0%–30%])	50% (50% [3%–77%])	33
Parasite counting	7% (0% [0%–40%])	41% (36% [13%–73%])	34

- Supported a pilot on virtual microscopy. To further build and maintain supervisor diagnostic skills, 75 supervisors were invited to participate in a virtual microscopy course, which included 20 hours of structured learning on all *Plasmodium* species slide development and reading. The slide reading component mimicked real life microscope conditions using photomicrographs to develop three-dimensional reconstructions of actual malaria slides. The operator can then read the slides using a “virtual microscope,” which allows both horizontal and lateral movement up and down and throughout the slide. Of the supervisors invited to participate, 48 completed the course. As part of the pilot, Intellectual Ventures, the developer of the course, led a process evaluation to ensure the content was relevant to all levels of microscopists and the course format was user-friendly. Overall satisfaction with the course was high, with 100 percent of the Kenyan participants agreeing that the delivery of the course content was effective and 98 percent agreeing that the course was relevant to their work.

Supported the introduction of an NCAMM to build a team of expert microscopists at the national and county levels. This assessment is based on the WHO ECAMM and focuses on the microscopist’s ability to diagnose low-density infections and perform accurate counting necessary for monitoring treatment of severe malaria. The NCAMM is available to a broader audience of national- and county-level staff, while the ECAMM is reserved only for those that meet a certain set of performance criteria (see below). A total of 19 microscopists from both the national team and from intervention counties participated in the NCAMM. Of these 19 participants, all participants met the Level A or B standard for parasite detection, 8 (42 percent) met the standard for species identification, and 14 (74 percent) met the standard for parasite counting. See Table 46 for a summary of results.

Table 46. NCAMM training, pre- and post-test results, Kenya (n=19)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	93% (93% [64%–100%])	96% (100% [82%–100%])	3
Species identification	52% (60% [10%–80%])	78% (77% [50%–100%])	26
Parasite counting	31% (20% [0%–100%])	51% (54% [15%–85%])	20

- Supported global malaria microscopy WHO accreditation of national and county laboratory staff. MalariaCare supported the six laboratory technologists and four national-level technologists who met the criteria to attend the ECAMM. Eligible participants must have scored at a WHO L2 for all three assessed competencies—parasite detection, parasite counting, and species identification—in either the NCAMM or an MDRT completed within the past year. OTSS supervisors and malaria QA officers were given priority. Of the ten who attended the ECAMM, eight scored at an expert microscopist level, which means the participant scored at least at the L2 standard for parasite detection, species identification, and parasite counting. Of these eight, three were OTSS supervisors, two were malaria QA officers, and three were from the NMRL. The WHO accreditation of these microscopists increased the number of globally accredited microscopist experts who can oversee and lead QA activities, including supportive supervision and microscopy training at the national or regional level.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who receive a diagnostic test for malaria, MalariaCare conducted the following activities:

- Provided technical assistance to the NMCP to develop the National Quality Assurance Guidelines on Parasitological Diagnosis of Malaria. MalariaCare participated in several technical working group sessions to provide input on the guidelines. However, the team had to cease support to the development in mid-PY5 due to the decision by the US Government to suspend funding to support the national program and the MOH at central level. At the time of writing, the guidelines were being finalized by the NMCP.
- Strengthened capacity to administer RDTs. Conducted RDT QA training for a total of 608 staff from lower-level facilities across the eight target counties. The two-day training sessions were led by the clinical and laboratory OTSS supervisors and focused on correct testing techniques, identification, correction of quality issues, and the appropriate use of test results for clinical treatment. In addition, the attendees were trained on mentoring other practitioners with the expectation to provide onsite training and mentoring to staff within their respective health facilities. Among the 542 participants with both pre- and post-test scores, the average score increased 15 percentage points, from 69 percent at pre-test to 84 percent at post-test.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Strengthened clinical case management skills of OTSS clinical supervisors. MalariaCare conducted a CCMRT for all 88 clinical OTSS supervisors. Of these, ten were trained in the second year of implementation to replace supervisors who had been transferred, left the government employment scheme, or were not performing well. The three-day course was based on the updated 2016 edition of the National Guidelines for the Diagnosis, Treatment and Prevention of Malaria in Kenya and focused on improving skills in history taking and physical examination to address fever, understanding the principles of diagnostic tests for malaria, selecting appropriate laboratory tests to confirm suspected malaria, interpreting laboratory results, managing essential outpatient clinical services, improving communication skills with laboratory staff and patients, identifying barriers to improved diagnosis and case management from both the clinician and laboratory staff perspectives, and monitoring malaria cases to determine caseload and malaria prevalence patterns. In addition, participants were trained on correct RDT techniques and accurate interpretations of the results.
- Across all training sessions, participant scores increased an average of 8 percentage points, from 80 percent at pre-test to 88 percent at post-test. Starting with the training of supervisors in PY4, an RDT competency test was administered at the end of the training. The average RDT competency score of supervisors assessed during the training (n=64) was 91 percent.
- Worked closely with county health management teams to select supervisors based on set criteria to establish competent OTSS supervision teams. Clinical supervisors had to have had clinical case management training within the past three years, and priority was given to those who worked in a malaria endemic region for at least a year and saw at least one malaria case per day. Laboratory supervisors had to have completed malaria microscopy training and malaria case management training within the past three years; priority was given to those who scored at a WHO L2 or above in previous microscopy training and worked actively on a laboratory bench that regularly sees malaria cases. All supervisors also had to be competent in problem-solving and be motivated as confirmed by peer or manager experiences. In addition, all were to be available for two-to-three weeks per quarter, without interruption.
- Trained OTSS supervisors in key supervision skills, including effective mentoring and feedback and proper use of the OTSS checklist. Following the technical training for diagnostics and treatment, conducted five-day supervisor training for the 175 clinical and laboratory supervisors. Training sessions used didactic lectures, demonstrations, and role-play to orient supervisors to the OTSS process. Training was conducted over multiple sessions with 20-to-30 participants each, and it covered use of the tablet-based OTSS checklist, mentoring, feedback skills development, and guidance on how to facilitate discussions for the collaborative development of improvement action plans. The training also included a field visit in which supervisors visited a nearby health facility to practice their supervision skills while being observed by program staff.
- Conducted OTSS in public health facilities across the eight counties. The number of OTSS rounds completed varied across counties due to the phased-in approach. A total of five rounds were conducted in phase one counties, four rounds in phase two counties, and two rounds in phase three counties. A total of 934 facilities

were visited at least once during the life of the project. During the final round, all facilities were visited in phase two and three counties but, as part of a strategic shift in use of resources, only the lowest-performing 50 percent of facilities were visited in phase one counties (Kisumu, Vihiga, and Migori).

- In PY5, MalariaCare piloted a checklist to assess severe malaria and anemia management competencies during OTSS. Originally, OTSS was focused on diagnosis and treatment of malaria in outpatient departments. In 2016, the NMCP conducted two bi-annual surveys to assess the quality of inpatient care among the 47 county hospitals. While the surveys demonstrated improvements over time, the quality of care remained low and few hospital staff reported receiving supervision on the management of severe malaria cases. In response, MalariaCare worked with the NMCP to integrate severe malaria mentoring into OTSS at the county hospital level. Over the course of two meetings, MalariaCare worked with key stakeholders from the national- and the county-level OTSS supervisors, most of whom had experience in managing inpatients with severe malaria, to develop two additional OTSS checklist modules on severe malaria management—one for clinical staff working with pediatric inpatients and one for diagnostics staff focusing on general inpatients.
- County supervisors piloted the tool in seven of the eight county referral hospitals—one facility did not participate due to a health worker strike. The clinical module included observations of inpatient staff, a knowledge test, review of key infrastructure, and a review of pediatric case files. The diagnostic module focuses on reference documents, infrastructure, and commodities needed to monitor a patient with severe malaria. Performance scores for facility management of severe malaria cases in the inpatient unit are calculated as the percent of correct actions or present items that support severe malaria case management (Table 47). The average facility overall score for clinical was 61 percent (n=4 facilities), and the score for diagnostics was 73 percent (n=7). See Table 47 for a list of indicators, which make up these overall scores. Performance gaps noted during this pilot round included preparing and administering injectable artesunate (45 percent, n=4) and management of pediatric cases (58 percent, n=7). However, the facility providers scored significantly higher in the knowledge (case scenario) testing portion of the checklist in these two areas—indicating a gap between providers’ knowledge and their routine

MalariaCare’s work has been a powerful catalyst to mobilize government resources in affecting change. One example is in rural Musunguti dispensary, which is located far from the county capital in a hilly part of Vihiga county. The dispensary has three rooms and is well ventilated, but it lacks electricity and running water. Due in part to its remote location, there is no public health officer attached to the facility, and only one nurse to attend to patients—a situation that does not adequately address the medical needs of this community.

The performance of the dispensary has improved significantly after mentoring provided during MalariaCare-supported OTSS. Even more important, however, has been the feedback from OTSS supervisors to county health administrators. This led to essential upgrades to the staffing capacity and infrastructural needs. An additional nurse was trained to work in the dispensary and three new support staff were also added to the team. Other problems noted during OTSS—such as the lacking of thermometers, scales, examination tables, trays, and desks—have been addressed and equipment supplied using county health resources. As a result of the data collected during these OTSS visits, local deficits were communicated to and understood by county-level decision-makers. Within a relatively short amount of time, this has led to changes enabling the local team to provide better quality care to the community.

practice. Supervisors reported this was due to inadequate supervision and mentorship by senior health facility staff in the wards. Only one round of severe malaria OTSS was held before the end of the project, and change over time could not be assessed. Although the checklists were administered only at the county-level hospitals, the experience motivated the county health management team and NMCP to plan for extending the approach to sub-county hospitals.

Table 47. Average health facility score on key severe malaria indicators

	N	Average performance (%)
Severe Malaria: Overall Clinical Score	4	61%
Clinical Infrastructure	7	61%
Preparation and Administration of Injectable Artesunate*	4	45%
Pediatric Inpatient Management	7	58%
Knowledge of Severe Malaria Management	7	67%
Severe Malaria: Overall Diagnosis Score	7	73%
Tests Performed & Reagents Stocked	7	74%
Standard Operating Procedures	7	71%
Equipment Maintenance	7	72%
Internal & External Quality Assurance	7	77%

*Only four of the seven facilities were able to observe injectable artesunate administration due to staff shortages during the health worker strike and difficulty in predicting when medication would be given within each facility.

- Developed a simplified clinical job aid to address gaps in knowledge of correct management of uncomplicated and severe malaria. The job aid was developed as part of the two meetings finalizing the severe malaria clinical and diagnostics management OTSS modules. The clinical job aid outlines steps in history taking and physical examination, identification of signs and symptoms of severe malaria, management of complications, treatment with artesunate and quinine, and management of blood transfusion reactions. It was produced as a flip-chart and 1,900 copies were distributed to outpatient and inpatient departments across all facilities in the eight counties.
- Supported strengthening of IQA at the eight county referral hospitals. To complement the external QA activities of OTSS and LLWs, and to support the Kenyan MOH’s broader movement toward building facility-based QA structures, MalariaCare, in coordination with the NMCP and county health management teams, worked to revitalize defunct hospital medicines and therapeutics committees (HMTC) and initiate new CME forums in each of the eight counties. HMTCs are used to improve administrative and departmental coordination of clinical hospital outcomes to strengthen implementation of high-quality malaria case management services. As part of the HMTCs developed action plans, MalariaCare supported several new initiatives developed during these sessions, including CME forums specific to known knowledge gaps, development of hospital formularies, and benchmarking across HMTCs. The Vihiga and Kakamega HMTCs were noted as particularly well-functioning groups and thus were supported by MalariaCare to share their operations with other HMTCs throughout the region. In October 2016, the Migori County Hospital HMTC visited the Kakamega County Hospital to document best practices of the HMTC. In September 2017,

MalariaCare supported a meeting with Migori and Siaya HMTCs where Vihiga provided an overview of formulary development. Table 48 provides a summary of HMTC and CME activity. By the end of the project, one hospital had a drug formulary in place, nine malaria case management CMEs were held, and 60 national guidelines for malaria case management were distributed.

Table 48. HMTC and CME activity supported by MalariaCare, Kenya

County	Date of first HMTC	Number of HMTCs held	Number of CME forums held	Other HMTC Initiatives
Migori	Feb 2016	5	4	Participated in HMTC benchmarking trip in Oct 2016 Participated in HMTC benchmarking meeting in Sep 2017
Vihiga	Apr 2016	4	1	Finalized hospital formulary Provided mentoring support during HMTC LLW meeting in Sep 2017
Kisumu	Jun 2016	2	3	
Homabay	Sep 2016	3	0	Participated in HMTC benchmarking trip to Kakamega in Oct 2016 Participated in HMTC LLW in Oct 2017
Kakamega	Mar 2016	2	0	Hosted HMTC benchmarking trip in Oct 2016
Busia	May 2017	3	0	Participated in HMTC LLW meeting in Oct 2017
Siaya	Jun 2017	2	1	Participated in HMTC LLW meeting in Sep 2017
Bungoma	May 2017	2	0	

Note: HMTC=hospital medicines and therapeutics committee; CME=continuing medical education; LLW=lessons learned workshop

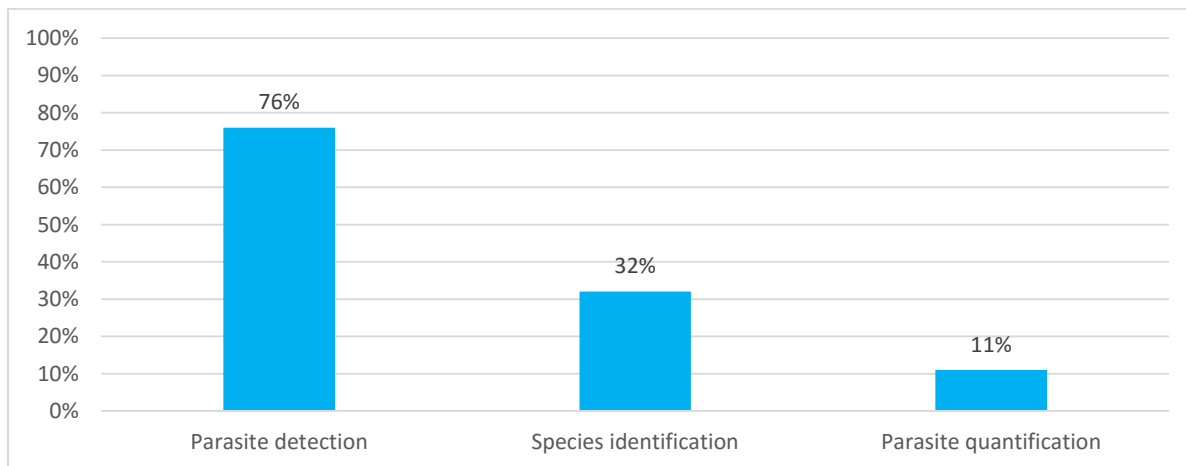
- Conducted follow-up visits by sub-county OTSS teams to selected low-performing health facilities following the third OTSS visit in phase one counties and after the second OTSS visit in phase two counties. The follow-up visits had three purposes: to focus on improving performance gaps identified in prior rounds, to follow up on action plans developed during the most recent OTSS visit, and to introduce the respective sub-county malaria control coordinators to implementation of OTSS and build their ownership in the system.
- Using the average change in the six indicators for the two most recent OTSS visits, MalariaCare selected four of the lowest-performing facilities in each sub-county for a follow-up visit. Teams of three—the sub-county laboratory and clinical OTSS supervisors and the sub-county malaria control coordinator—conducted the follow-up visits to the selected facilities to provide further mentoring on weaknesses and to review progress on the action plans emerging from the most recent OTSS visit. A total of 152 facilities were selected, and 134 (88 percent) submitted data from the visit using the OTSS checklist.
- To better understand the impact of the follow-up visits, data from OTSS visits before and after the follow-up visits, as well as data collected during the visits themselves, were used to compare performance trends in facilities with and without a follow-up visit. While both cohorts improved, it was at the same rate, with no detectable greater improvement noted in the intervention group. MalariaCare concludes that these type of follow-up visits do not appear to provide any additional benefit over normally scheduled OTSS.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases

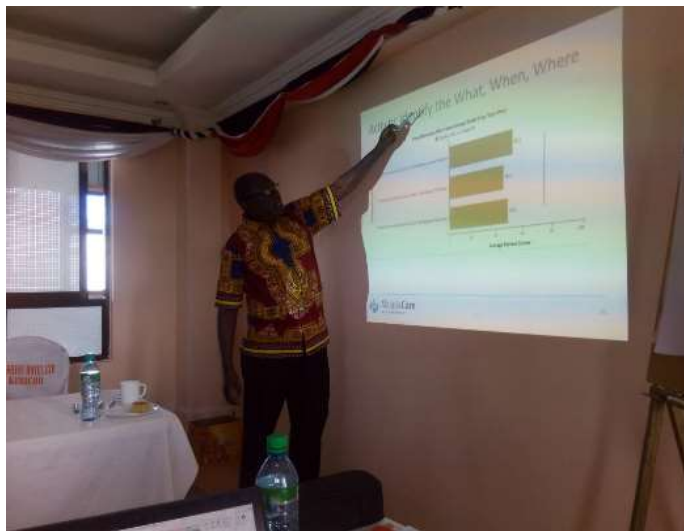
In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Conducted a rapid baseline health facility assessment of 50 health facilities in the eight targeted counties to evaluate the capacity of county health management teams to manage a QA system, to identify existing health facility capacity in providing quality case management services, and to prioritize counties in which to begin MalariaCare activities.
- In conjunction with the NMCP and NMRL, strengthened the PT program to improve the quality of malaria diagnosis in the counties. The Walter Reed Project Malaria Diagnostics Center (United States Army Medical Research Directorate—Kenya, Kisumu Field Station) donated 2,500 slides comprising 52 different samples from 26 donors to the NMCP for use in the national PT program. However, these slides were yet to be validated. Therefore, MalariaCare contracted four WHO L1 microscopists to review and validate the 52 different samples on presence of a parasite, parasite density, and species. A quarter of the slides were found to be discordant among validators, and a final determination was made by a MalariaCare L1 microscopist. To supplement these slides, an additional 600 validated slides were procured from a laboratory at UCAD in Senegal. MalariaCare also worked with the NMRL to develop a PT system management and evaluation database designed to automate PT panel development and generate performance statistics.
- With financial support from the Global Fund and technical support from MalariaCare, the NMCP and NMRL implemented one round of malaria microscopy PT in each of 46 county reference laboratories. A panel of 10 slides was sent to each laboratory, read by the staff on site, and their results entered by them directly into the internet-based PT database described above. MalariaCare then worked with the NMRL to analyze results received from 45 out of the 46 facilities that were sent panels. Facilities did best on parasite detection compared to the other two competency areas assessed—species identification and parasite quantification (Figure 40).

Figure 40. Average performance on the proficiency panel testing, Kenya (n=45)



- Initiated the transition of the EDS platform to the NMCP and Kenya HMIS platform. However, prior to being able to finalize implementation plans, all US-funding to the national level was suspended. MalariaCare subsequently focused on transitioning EDS capability to the county health management teams in the eight focus counties.
- Strengthened capacity to interpret OTSS data at the county level. A core group of six MalariaCare staff were trained in a TOT to co-facilitate EDS data-user training for county health management teams. A total of 17 county and sub-county health management team staff were then trained on the use of the EDS platform and scoring system for health facility competencies. Participants included health records information officers, county malaria coordinators, and select OTSS supervisors. Training focused on reviewing, managing, and



A participant explaining key data dimensions during the training.
Photo credit: MalariaCare/Kenya

interpreting the data collected during OTSS and comparing these with data collected during monthly HMIS reporting. During the training, participants successfully used OTSS data for decision-making. For example, participants noted that there was a significant discrepancy between the number of cases of severe malaria noted during OTSS and the number reported through the HMIS. Analysis showed that this was due in part to a lack of routine tally sheets to capture the number of severe malaria cases. Participants decided to work with the county health management teams to make sure that adequate tally sheets were available for use within all facilities diagnosing and/or treating severe malaria.

- Following OTSS visits conducted from November 2016 to March 2017, MalariaCare convened a two-day meeting for all health records information officers and county malaria coordinators who participated in the EDS training to review data use and expectations. During this meeting, participants also had the opportunity to update the dashboards and complete their OTSS county reports. After the initial report development, MalariaCare staff provided mentoring and support on data interpretation and use to enhance the county staff's ability to use the information to guide decision-making.
- Encouraged data use for decision-making in review of OTSS data during LLWs. In PY4, MalariaCare conducted one county-level LLW in each of the phase one and phase two counties—Vihiga, Migori, Kisumu, Kakamega, and Homabay—following the third round of OTSS. In PY5, the project combined counties in the LLWs following the fourth round of OTSS to allow for cross-county sharing of practices and strategies for improvement. A total of three LLWs were held across the eight counties. Each LLW included the county health management team members, the county malaria coordinator, county OTSS supervisors, the sub-county medical health officers, sub-county pharmacists, sub-county OTSS supervisors, and malaria implementing partners, including APHIAphus Western and ASSIST. Table 49 below presents select examples of actions emerging from the LLWs as well as the result of implementation.

Table 49. Examples of lessons learned workshops action plan results, Kenya

Problem	Action Taken	Results
Facilities still using Field stain instead of Giemsa stain to stain microscopy slides.	Supervisors removed any remaining Field stain from health facilities during outreach training and supportive supervision visits.	Field stain use decreased from 12% to 2%.
Laboratory staff overwhelmed by doing rapid diagnostic tests (RDTs), with less time to conduct quality microscopy.	Conducted RDT QA training for clinical staff and encouraged non-laboratory staff to do RDTs.	Laboratory personnel observed doing RDTs during visits decreased from 56% to 49%.
High rates of RDT stock-outs.	Worked with the NMCP and county health management teams to develop a standardized approach for recording RDTs in laboratory registers and managing stock through the laboratory department. In addition, coordinated with county malaria coordinators and Kenya Supply Chain Systems Strengthening Project to facilitate intra-county redistribution of RDTs.	The number of facilities with RDTs in stock improved from 47% at the first visit to 78% by the third visit.
Poor adherence to negative test results.	Encouraged adherence to current case management guidance, which specifies that pharmacists can deny antimalarials to those patients without a documented positive test result.	Adherence to negative test results improved from 86% to 94% from the first to the last visit.

Note: NMCP=national malaria control program.

- Participated in national-level meetings to share results and harmonize activities across partners, including several PMI malaria implementing partner meetings. The project team participated in six malaria case management technical working group meetings, which were held at least twice a year. MalariaCare worked with the Kenya Supply Chain Systems Strengthening Project in addressing stock-outs and redistribution of case management commodities, both within and between counties. Project leadership met several times with the NMCP to review work plans, share the latest OTSS results, and discuss overall progress to date and upcoming planned activities. The NMCP invited MalariaCare to support development of the Global Fund concept note, and the team attended a three-day meeting to start drafting the concept note with the NMCP and other partners. As part of this meeting, MalariaCare encouraged the NMCP to shift from workshop-based training (as previously supported by the Global Fund) to supportive supervision.
- Presented at the 2017 ASTMH Annual Meeting. Two posters were presented: 1) “Improvements in Quality of Malaria Case Management through County Referral Hospital Medicines and Therapeutics Committees in Kenya: The Migori County Experience” and 2) “Improving Adherence to the Kenya National Malaria Diagnosis & Treatment Guidelines: An Outreach Training and Support Supervision (OTSS) Approach in Vihiga County, Western Kenya.”
- Supported World Malaria Day in each of the intervention counties in both PY4 and PY5. Activities included hosting MalariaCare information booths as well as meeting with key government and implementing partner stakeholders.

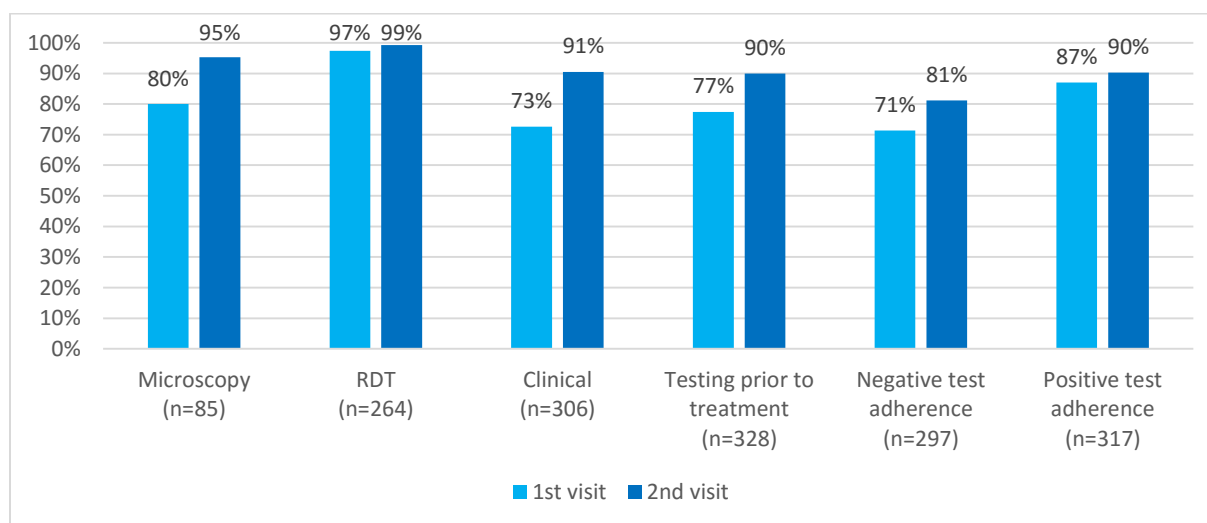
Progress made on key MalariaCare indicators

Trend analysis

Since start-up in Kenya, MalariaCare visited all of the 934 public health facilities in its eight focus counties, representing 62 percent of the 1,501 health facilities (public and private) in the target area. The number of visits per facility ranged from one to four: 5 facilities (1 percent) were visited only once, 341 facilities (36 percent) had two visits, 438 facilities (47 percent) had three visits, and 150 facilities (16 percent) had four visits.

Among facilities with two visits, which are predominantly from phase three counties, improvement was demonstrated in all six indicators (Figure 41). The greatest improvement was seen in clinical scores, increasing from 73 percent to 91 percent of facilities meeting the target by the second visit.

Figure 41. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus second visit, Kenya



Note: For five of the six indicators, the percentage of facilities with two visits that had scores at both visits was above 77 percent. For microscopy, 44 percent of the 191 facilities with microscopy had a score at both visits.

For microscopy, the performance improvement is attributed to greater adherence to two minimum standard steps:

- Spreading the thick film into a 1–2 cm diameter circle and reading the print placed under the slide (15 percentage point increase).
- Air-drying the thick film slide before staining (13 percentage point increase).

For RDTs, given the already high adherence to minimum standards, the greatest marginal gains were seen in other steps:

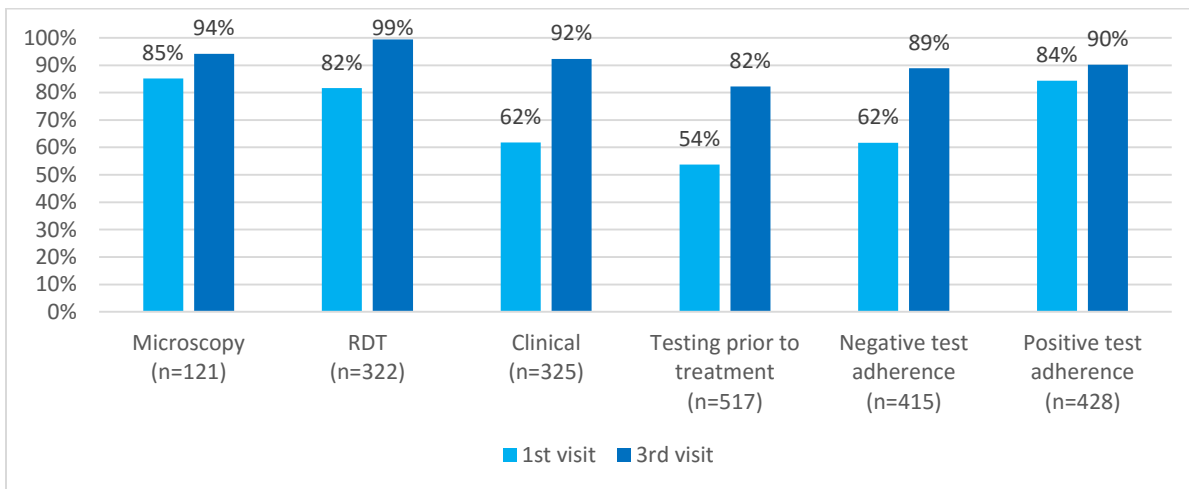
- Labeling the cassette (16 percentage point increase).
- Checking the expiry date (6 percentage point increase).
- Disposing of used tests, transfer devices, and other blood-contaminated material (6 percentage point increase).

For clinical management, the greatest improvements were seen in:

- Checking for at least one sign of severe malaria—a minimum standard step (10 percentage point increase).
- Checking the heart rate (28 percentage point increase).
- Conducting an abdominal exam or checking for abdominal stiffness (26 percentage point increase).
- Conducting a lung exam (22 percentage point increase).

Among facilities with at least three visits (phase one and phase two counties only), improvements were seen for all six core indicators (Figure 42). The largest improvements were seen in clinical management, testing prior to treatment, and negative test adherence—with scores increasing by 30, 28, and 27 percentage points between the first and third visit, respectively.

Figure 42. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus third visit, Kenya



Note: For three of the six indicators, the percentage of facilities with three visits that had scores at both first and third visits was above 71 percent. For the remaining two indicators, 55 percent of facilities had RDT and clinical scores, and 42 percent of the 285 facilities with microscopy had a microscopy scores at both visits.

Among those facilities with at least three visits for microscopy, performance improved for the following two minimum standards:

- Immersing the thick film slide in 10 percent Giemsa stain for 10–15 minutes (13 percentage point increase).
- Spreading the thick film into a 1–2 cm diameter circle and reading the print placed under the slide (11 percentage point increase).

For RDTs, the greatest improvements in the minimum standard steps were:

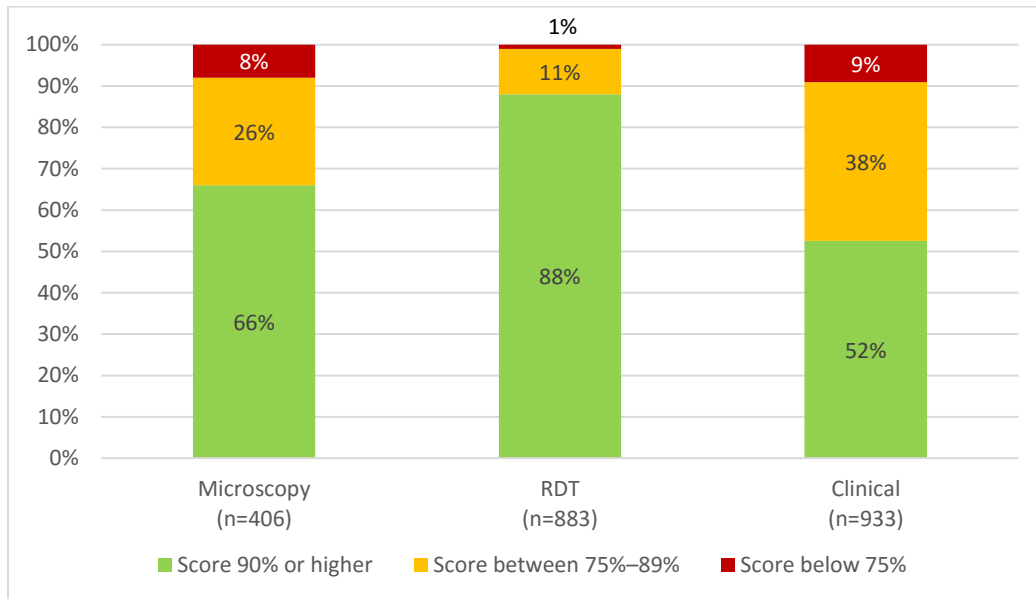
- Recording the results correctly in the register (18 percentage point increase).
- Waiting the correct amount of time per manufacturer’s instructions before declaring the test result negative (16 percentage point increase).

Improved performance in clinical management among facilities with at least three visits can mostly be attributed to a 23 percentage point improvement in checking for at least one sign of severe malaria.

Most recent visit

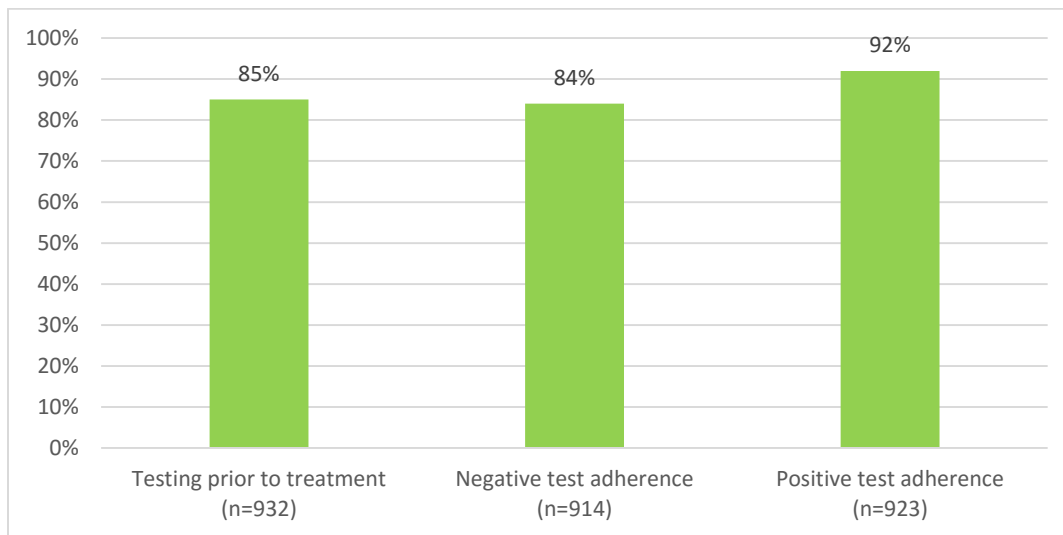
The proportion of facilities meeting the minimum standards at the most recent visit for all facilities was similar to the last visits in the trend analyses, as shown in Figure 43 and Figure 44 below. More than 90 percent of facilities met the minimum standard (scoring at least 75 percent) for each of the three technical performance indicators. However, the proportion of facilities scoring 90 percent or higher was greater for RDTs (88 percent) than for microscopy (66 percent) and clinical management (52 percent).

Figure 43. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Kenya



Note: Two indicators (RDT and clinical) had completeness rates at or above 94 percent. For microscopy, 85 percent of the 477 facilities with microscopy had a score at the most recent visit.

Figure 44. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Kenya



Note: All three indicators had completeness rates at or above 98 percent.

Challenges

Challenge	Solution/recommendations
<p>A number of events in Kenya delayed several activities, causing cancellation in some cases. There was one health worker strike from December 2016 to March 2017, which caused delays in the completion of the third round of OTSS and caused challenges in holding HMTC meetings. A second health worker strike from June to October 2017 as well as election activity caused delays in the LLWs for the third round of OTSS, sub-county follow-up visits following the third round of OTSS, peer-to-peer mentoring, fourth round of OTSS, RDT QA training, and aMDRT for county MRL technicians.</p>	<p>MalariaCare followed the situation closely to best identify when activities could be implemented based on safety and availability of participants. However, these delays led to cancellation of a number of activities as they could not be implemented within the project period—peer-to-peer mentoring, sub-county follow-up visits following the third round of OTSS, part of the fourth round of OTSS, and the entire planned fifth round of OTSS. Clinical job aids were to be distributed as part of the fifth round of OTSS, but instead they were distributed as part of a separate initiative where supervisors spent a few hours at each facility to review the job aid with staff. Future support should focus on implementing activities that could not be conducted.</p>
<p>In response to suspension of US Government funding to the Government of Kenya at central level beginning in May 2017, MalariaCare had to suspend all support to the national level.</p>	<p>The situation was not resolved by the close of the project and, consequently, several activities could not be conducted. MalariaCare was able to partially conduct some activities prior to the suspension, including the development and dissemination of national diagnostic quality guidelines and job aids, and technical support for one round of microscopy PT. MalariaCare attended several meetings to review guidelines development; however, the team was unable to participate in meetings to finalize. Through the PMI Mission, MalariaCare was able to hand over the procured slide sets and database for managing PT. MalariaCare was unable to transition the EDS platform to the NMCP and the MOH's HMIS department. Instead, MalariaCare focused on building capacity at the county level for management of the electronic system. Following the suspension, MalariaCare was unable to support NMCP participation in activities but continued to work in close coordination with county governments to implement all activities.</p>
<p>Implementation of national-level PT program by the NMCP, prior to the validation of all slides donated from the Walter Reed project.</p>	<p>The team worked closely with the NMCP to ensure that only those slides found to be concordant in the first review by WHO L1 validators were used in the round of PT. In addition, once results were received, MalariaCare worked with the NMCP to harmonize databases and analyze results.</p>

Challenge	Solution/recommendations
Continued gaps in meeting performance target in testing before treatment and adherence to negative test results.	Although there has been improvement in RDT stock since the start of implementation, supply deficits continue to affect the ability of providers to properly test before treatment. The national- and county-level health leadership need to work on better allocating RDTs. Additionally, some facilities that rely on microscopy are overwhelmed with the number of tests received and, therefore, not all patients are tested. To help alleviate this, it is recommended that facilities use RDTs for uncomplicated cases and focus microscopy efforts on diagnosing and managing severe malaria.

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Kenya, the following recommendations may be considered:

- Microscopy is a difficult skill to master as demonstrated through MDRT performance. To make the most effective use of limited capacity-building resources, future diagnostic training in Kenya should be tailored to the specific needs at each level of the health system. Given the low proportion of non-*P. falciparum* species throughout the country, training focused on species identification could be reserved for reference sites with NCAMM or ECAMM-accredited staff (county/regional/national hospitals), while laboratory staff at facilities that offer inpatients services could receive training focused on parasite detection and counting, which are critical for the diagnosis and monitoring of severe cases.
- A continuous and multi-interventional training system should be established to maintain and grow the skills of microscopists and laboratory supervisors. While WHO recommends annual refresher training of at least one week duration for all practicing microscopists (*WHO Malaria Microscopy Quality Assurance Manual, V2, 2015*), this may not be feasible in Kenya given the current level of resources. Depending on resource availability, MalariaCare recommends that reference-level microscopists undergo five-day MDRTs annually for at least two years in a row initially, then at least every other year thereafter. The training target for this cadre is a Level A or B performance, which would provide assurance that they are able to perform the most critical skills at this level: identify low density infections, identify non-*P. falciparum* species, and perform consistent and accurate parasite counts. Ideally, peripheral-level microscopists would also receive appropriately targeted refresher training at least every other year—and this should focus on identifying low density *P. falciparum* infections and determining parasite density (in order to diagnose and monitor severe malaria). Strategies such as PT and virtual microscopy courses should be implemented on a larger scale, to include all laboratories performing microscopy as a standard available test.
- The national level needs additional support to effectively manage the national PT scheme. Although MalariaCare provided the NMRL with a database to manage PT, the NMRL needs training on how to use this system for slide management and data analysis. In support of PT, the NMRL needs supplies including barcode labels, a printer, slide mailers, and bags with biohazard labels. Additionally, to maintain a sustainable

slide repository, the NMCP and the NMRL should establish a system of recalling PT slides, rather than the current practice of leaving these at each facility.

- Additional efforts are needed to improve management of severe malaria with a focus on correct use of intravenous artesunate, increasing use of post-treatment microscopy to monitor the effectiveness of treatment, and improving overall case management. High-value approaches would include focused training on severe malaria management, use of CMEs in inpatient management, and using inpatient OTSS in reference facilities. HMTCs will have a particularly important role in improving inpatient management given the necessity of coordination between different departments and monitoring of multiple indicators. In addition, the severe malaria checklists should be further tested to ensure capture of both pediatric and adult management gaps and improve mentoring and action planning.
- To better track progress during OTSS visits, supervisors should be able to link in the EDS all feedback and action plans from past visits to the current visit. This will facilitate the review of progress and updates made in real time during each mentoring visit.
- While national and county health teams are beginning to use DHIS2 data in their planning and implementation decisions, they need more training and practical experience with data use in general and with the OTSS performance data in particular before it becomes institutionalized. The NMCP should include data evaluation and use as tasks in county-level management team job descriptions. At least four staff from each county, who are committed and have the capacity, should be trained on data use. The EDS data platform should be fully transitioned to management by the MOH.
- In order for HMTCs to continue to operate, the committees will need commitment from both health facility and county leadership. For sustainability, a committed manager of HMTCs will need to be designated in both the health facility and the county health management team, HMTC activities will need to be included in the county strategic plans, and funding will need to be secured either through another implementing partner or the county itself.
- Regional LLWs in which three or more counties participate (versus single-county LLWs) should be held to encourage cross-county sharing of experiences and lessons learned. It is important that key decision-makers, such as the county directors of health, participate in the LLWs so that actions relative to the higher level are understood and discussed.

Transition and sustainability

- Held a two-day close-out meeting with 40 participants to share achievements and recommendations to carry the achievements forward and bring further to scale. Participants included representatives from the PMI Mission, county government, and implementing partners, as well as select county- and sub-county OTSS supervisors. Presentations were made highlighting diagnostic and clinical work completed. MalariaCare shared challenges and recommendations based on implementation experience.
- EDS transition activities at the national level were suspended mid-PY5 due the US Government suspension of support to the MOH at national level, and MalariaCare focused its data-user training on the county-level. The EDS database in Kenya went offline at the close of the MalariaCare project when the server support contract was discontinued. The database can be accessed per request and can be loaded onto another server as needed.

However, administrators of EDS at the national level will need to be selected and trained. The Government of Kenya or other partners will need to determine how to financially and technically support the EDS platform. This would include funding of the Kenya EDS server and training administrators to manage the EDS.

Liberia

Introduction

MalariaCare worked in Liberia during PY1, PY2, and PY4 to support the NMCP and county health teams to conduct malaria diagnostic QA training and supervision. Activities were suspended in late PY2 and the entirety of PY3 as a result of the Ebola virus outbreak (the first confirmed case of Ebola virus disease was reported on March 17, 2014; WHO declared an end of the crisis on January 14, 2016).



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

- In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:
- Supported the update of the national malaria laboratory diagnostic guidelines in collaboration with the NMCP and Ministry of Health and Social Welfare beginning in PY2. As a part of this effort, MalariaCare supported a three-day workshop to gather input from more than 20 stakeholders. Following the workshop, universal testing of suspected malaria cases was added as a standard practice to the guidelines, and a draft policy was distributed for review. In PY4, MalariaCare provided additional technical input into the draft document, which was then passed to the NMCP's technical working group for finalization.
- Reinforced the skills of national reference laboratory expert microscopists. In PY4, MalariaCare supported an aMDRT and competency assessment in malaria diagnostics for the ten microscopists from the national reference lab. The purpose of this training was to refresh diagnostic skills of the national cadre responsible for overseeing decentralized training and supervision activities and for implementing the national QA plan for malaria diagnostics. The long-term objective was to improve the technical capacity of this group to Level A or B status, assuming that continuous training and mentorship would be available; the refresher course is a first step in this process. The refresher training and assessment focused on three microscopy competencies: parasite detection, species identification, and parasite quantification.
- Parasite detection scores were high in the pre-test with an average of 79 percent (median 82 percent; range 36 to 100 percent), and improved to 86 percent post-test (median 88 percent; range 70 to 100 percent). Although only two of ten (20 percent) participants passed all three components of the competency assessment by attaining Level A (n=1) or B (n=1), improvements were made by the group overall, with a third participant

falling only two points short of the passing threshold on species identification. Based on class average scores, the greatest gains between pre- and post-test were observed for parasite quantification, up 62 percentage points from 8 percent at pre-test (median zero; range 0 to 25 percent) to 70 percent at post-test (median 67 percent; range 50 to 83 percent) and species identification, which increased by 24 percentage points, from 42 percent at pre-test (median 50 percent; range 0 to 67 percent) to 66 percent at post-test (median 64 percent; range 39 to 94 percent). By the end of the training, all participants (100 percent) performed at Level A for parasite counting. All RDT steps were performed correctly during an observation. See Table 50 for overall group results over the course of the training. The three highest performers from this training helped to facilitate the PY4 MDRT for county supervisors.

Table 50. Advanced malaria diagnostic refresher training pre- and post-test results, Liberia (n=10)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	79% (82% [36%–100%])	86% (88% [70%–100%])	7
Species identification	42% (50% [0%–67%])	66% (64% [39%–94%])	24
Parasite counting	8% (0% [0%–25%])	70% (67% [50%–83%])	62

- Reinforced the competency of 19 county diagnostic supervisors by conducting malaria microscopy refresher training and competency assessment in two sessions, held in PY2 and PY4 (12 participated in both sessions). This cadre is responsible for implementing decentralized training and supervision activities within their counties. Both sessions focused on two essential microscopy skills, parasite detection and counting, while species identification was evaluated only during the PY2 session. Fourteen (14) of the 19 participants with both pre- and post-test scores (74 percent) passed the competency assessment for parasite detection and counting at Level A (n=10) or B (n=4). Overall, these participants scored higher on parasite detection than their national-level counterparts, likely due to the frequency with which they examine blood smears. See Table 51 below for overall group results over the course of the training.

Table 51. Most recent basic malaria diagnostic refresher training pre- and post-test results for county supervisors, Liberia (n=19)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	75% (73% [50%–100%])	87% (90% [68%–100%])	12
Parasite counting	16% (25% [0%–50%])	59% (58% [33%–83%])	43

- Supported three Liberian expert microscopists to undergo reaccreditation at ECAMM in PY2; however, they were not able to maintain their high level of accreditation (L1 or L2) during the course: two received L3 and one received L4. Two of the three participants attended the aMDRT during PY4, where one attained L1, and the other L3 competency.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

- In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:
- Worked closely with the NMCP, PMI, national human immunodeficiency virus (HIV) program, and national tuberculosis program in PY2 to begin collaborative development of an integrated health facility supervision checklist. The joint tool was anticipated to be adopted and used by the national malaria, tuberculosis, and HIV programs to introduce integrated QA supervision visits to health facilities nationwide.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Facilitated the procurement of 20 slide sets, made up of 15 slides per set that consist of varying malaria parasite species and densities for the NMCP in PY4. The slides, which were developed under WHO protocols for slide banking, will be used for routine training of malaria microscopists, competency assessments, and PT. Members of the NMCP underwent a two-day orientation on the operational and management aspects of the slide bank, and a slide management database (Microsoft Access) was handed over to the NMCP and a brief tutorial provided. As part of the transition, SOPs for the database and an implementation manual were provided to the NMCP.

Recommendations

To ensure continued progress in strengthening the national- and county-level core groups to carry out training and QA activities for malaria microscopy, the following immediate and long-term recommendations may be considered.

- At the national level:
 - Develop a three-month training plan using the newly acquired PT slides. This training, to strengthen the performance of the national core group, could be led by the two aMDRT participants who received passing scores.
 - Consider replacing or reassigning members of the core group who are unable to meet WHO L2 minimum standards for parasite detection and quantitation.
 - Consider sponsoring the two participants that passed the MDRT to attend the WHO ECAMM in Nairobi, Kenya.
- At the county level:
 - It is recommended that the county supervisors from Grand Cape Mount (the only county that failed the competency assessment) receive follow-up training. County supervisors from Margibi and Maryland counties, who were not present during the training, could join as well.

- For the long term, MalariaCare recommends that the NMCP:
 - Provide regular refresher training and PT opportunities to those supervisors supporting malaria microscopy in health facilities.
 - Consider using distance-based learning courses for malaria microscopy as a way to conduct low-cost MDRT-like training more frequently.
 - Consider developing a NCAMM course (using the newly acquired slide sets). WHO has published a course description and details that can be used as a reference.

Transition and sustainability

- Three participants who scored at least at or close to Level A or B during the aMDRT co-facilitated the MDRT for county supervisors in PY4. By doing so, the overall course management, including teaching, daily preparations, and grading, was transitioned to the NMCP. To support the NMCP's implementation of malaria microscopy QA activities using the provided slides sets, a PT slide management database, SOPs, and implementation manual were handed over to the NMCP.
- As part of restoring laboratory services for malaria in Liberia (post-Ebola outbreak), the Ministry of Health and Social Welfare is planning to reinstate the OTSS program mobilizing recently trained and competency-assessed county supervisors and using the integrated checklist for tuberculosis and HIV to collect critical information on all three diagnostic areas. Additionally, the NMCP indicated in PY4 that it plans to recertify a number of former WHO L1 and L2 microscopists that make up their national-level core group.

Madagascar

Introduction

In Madagascar, MalariaCare worked in close collaboration with the national malaria control program (*Département de Lutte contre le Paludisme*, or DLP) to build its capacity to roll out a national malaria case management and supervision program with Global Fund funding. MalariaCare began work in PY3 with a health facility assessment that reached PMI-supported health facilities in 20 regions, followed by work at the central and provincial level to create a pool of supervisors that would introduce malaria case management QA activities in the high-burden provinces of Antsiranana, Fianarantsoa, Mahajanga, and Toliara. In PY4, MalariaCare worked primarily in Antananarivo, with a focus on 1) preparing the DLP for the rolling out of the national supervision mechanism and 2) implementing OTSS. The project also supported case management training in Menabe region.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Collaborated with the DLP to train 18 central- and regional-level laboratory technicians in an MDRT TOT during PY3, which aimed to prepare the technicians to train, in turn, district-level technicians who would also go on to act as OTSS supervisors. Analysis of pre- and post-test training scores was used to evaluate overall performance and to identify gaps in knowledge. Great improvement in all three competency areas was seen from pre-test to post-test (Table 52), with a 48 percentage point improvement for species identification, 43 percentage point improvement for parasite counting, and 15 percentage point improvement for parasite detection. Of the 18 participants, 14 (78 percent) attained Level A or B scores overall. All participants attained Level A or B competency in both parasite detection and species identification. Scores from this MDRT are the highest observed to date for any single MDRT when compared across all MalariaCare-supported countries. The trainers can now be called upon to strengthen the skills of laboratory technicians nationwide through MDRT.

Table 52. Malaria diagnostic refresher training training-of-trainers pre- and post-test results, Madagascar (n=18)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	85% (91% [0%–100%])	100% (100% [97%–100%])	15
Species identification	47% (50% [0%–71%])	95% (98% [81%–100%])	48
Parasite counting	7% (0% [0%–25%])	50% (50% [25%–75%])	43

- The central- and regional-level participants from the TOT supported a district-level MDRT for 41 laboratory technicians from Toliara, Fianarantsoa, and Mahajanga provinces in PY3. The training included RDT and microscopy skills strengthening, with special attention on parasite detection; species identification and parasite counting are in Madagascar generally not routinely practiced at the district level. Thirty-two (32) of the 41 participants (78 percent) attained Level A or B competency scores in parasite detection. Average scores increased by 22 percentage points for species identification, 13 percentage points for parasite detection, and 5 percentage points for parasite counting (Table 53).

Table 53. District-level malaria diagnostic refresher training pre- and post-test results, Madagascar (n=41)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	74% (82% [18%–100%])	87% (89% [61%–100%])	13
Species identification	35% (43% [0%–71%])	57% (57% [4%–95%])	22
Parasite counting	6% (0% [0%–50%])	11% (6% [0%–44%])	5

- Developed high-quality microscopy skills within the national core team of OTSS supervisors through a follow-up training on malaria microscopy in PY4. A set of 84 malaria slides were procured from the existing slide archive at the Madagascar Pasteur Institute (*Institut Pasteur Madagascar*, or IPM) to serve as PT panels for identification of *Plasmodium* species and determination of parasite density. The OTSS supervisors provided their results on parasite detection, density, and species identification to IPM staff who cross-referenced them and provided feedback on correct characterization of the slides. The supervisors and technicians involved in this activity kept the IPM PT panels to continue practicing slide reading. Table 54 below presents the results of the PT panel exercise.

Parasite detection scores were high, with a mean score of 98 percent and a median of 100 percent. Species identification scores were generally strong, with a mean score of 82 percent and a median of 80 percent.

Parasite quantification scores were weaker, with a mean score of 21 percent and a median of 25 percent.

Table 54. Results of malaria proficiency testing panel exercise conducted for core national team of outreach training and supportive supervision supervisors in Madagascar, 2016

	Number of slides	Parasite detection	Species identification	<i>Plasmodium falciparum</i> counting*
Supervisor #1	10	100%	80%	33%
Supervisor #2	10	100%	90%	40%
Supervisor #3	10	100%	100%	25%
Supervisor #4	10	90%	60%	0%
Supervisor #5	10	100%	80%	0%
Supervisor #6	10	100%	80%	25%

* *P. falciparum* counting scores were graded against ± 25 percent of the true count provided by Institut Pasteur Madagascar (IPM).

- In support of building expert-level capacity at the national level, provided financial and logistical assistance for three participants to attend ECAMM, held at UCAD in Dakar, Senegal. The objectives of ECAMM are 1) to help develop a national core group of expert microscopists in participating countries who are accredited to internationally recognized standards for malaria microscopy and 2) to provide formal certification of the competency of these microscopists. Among the three expert microscopists who participated in the ECAMM in Dakar, two received WHO L1 accreditation; one was accredited as a WHO L2.



Twelve (12) ECAMM participants from Madagascar, DRC, Mali, and Senegal. Dakar, June 2016.

Photo credit: Daouda Ndiaye

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Coordinated with the DLP to conduct CCMRT for a total of 120 participants over two years. In PY3, MalariaCare and the DLP organized CCMRT focused on improving the knowledge and adherence to MOH/DLP guidelines for clinical case management of malaria and other febrile illnesses. Eighteen (18) central- and regional-level clinicians underwent a CCMRT session that also focused on building capacity of the participants to work as clinical mentors alongside their laboratory counterparts. These supervisors then cascaded the training to 45 district level clinicians from Mahajanga, Toliara, and Fianarantsoa. In PY4, MalariaCare supported two CCMRT courses for 55 district-level nurses and physicians in the target districts of Morondava, Belo sur Tsiribihina, Miandrivazo, and Mahabo. Although pre- and post-test results are not available for the district-level cascade training that occurred in PY3, results from the central/regional-level session and PY4 sessions show that performance for both supervisors and clinicians improved from pre-test to post-test (see Table 55).



Practical exercises on use of rapid diagnostic tests (RDTs). Miandrivazo, December 2015.
Photo credit: MCDI

Because participants were made up of different cadres, trainers had to make a special effort to deliver course content in a way that was understandable to all trainees, sometimes leading to challenges in completing the training within the scheduled time period. Participants received feedback on pre-test performance to help address areas that required strengthening and were provided with a CD with learning tools, including reference guidelines, participant workbooks, job aids, and bench aids for using injectable artesunate, at the end of the workshop.

Table 55. Clinical training pre- and post-test results, Madagascar (n=74)

Trainees	Pre-test score Mean (median [range])	Post-test score Mean (median [range])	Percentage point change in mean score
Supervisors (n=18)	78% (75% [63%–100%])	88% (89% [71%–96%])	10
Clinicians (n=56)	64% (67% [47%–83%])	82% (87% [33%–100%])	18
Total (n=74)	68% (67% [47%–100%])	84% (87% [33%–100%])	16

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Initiated activities in PY3 with a health facility assessment of 65 PMI-supported facilities nationwide, covering each of the country’s three malaria transmission zones. The assessments served to help target technical support for overall febrile case management activities by both MalariaCare and other partners working in case management. Information was gathered through direct observation, interviews, patient record review, and assessment of the availability of drugs and equipment.
- Created a cadre of clinical and laboratory OTSS supervisors to implement the DLP’s malaria case management QA approach through OTSS visits to health facilities. In PY3, MalariaCare conducted an OTSS

supervisor TOT for the 16 central-level laboratory supervisors who achieved a Level A, B, or C score in the MDRT and the 18 high-performing central- and regional-level clinicians from the CCMRT. The participants were oriented to the OTSS approach and supervision skills and then supported to develop plans to cascade the training to the district level, where a total of 85 district-level supervisors were then trained. Emphasis was placed on working as a team to conduct joint OTSS visits, including deliberate collaboration among clinical and laboratory supervisors to identify case management issues and working together to resolve them.

- In preparation for OTSS in PY4, MalariaCare supported a three-day theoretical and practical training on OTSS methodology and the use of the MalariaCare supervision tool. Nine participants from the DLP who act as OTSS supervisors in Antananarivo were trained. Classroom training sessions were delivered at the DLP, and practical training took place at health facilities in and around Antananarivo.
- In collaboration with the DLP, conducted two rounds of joint laboratory and clinical OTSS at 24 health facilities in Antananarivo. The objective of the activity was to strengthen the skills of the central supervisory team, preparing them to train, mentor, and supervise regional and district supervisory teams in anticipation of a nationwide rollout of OTSS. MalariaCare printed and distributed case management algorithms to CCMRT participants and printed malaria diagnostics bench aids for distribution to Antananarivo health facilities during OTSS visits in PY4.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Supported the DLP to develop a national malaria diagnostics QA strategy in PY4 by providing a one-day orientation to the WHO *Malaria Microscopy Quality Assurance Manual* and QA approach. The orientation targeted six participants from the DLP who are involved in the development of the national malaria diagnostics QA framework. The orientation provided an overview of the NAMS development process, implementation of a national QA system, IQA standards and protocols, and NCAMM schemes. Since completion of project activities in the country, the DLP has finalized but has not yet distributed the malaria diagnostic QA manual. The DLP has already implemented several QA activities, including printing and distributing bench aids and standards of practice to health facilities, conducting OTSS in both public and private health facilities, performing on-site PT, supporting health facilities to implement IQA measures, and distributing reagents and supplies to health facilities.
- Provided technical assistance to the DLP to build its capacity to develop a NAMS. To this end, MalariaCare provided guidance documents, supported protocol development, and conducted a five-day NAMS training to orient key staff to the essential competencies needed to develop a national slide bank, such as sample collection, dilution of samples to specific parasite densities, preparation of thick and thin blood slides, parasite identification and quantification, and microscopy and PCR slide validation processes. Twelve laboratory technicians and clinicians from IPM and the DLP who are directly involved in the development of the Madagascar NAMS were trained.
- During the training, 384 slides were prepared in accordance with WHO procedures for thick and thin blood film preparation, staining, mounting, and storage (see

Table 56 below). These slides can be used by the DLP to support microscopy training, prepare microscopists for national and WHO-level accreditation, and develop PT panels that can be used for skills testing and ongoing training during on-site supervision at the regional and district level. Following this training, the DLP has the technical capacity to develop a full NAMS.

Table 56. Slide sets prepared during national archive of malaria slides training, Madagascar

Slide type	Donor	Parasite density (p/μL)	Total slides
Negative slides	1	N/A	100
Plasmodium falciparum	2	458,133	14
P. falciparum	3*	228,000	63
P. falciparum	3*	114,000	84
P. falciparum	3*	76,000	48
P. falciparum	3*	45,000	30
P. falciparum	3*	22,000	45
Total			384

*From this donor, several dilutions were performed to make slides with different parasite densities.

- Supported a two-day LLW following the end of each round of OTSS to present and discuss OTSS data and results from the 24 health facilities visited each round. At these workshops, supervisors met to share experiences by presenting their own district's OTSS results, discuss the quality of data collected, identify systemic problems, and develop action plans to address any gaps and challenges prior to the next round of OTSS.

Progress made on key MalariaCare indicators

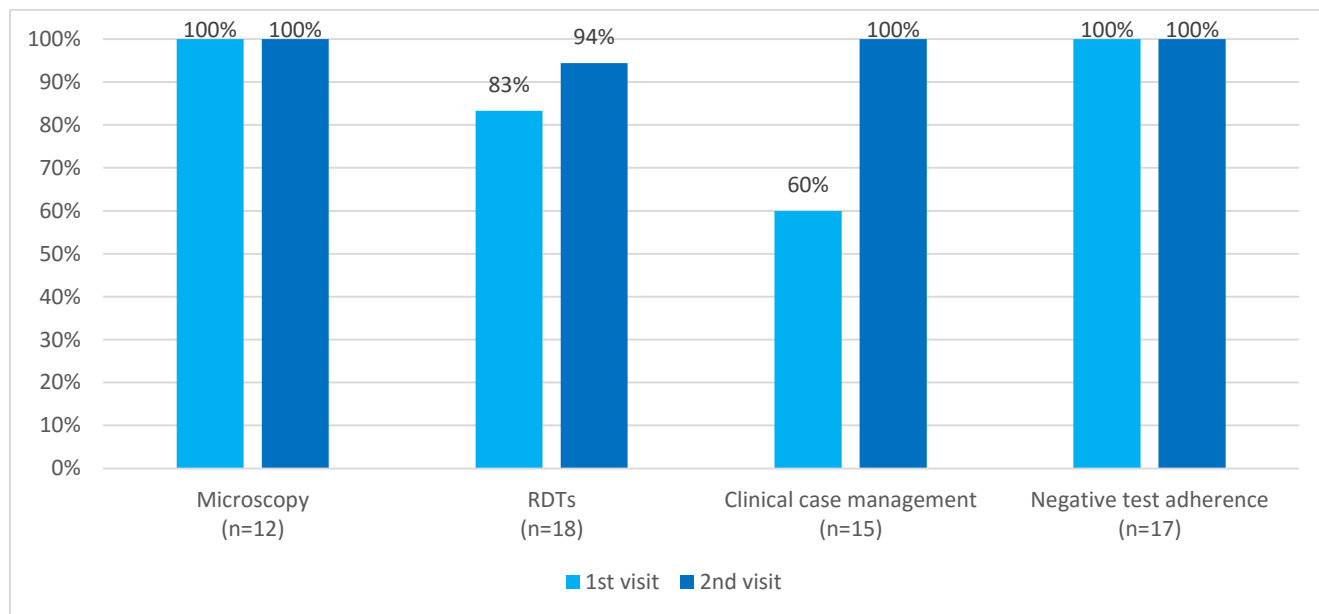
Trend analysis

Figure 45 summarizes trends on key MalariaCare health facility performance indicators for facilities with scores available in both rounds conducted in PY4. Among these facilities, supervisors rarely found at least five records of ACTs being prescribed or positive test results, so trends in performance on testing prior to treatment and positive test adherence could only be calculated for a few facilities (2 and 3 respectively) and are not presented.

Among facilities with trend data, all were found to already meet the minimum performance target of 75 percent for microscopy during the first round. However, average microscopy scores improved from 89 percent to 93 percent, indicating that progress was made among some facilities toward meeting or exceeding the overall target of 90 percent. The proportion of facilities meeting targets for negative test adherence remained unchanged with a perfect score (that is, no ACTs prescribed for negative test results) in both the first and second OTSS rounds. This may in part be due to the relative low prevalence of malaria in Antananarivo, where OTSS was conducted for practical purposes and, as is often the case in high prevalence areas, providers did not show a propensity to routinely prescribe antimalarial drugs for fever. On the other hand, improvements were found in conducting RDTs

and febrile clinical case management: the proportion of facilities meeting minimum performance targets increased by 11 percentage points for the former, and by 40 percentage points for the latter.

Figure 45. Proportion of health facilities meeting minimum performance target (75%) on competencies, and overall target on negative test adherence (90%), first versus second visit, Madagascar

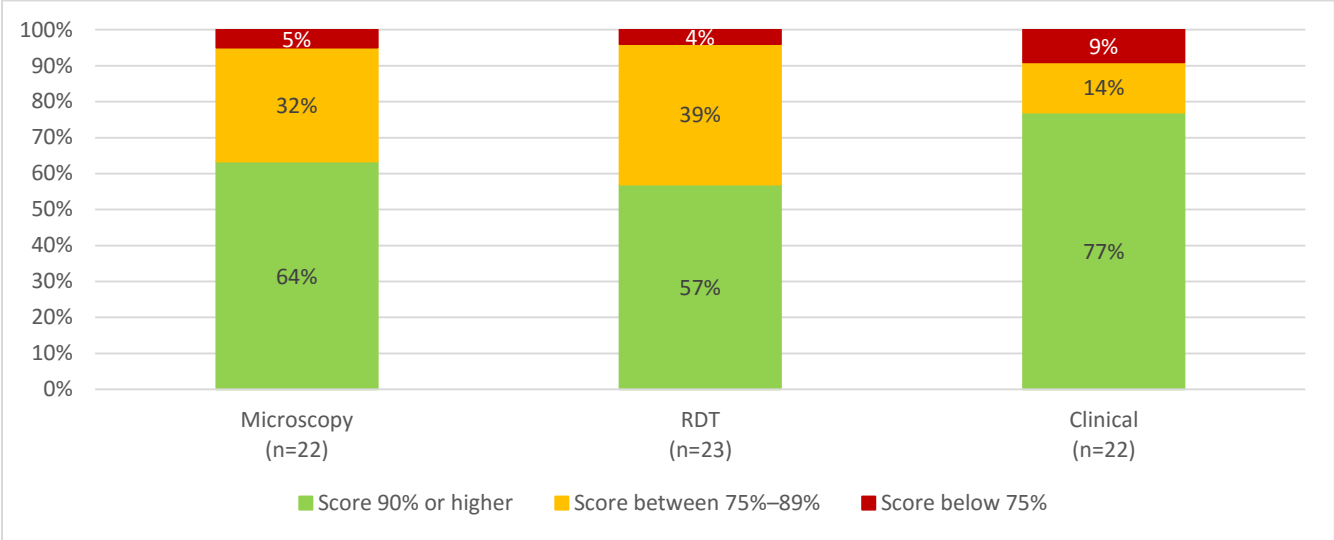


Note: Trend data was available for 55 percent of facilities that performed microscopy; for the other 3 scores trend data was available for more than 62 percent of facilities.

Most recent visit

Figure 46 summarizes health facility performance for malaria microscopy, RDT use, and clinical competencies for all facilities with available data during the most recent OTSS visit in PY4. The proportion of facilities meeting the minimum performance targets for technical competencies was similar to those facilities with trend data during the most recent visit. However, a substantially lower proportion of facilities met the overall target (score of 90 percent) than in other countries, indicating that RDT skills have room for improvement.

Figure 46. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on microscopy, RDT, and clinical competencies during the most recent OTSS visit, Madagascar



Note: Due to rounding, percentages presented here may not sum to 100. Results for each score were available for more than 91 percent of facilities.

Challenges

Challenge	Solution/recommendations
DLP staff has competing priorities, making it difficult to coordinate MalariaCare activities such as training and supervision (OTSS).	MalariaCare made a concerted effort to coordinate its training activities with other activities requiring the participation of DLP staff.
Lack of sufficient microscopes for training at the regional level.	Advise the DLP to use funding from other sources to purchase microscopes and basic materials and supplies for the capacity-building of laboratory technicians on diagnostic quality of malaria.

Additional recommendations

- In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Madagascar, the following recommendations may be considered:
- In the future, the DLP should take the skill set of individuals into consideration when identifying participants to ensure that a single training session targets individuals of similar cadre and competence level in order to provide information efficiently and appropriately.
- It is recommended that the DLP build on the work done in collaboration with MalariaCare to further develop and implement the integrated diagnostics and clinical malaria case management QA system. It also is recommended that supervisors be selected according to the following criteria, dependent on level:
 - At the reference level, laboratory supervisors should be selected from among staff with considerable bench microscopy experience and who passed proficiency tests, to ensure that they can perform PT with

facility laboratory staff. Clinical supervisors are best selected based on their knowledge and mentoring skills in both outpatient and inpatient management.

- At the peripheral level, the DLP should select supervisors that are well versed in performing and interpreting RDTs and understand their application to treatment, in addition to possessing knowledge and mentoring capacity in outpatient and inpatient management.
- To build and maintain key microscopy skills, it is recommended that supervisors continue to practice reading the malaria slides provided to them in the PT panels with guidance and feedback from IPM, especially as relates to parasite quantitation. The project recommends that the DLP and IPM continue to support periodic refresher microscopy training overall to further develop and sustain microscopy skills in the country.
- Additional CCMRT for clinical supervisors, especially targeting those who have not been trained on the updated national guidelines, is recommended. Supervisor refresher training for both cadres should be provided regularly to ensure that supervisors are equipped with mentorship and on-site training skills.
- To achieve the most impact, it is recommended that the DLP target joint clinical and laboratory OTSS at low-performing health facilities in order to bring the quality of care up to minimum standard levels. It is also recommended that following OTSS rounds, the DLP carry out LLWs with the national and regional teams, allowing them to provide health facility–level feedback and recommendations for the improvement of the QA system and short-term action plans to correct systemic issues in Madagascar.
- Investment in training and PT slide sets, either a NAMS or PT panels, for use in EQA is also recommended. It is recommended that the DLP identify funding to continue adding to the slide sets developed during the NAMS training, in order to create a full NAMS that includes all *Plasmodium* species. These slides can be used by the DLP to support microscopy training, prepare microscopists for national and WHO-level accreditation, and develop PT panels that can be used for skills testing and ongoing training during on-site supervision visits at the regional and district levels.

Transition and sustainability

- Following completion of activities planned for PY4, MalariaCare organized and carried out a one-day close-out meeting. All activity participants, implementing partners, and the USAID Mission in Madagascar staff were invited. The results of all activities conducted by MalariaCare in PY4 were presented and recommendations for the DLP made. It was specifically suggested that the DLP continue to 1) conduct two to four regular rounds of OTSS annually and 2) identify funding to use the skills learned from MalariaCare to develop and manage a malaria slide bank for EQA use. OTSS is planned for 2018 in all 22 regions; however, funding has not been secured to move forward with development of a NAMS in the coming year.
- MalariaCare has worked in Madagascar in collaboration with the DLP and IPM to strengthen the country’s malaria case management QA program by ensuring that strong core competencies are instilled in laboratory technicians and clinicians to provide effective and impactful supervisory visits. The project leaves behind a well-trained core team that can continue to implement malaria QA measures nationally.

Malawi

Introduction

MalariaCare started implementation of activities in Malawi in 2013 (PY1) and continued through September 29, 2017 (PY5). The project worked closely with the NMCP and other partners to build capacity in malaria case management at all levels of the health system. MalariaCare worked nationwide, covering all 29 districts with OTSS, and conducted training in malaria case management for all facilities in the 14 focus districts of Blantyre, Chiradzulu, Dedza, Likoma, Mchinji, Mwanza, Mzimba North, Mzimba South, Rumphi, Neno, Nkhata Bay, Ntcheu, Ntchisi, and Thyolo. Beginning in PY4, the project’s focus expanded to support iCCM activities within the four districts of Mwanza, Thyolo, Neno, and Blantyre.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Created a pool of 151 microscopists through MDRT to support diagnostics QA within Malawi over the five-year project period, 43 of whom were OTSS laboratory supervisors. Practical skills evaluated during the MDRT included parasite detection, species identification, and parasite counting. Improvements were seen for all three competency areas, with the largest increase in performance seen for species identification (23 percentage point increase) (Table 57). Despite these improvements, performance remained low at the time of the final assessment for both parasite counting and species identification, with an average score of 51 percent and 36 percent, respectively. Of the 151 participants, 121 (80 percent) met the Level A or B standard for parasite detection, 5 (3 percent) percent met the standard for species identification, and 70 (46 percent) parasite counting. As in other countries, species identification remains the greater barrier to meeting the WHO standards, although given the high prevalence of *P. falciparum* in Malawi, species identification skills are not critical except at the highest reference facilities to monitor changes in epidemiology. Parasite counting skills, which were also low following the MDRT, are a critical for the ongoing management of severe malaria cases.

Table 57. Malaria diagnostic refresher training microscopy practical pre- and post-test results, Malawi (n=151)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	74% (79% [0%–100%])	87% (88% [33%–100%])	13
Species identification	28% (27% [0%–73%])	51% (52% [18%–84%])	23
Parasite counting	16% (0% [0%–100%])	36% (35% [0%–83%])	20

- Supported nine microscopists, in collaboration with the NMCP, to attend the WHO ECAMM accreditation training in Nairobi, Kenya, over the project period. One microscopist achieved L1 accreditation, seven achieved L2, and one achieved L4. The L1- and L2-accredited microscopists are currently serving as national-level OTSS supervisors and facilitators for the laboratory technician and laboratory assistant microscopy training.
- Assured the quality of RDT use at the health facility level by supporting the NMCP to conduct an RDT QA refresher training for 38 new OTSS supervisors in PY4. The purpose of training these supervisors was to provide support to lower-level health facilities on RDT testing procedures and use of test results. Of the 38 participants, 19 were clinicians and 19 were laboratory technicians. Average performance increased from 81 percent (median 80 percent; range 55 to 95 percent) at pre-test to 90 percent (median 91 percent; range 71 to 98 percent) at post-test. These supervisors subsequently trained and mentored staff in RDT QA at 146 health facilities.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Supported the scale-up of quality iCCM services in Malawi by launching an integrated supervision and mentoring QA program for health surveillance assistants (HSAs) in four districts: Mwanza, Thyolo, Neno, and Blantyre. Within the four districts, there are a total of 460 village clinics in hard-to-reach areas, each staffed by an HSA. Even though MalariaCare, as per the work plan, initially planned to support 280 of these village clinics, the project was able to expand its support to all 460 village clinics within the districts over the course of implementation through cost sharing with ongoing Save the Children iCCM interventions.
- Worked with the MOH and PMI to design the iCCM QA program so that senior HSAs (SHSAs) would conduct quarterly supervision visits to HSAs within their catchment area to monitor RDT use and the number of patients seen, diagnosed, treated, and referred. As SHSAs have limited clinical training, HSAs also traveled to health centers to receive mentoring in the clinical management of febrile cases by health center staff on a quarterly basis. Mentoring visits by the district health office (DHO) quality-of-care team and supervision visits by the district and national supervision teams to HSAs' village clinics also occurred at a sample of village clinics to further support HSAs in improving their skills in providing quality services to clients.
- Collaborated with the MOH integrated management of childhood illness (IMCI) unit and NMCP to conduct a three-day workshop in PY4 to develop the iCCM quality improvement data collection tools, including the national iCCM supervision tool, the RDT job aid, and the mentoring handbook. The national and district teams, SHSAs and the clinical mentors used these tools during the supervision and mentorship activities. MalariaCare trained 90 SHSAs as supervisors and 82 health facility and district staff as mentors, and oriented 35 DHMT staff, 436 HSAs, and 156 facility health workers to the MalariaCare iCCM QA approach (Table 58).

Table 58. Summary of participants trained on aspects of the MalariaCare integrated community case management approach, Malawi

Participant	Number trained	Focus of training
District health management team staff	35	Orientation to MalariaCare integrated community case management quality assurance approach
Health Surveillance Assistants (HSAs)	436	
Facility health workers	156	
Senior HSAs	90	Supervision
Health facility and district staff	82	Mentorship
Total	799	

Table 59 below provides details on the QA supervision scheme at all levels and the total number of supervision and mentorship visits over the project period.

Table 59. Summary of quality assurance supervision and mentoring program for health surveillance assistants, Malawi

Supervisor/mentor Health system level	Frequency of visit	Total supervision/ mentor visits	Tools
SUPERVISION			
Senior health surveillance assistant (SHSA)	Quarterly	770 visits	National integrated community case management (iCCM) supervision tool Rapid diagnostic test (RDT) job aid
District supervision team (iCCM coordinators laboratory personnel, malaria coordinator, SHSAs, and project staff)	Quarterly, sampled village clinics	265 visits	National iCCM supervision tool RDT job aid
National supervision team (National project staff and IMCI unit and NMCP representatives)	Bi-annually, sampled village clinics	31 visits	National iCCM supervision tool RDT job aid
MENTORING			
Health center clinical mentors	Quarterly	633 visits	National iCCM supervision tool Mentoring handbook
District health office quality-of-care team	Quarterly, sampled village clinics	308 visits	Case management quality-of-care assessment tool

- Supported supervision by SHSAs and district and national teams to 460 HSAs. SHSAs were tasked with conducting a supervision visit to each HSA once per quarter, while district and national supervision teams were tasked with visiting a sample of village clinics. During the visits, the supervisors observed HSAs providing care and using RDTs. Observations were followed with feedback and on-site coaching on problems noted by the supervisors. The national-level supervision also included debriefings with DHMTs on key issues requiring further attention by district management.

- MalariaCare supported 770 supportive supervision visits by SHSAs, 265 by district supervision teams, and 31 by national supervision teams. In the first three quarters of PY5, MalariaCare supported supportive supervision for 436 HSAs. Beginning in the fourth quarter of PY5 (July to August 2017), MalariaCare scaled up to support 460 HSAs with supportive supervision.

The percentage of enrolled HSAs who received a supervision visit from SHSAs and district and national teams ranged from 34 percent (Oct–Dec 2016) to 51 percent (Jan–Mar 2017). As reported by the partner responsible for this component, the increased workload of SHSAs, who are required to perform normal HSA tasks in the community and health facility as well as conduct supervision visits, was the main factor for not completing supervision visits to all HSAs each quarter. Other factors included the lack of reliable transport for supervisors, given the long distances they cover to supervise HSAs within their catchment area, and lack of confidence from some SHSAs in their iCCM skills.



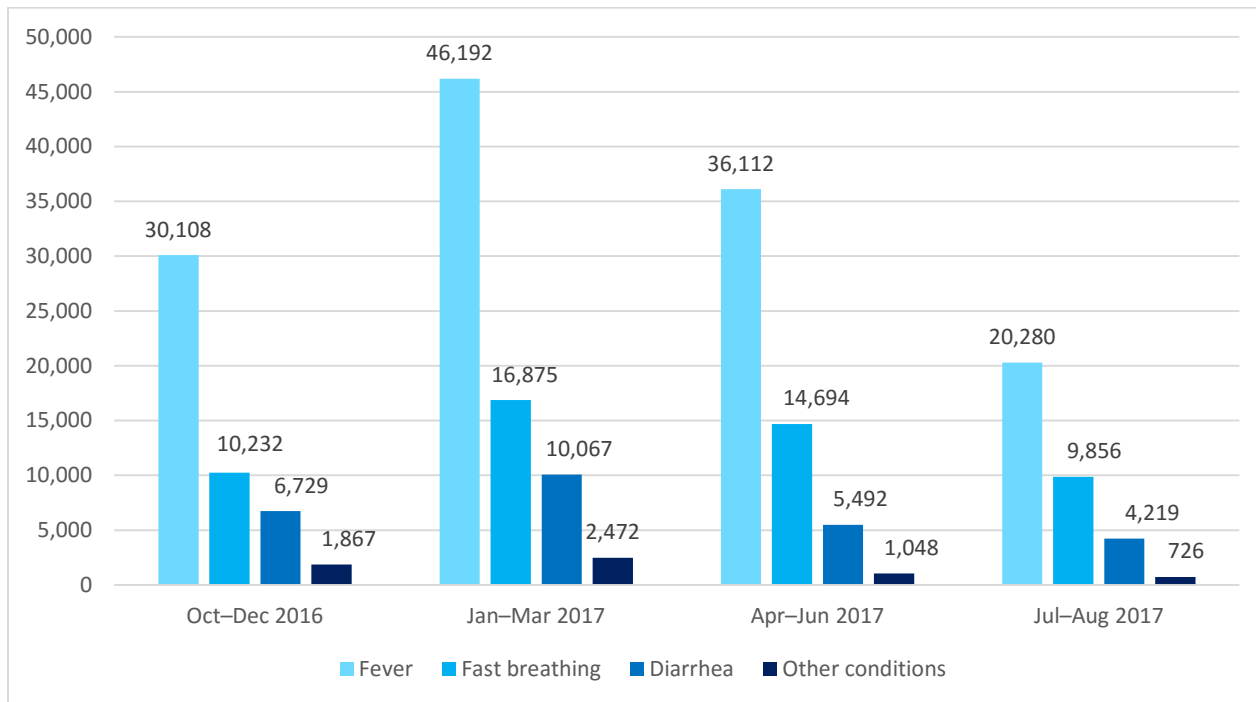
HSA in Mwanza supervised by a national supervisor while providing care.

Photo credit: Save the Children Malawi

- Supported clinical mentors from the health center–level to work on improving key diagnostic, treatment, and referral skills among HSAs—with a special emphasis on improving rapid management of severe illness danger signs among children under five. MalariaCare trained 82 health care workers, including medical assistants, nurses, and laboratory assistants, in mentorship for HSAs. These mentors directly interacted with HSAs to observe and improve their clinical practice in iCCM. The number of mentors trained exceeded the initial target of 60. DHMTs requested the project to include district-level staff as health care workers are often overwhelmed with large patient numbers within their facilities and not able to consistently provide mentorship support to HSAs. A total of 633 mentorship visits were conducted at the health centers, involving 460 HSAs; some HSAs were mentored more than once.
- Conducted quarterly mentorship visits with the DHO quality-of-care team, composed of the IMCI coordinator, malaria coordinator, laboratory coordinator, district HMIS officer, and a clinical mentor, to observe HSAs within the village clinics. These visits aimed to strengthen on-the-job training for HSAs by mentoring them within their village clinics while providing iCCM services. During these visits, more than 90 percent of the HSAs visited showed competence in the overall management of iCCM cases, including conducting RDTs, according to the observation checklist. A total of 308 district quality-of-care team visits took place over the project period. Similar to the supervision visits, the percentage of enrolled HSAs who received mentoring each quarter from health center staff or district quality-of-care teams ranged from 30 percent (Oct–Dec 2016) to 48 percent (Jan–Mar 2017). Major strengths observed by clinical mentors included correct classification of cases for referral, correct use of the iCCM protocol when conducting patient history and physical exam, good knowledge of patient education, good patient/guardian provider relationship, and correct use of RDTs. Mentors observed weaknesses such as incomplete register data, not providing a date for follow-up, challenges with waste segregation (sharps mixed up with non-sharps), and not providing advice on the use of bed nets.

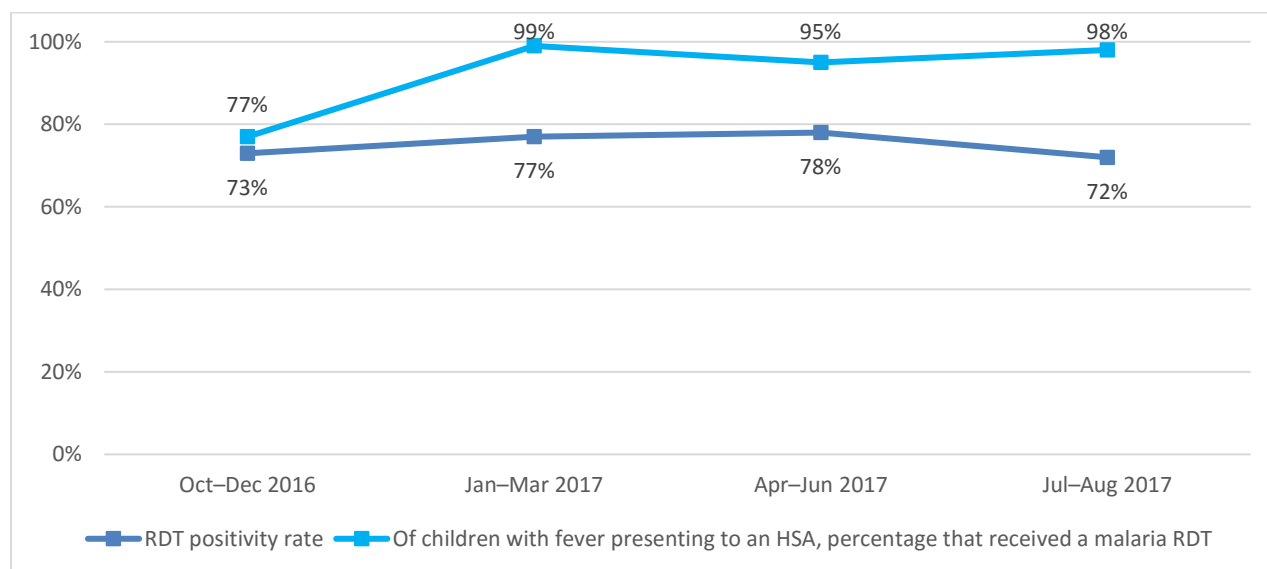
- Supported HSAs to see an aggregate total of 216,969 iCCM cases in the targeted village clinics throughout the four districts. Out of these iCCM cases, fever cases were the most prevalent, representing 132,692 (61 percent) of all cases (Figure 47). Fever cases peaked from January to March 2017, during the rainy season. The remaining cases included patients with symptoms of fast breathing (51,657 cases; 24 percent) and diarrhea (26,507 cases; 12 percent), among others.

Figure 47. Total number of cases seen in the village clinics, by condition, Malawi (n=216,969)



- Of the 132,692 fever cases which presented to HSAs, 123,236 (93 percent) were tested using an RDT. Of these tested cases, 93,050 (76 percent) were positive (Figure 48). The proportion of fever cases tested increased after the first quarter of the project, after all HSAs were trained in RDT use, and it remained at 95 percent or above over the remaining three quarters.

Figure 48. Percentage of children 2–59 months old with fever presenting to a health surveillance assistant that received a malaria rapid diagnostic test, Malawi (n=132,692)



- Of the 93,050 positive cases, 92,545 (99 percent) were classified as uncomplicated cases and of these, 92,267 (99.7 percent) were treated at the village clinic with artemether lumefantrine. The percentage of children with positive RDTs who were treated with artemether lumefantrine was 99.6 or higher for each of the four quarters of implementation.
- A total of 505 (0.6 percent) were severe cases. While all severe cases were referred by the HSAs, only 234 caregivers (46 percent) returned the referral slip to the HSA after visiting the health facility, thus confirming that they had followed through on the referral and received treatment. To determine the number of severe cases administered rectal artesunate, MalariaCare also tracked the number of fever cases referred due to danger signs and the number of suppositories dispensed. However, it was difficult to estimate the number of cases receiving appropriate treatment due to limitations in the Malawi’s national summary reporting tools. These tools track the number of suppositories dispensed, rather than the number of children receiving treatment. As the number of suppositories required varies by age, and age is not recorded, it is difficult to determine how many children received rectal artesunate and a dosage appropriate to their age.
- Worked with HSAs to orient 752 village health committee (VHC) volunteers from 102 of the 460 VHCs. VHCs were trained to improve the systematic referral of children with danger signs by following up with caregivers to determine if referrals were completed. The VHCs supporting the remaining 358 village clinics were oriented through a sister project with Save the Children.
- Conducted four rounds of district review meetings in each district with HSAs, SHSAs, health facility nurses, and health facility in-charges in all four targeted districts to discuss the progress of project activities and share updates, with an average of 55 participants per meeting. Health facility staff and program coordinators presented progress based on key program indicators, which formed the basis for discussions and planning. The presentations stimulated discussions on data quality, supervision and mentorship rates, and waste management and assisted in isolating challenges affecting project implementation. Recommendations from

these meetings led to improvements such as SHSAs and facility-in-charge staff conducting data cleaning on all consolidated health facility monthly reports before sending to the district level, and VHCs constructing waste disposal pits in areas where they were not previously available.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- In PY3, supported the NMCP in the rollout of revised national case management guidelines by conducting 98 CCMRT sessions that reached 3,035 frontline health workers across 14 districts. In PY4, MalariaCare trained 19 new clinical supervisors in CCMRT as part of a combined RDT, clinical, and EDS training. Of all 3,054 participants trained in the CCMRT, scores at both pre- and post-test were available for 2,947 (96 percent) participants. Table 60 below shows that on average, participants improved between the pre- and post-test evaluations, with average scores increasing from 41 to 76 percent.

Table 60. Clinical training pre- and post-test results, Malawi (n=2,947)

Trainees	Pre-test score (median [range])	Post-test score (median [range])	Percentage point change in mean score
Additional supervisors trained in PY4 (n=19)	66% (65% [46%–86%])	79% (78% [68%–95%])	13
National CCMRT* (n=2,928)	41% (41% [0%–94%])	76% (79% [0%–100%])	35
Total (n=2,947)	41% (41% [0%–94%])	76% (79% [0%–100%])	35

Note: PY=project year; CCMRT=clinical case management refresher training.

*Includes trained as part of the national CCMRT who went on to become clinical supervisors.

- Strengthened the quality of malaria case management education at eight pre-service institutions through training in malaria case management and curriculum material update workshops in PY4. MalariaCare, in collaboration with the NMCP, trained 22 tutors from eight institutions in Northern and Central regions on the revised national malaria case management guidelines. Tutors’ scores on a case management pre- and post-test improved by 35 percentage points, from 38 percent (median 39 percent; range 20 to 72 percent) to 73 percent (median 73 percent; range 55 to 87 percent).
- MalariaCare and the NMCP then conducted a workshop for the eight pre-service training institutions to update their course materials and provided follow-up support to ensure updates were made. MalariaCare found the following key revisions made to training curricula, course outlines, and logbooks:
 - Updated malaria epidemiological content.
 - Adjusted depth of course content in line with academic year and specialization.
 - Added triaging of severe malaria.
 - Revised competence checklists to include correct administration of injectable artesunate and proper monitoring of patients with severe malaria.

- In PY5, MalariaCare assisted the Support for Service Delivery Integration (SSDI) project to revise malaria training curriculum content for eight pre-service institutions from the Southern Region that did not participate in MalariaCare’s workshop in PY4. As a result of the workshops, the training curricula now have complementary, up-to-date content and competencies across participating institutions, leading to more uniformly capable providers being added to the workforce. In total, 16 out of 18 training institutions in Malawi participated in the malaria case management content update exercise. The two remaining colleges were invited but unable to participate during the PY4 or PY5 sessions.
- In PY5, MalariaCare also conducted follow-up visits to the eight training institutions in the Northern and Central regions to determine challenges in the delivery of the new content. During the visits, MalariaCare found that the new course content had been delivered with minimal difficulties. Key challenges identified were that some institutions did not have adequate RDT kits for students’ practical sessions and that not all lecturers had been trained in the malaria case management guidelines despite the project meeting its target. The MalariaCare team then discussed with NMCP to provide each school with expired RDTs based on number of final-year students enrolled and to include the untrained lecturers in the ongoing Global Fund–supported case management training. In total, 1,058 students were trained at pre-service institutions since MalariaCare worked with instructors to revise their curriculum. In four schools, instructors administered a malaria case management knowledge test provided by MalariaCare to students after the tutors used the revised content to train them (pre-test) and after they returned from their final-year field internships (post-test). Due to the course scheduling, it was not possible to administer the pre-test to students before training using new curriculum content. For the 146 students evaluated, average scores increased from 58 percent (median 57 percent; range 31 to 80 percent) to 82 percent (median 90 percent; range 37 to 100 percent). The increase in students’ test scores could be attributed to the additional effects of on-the-job mentoring during their internships.
- Worked in collaboration with the NMCP, the Malaria Alert Centre, and Queen Elizabeth Hospital in Blantyre to strengthen clinical competencies to test and treat uncomplicated and severe malaria by training a core group of ten clinical mentors drawn from specialized emergency, pediatric, and internal medicine units. Clinical mentoring was first introduced in PY4 as a supplementary activity to be done in between OTSS visits. This approach was designed specifically to target areas of clinical weakness, both for inpatient and outpatient care, and to improve performance using problem-solving approaches and experiences that have worked in similar settings.
- Clinical mentors conducted five rounds of intensive clinical mentoring visits. The first was an initial pilot in 15 facilities to provide mentors with an opportunity to field test the approach and practice their skills. This was followed by two sets of clinical mentorship visits, with two visits between



Mentor and mentees discussing a patient admitted with malaria.

Photo credit: MalariaCare Malawi

each round of OTSS. Following the pilot, 34 low-performing facilities were chosen for the first phase of implementation, with 17 randomized to receive two mentoring visits, while the remaining 17 continued to receive OTSS alone. In the second phase, 32 low-performing facilities received two mentoring visits, while 30 received OTSS alone. Across these five rounds of visits, mentors reached 141 clinical providers from 47 health facilities.

- Seven indicators of case management performance were measured during the mentoring: 1) RDT performance, 2) clinical management, 3) testing prior to treatment, 4) adherence to negative test results, 5) adherence to positive test results, 6) knowledge and diagnosis of severe malaria, and 7) severe malaria patient monitoring. Preliminary analysis examined the effects of mentoring and OTSS on selected facilities' OTSS scores after the two intensive mentoring visits following the pilot. While average performance increased by 6 percentage points among the intervention facilities and 3 percent among the control facilities, regression analysis found no difference in the degree of improvement between the two groups (relative relative risk [RRR] = 1.02, 95 percent confidence interval [CI]: 0.94–1.10). The findings from the second phase showed similar results, with no significant improvements due to mentoring.
- Created a pool of 113 OTSS supervisors trained in clinical and diagnostic technical areas, mentoring, and systematic data collection and use. Throughout the five project years, MalariaCare supported joint OTSS visits to 345 facilities in all 29 districts, during which a team of laboratory and clinical supervisors visited each facility to assess diagnostic and clinical competencies. Given the need to support lower-level facilities as well, MalariaCare and the NMCP also introduced clinical-only OTSS visits in PY4, targeting 146 facilities without laboratories in the 14 MalariaCare focus districts. These visits focused on clinical case management and the use of RDTs. Through 2,368 OTSS visits, MalariaCare improved the malaria diagnosis and treatment of 491 health facilities over seven rounds.
- Over the course of the project, MalariaCare made several modifications to the OTSS program in Malawi. In PY2, MalariaCare worked with the NMCP and SSDI to revise the clinical and diagnostic supervision checklists. In addition, during the first years of the project, supervisors used paper checklists, which led to incomplete checklist data and made it challenging to compare health facility performance over time. In PY3, MalariaCare introduced the tablet-based EDS, which resulted in improved data completeness and the projects' ability to measure health facilities' progress. At the same time, the NMCP and MalariaCare were coming to a growing realization of the challenges in diagnosing and treating severe malaria patients. In PY4, the NMCP, in collaboration with MalariaCare and other implementing partners, developed a national severe malaria checklist, which then became integrated into the EDS and was used during OTSS. The performance of OTSS health facilities is described in more detail under the "Progress made on key MalariaCare indicators" section.
- Finally, in PY5 MalariaCare evaluated the performance of 58 (64 percent) of the 90 clinical and laboratory supervisors during the last two OTSS visits to determine the quality of supervision and mentorship provided during OTSS. Overall, average evaluation scores among supervisors were high, with an average score of 94 percent among clinical supervisors and 92 percent among laboratory supervisors. The evaluation showed that all supervisors greeted the health worker, provided the health worker with both positive feedback and areas in need of improvement, ensured staff understood feedback, properly collected registry data to assess adherence (if responsible for collecting registry data), and indicated the correct reason for not completing each observation. The most commonly missed items among both clinical and laboratory supervisors were

reviewing data from the previous OTSS visit (57 percent completed this item), completing 100 percent of all relevant checklist questions (79 percent), and determining the status of the problems identified during the previous visit to discuss with facility staff (81 percent). These findings are similar among other MalariaCare supported countries that conducted a supervisor evaluation during the final project year.

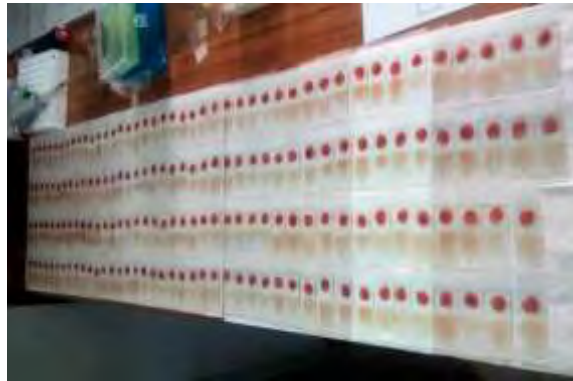
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Strengthened diagnostics capacity in Malawi by conducting a microscope evaluation that assessed the functional status of electric binocular microscopes in 240 health facilities in PY1. This evaluation was used to inform the distribution of 313 microscopes purchased by the NMCP through Global Fund.
- Supported the MOH to finalize the *National Guidelines for Laboratory Diagnosis of Malaria* by coordinating a national stakeholders' workshop in PY5, where participants reviewed and edited the draft document. MalariaCare printed 800 copies of the finalized guidelines for the MOH to distribute to 690 district health facilities, key departments, and pre-service training institutions.
- Conducted seven LLWs between PY1 and PY5 to enhance the use of OTSS data for decision-making. During LLWs, supervisors reviewed OTSS data and identified challenges and solutions to scaling up quality assured malaria diagnostics and treatment in health facilities. As a result, participants generated reports outlining specific recommendations and next steps to address gaps and enhance the intended outcomes of OTSS activities. Reports were shared with stakeholders and were used to support follow-up programming. OTSS supervisors, high-level government stakeholders, and facility health workers were invited to participate in these workshops. At the request of the NMCP, MalariaCare expanded participation to managers, such as DHOs, to generate support from leadership for implementation of the action plans developed. LLWs provided information for programmatic decisions. For example, during one workshop, supervisors noted that many non-clinical providers were administering RDTs but had no formal training on how to do so properly. This information supported the decision by MalariaCare and NMCP to expand RDT QA to lower-level health facilities without laboratories.
- Supported the NMCP to strengthen the capacity of the national case management working group by conducting two national workshops on the use of data to improve case management programming. During this workshop, 46 participants from PMI, NMCP, the IMCI unit, SSDI, and other implementing partners shared project data and lessons learned, and they discussed transition and sustainability plans.
- Supported the MOH to create a NAMS that can be used to support QA, training, and accreditation assessment programs for the overall improvement of the accuracy of malaria microscopy. MalariaCare provided an overview of slide bank protocols in PY1 to a group of MOH senior planners to begin the process of developing the NAMS. Over the following two years, MalariaCare worked with the NMCP and the WHO technical working group on diagnostics to develop a NAMS protocol, which was approved by the Malawi MOH ethics committee in early 2016. In PY4, 10 laboratory technicians were trained on NAMS donor collection and mass slide production. MalariaCare then conducted QA visits to the Nkhotakota and Mchinji

NAMS sites to assess the quality of slides and provide recommendations on improving the quality of mass slide development. It was determined from the QA visit that the Mchinji site was not producing slides at the required standard. As a result, the community health services unit (CHSU) NAMS team stained and characterized the remaining blood films prepared by the Mchinji team.

- The Malawi NAMS has a total of 6,000 validated slides from 41 donors (10 negative and 31 *P. falciparum*) that can be used in ongoing external QA, on-site laboratory supervisor and laboratory technician PT, MDRT, and other training related to malaria diagnosis. As part of the transition of NAMS management to the NMCP, MalariaCare supported two CHSU laboratory staff to visit KHRC in Ghana to improve knowledge and skills at the Malawi MOH on the use of malaria slides sets as part of a functioning NAMS. MalariaCare also oriented one NMCP staff member on management and functionality of the NAMS Microsoft Access database. To help maintain and manage the slides, MalariaCare provided storage cabinets, as well as a laptop, printer, and barcode scanners to support use of the NAMS Microsoft Access database.
- Supported the NMCP in using the EDS platform for OTSS by training 96 supervisors as EDS end-users from PY3 through PY5. In addition, MalariaCare trained 86 district malaria coordinators and district medical officers on the access to and use of OTSS and HMIS data in DHIS2. Finally, in PY5 MalariaCare conducted an EDS systems administration training for six participants from the NMCP, the MOH's central M&E department, and the Organized Network for Services for Everyone's Health (ONSE) project. Following this training, MalariaCare provided remote support to NMCP and ONSE to monitor the trained administrators as they used their new skills in managing user accounts, organization units, and checklist content. Finally, MalariaCare supported the Malawi EDS's transition from a shared server used by multiple countries to an independent server specific to Malawi, which is funded by ONSE and jointly managed by ONSE and the NMCP to support supervision in all 29 districts.
- Conducted an evaluation in PY5, following the data-user training, to better understand the challenges faced in using data for decision-making. Out of the 57 data-users surveyed, 31 (54 percent) responded to the questionnaire, representing 28 of the 29 districts of Malawi. Of the 29 participants who responded to the question on their most recent use of the dashboards, 22 (76 percent) reported accessing the EDS dashboard on their own within the previous three months. The major challenges to using the EDS were lack of internet access (n=25, 81 percent) and forgetting how to use the system (n=13, 42 percent). More than half (n=16, 53 percent) of the users reported reviewing and presenting OTSS and HMIS data at various forums in their districts, such as district data review meetings, district hospital handover meetings, follow-up supervision visits, and artemether lumefantrine dispensing meetings.



Slide preparations during QA visit at the Nkhotakota site.

Photo credit: Emanuel Yamo

- When asked whether they used the data to drive decision-making, 18 (62 percent) reported they had and 17 (74 percent) confirmed that use of EDS data had resulted in improvements of malaria management in their district. Key examples of OTSS and HMIS data use and associated improvements are as follows:
 - OTSS data revealed ACT and RDT stock-outs within some health facilities. Supervisors were then able to use this information to redistribute ACT and RDTs within districts, resulting in reduced stock-outs.
 - Using OTSS and HMIS data, supervisors discovered a gap between confirmed and total suspected malaria cases recorded in registers. Through discussions with health facility staff, they found that registers were not being routinely used during weekends and public holidays. Supervisors mentored staff on the need to continue to record information in the registers during these times, which led to improved documentation of ACT use.
 - OTSS data revealed low scores in identification of severe malaria cases and inpatient monitoring. During subsequent visits, supervisors focused their efforts on these areas of weakness, which led to improvement in these areas.
- These results are encouraging, demonstrating that many of those trained in data use have begun to use the system to drive improvements. However, as is the case in other countries supported by MalariaCare, more work needs to be done to institutionalize data use as a part of routine programming within all districts. Internet access needs to be available for all those expected to use the system, and some may need a refresher course on using the system—this could be done in person or through remote mentoring. District HMIS officers, given their familiarity with DHIS2, should be engaged to work with district malaria coordinators on creating visualizations and reports using the EDS and HMIS data. Finally, the roles and responsibilities for data use should be included in job descriptions, and the NMCP should create standardized expectations for data to be presented within the districts during specific meetings and forums.

Progress made on key MalariaCare indicators

Trend data

In Malawi, a total of 345 facilities (70 percent) received joint OTSS visits starting in PY1, while 146 facilities (30 percent) received clinical-only OTSS visits starting in PY4. The revised checklist was introduced in PY3 and used in 268 of the 345 joint OTSS facilities. Only data from these facilities are included in this analysis. Of the 268 facilities visited at least once after the introduction of the revised checklist in September 2015, 229 (66 percent) received a total of five visits, and their trend data is provided below. From the first to the fifth visit, facilities showed improvement in four of the six core indicators (Figure 49). Performance on microscopy remained the same between these two time points. Performance improved significantly on two minimum standard steps:

- Air-drying the thick film slide before staining (9 percentage point increase).
- Spreading thick film into 1–2 centimeter diameter circle and able to read print placed under the slide (8 percentage point increase).

However, performance declined slightly for the other three minimum standard steps:

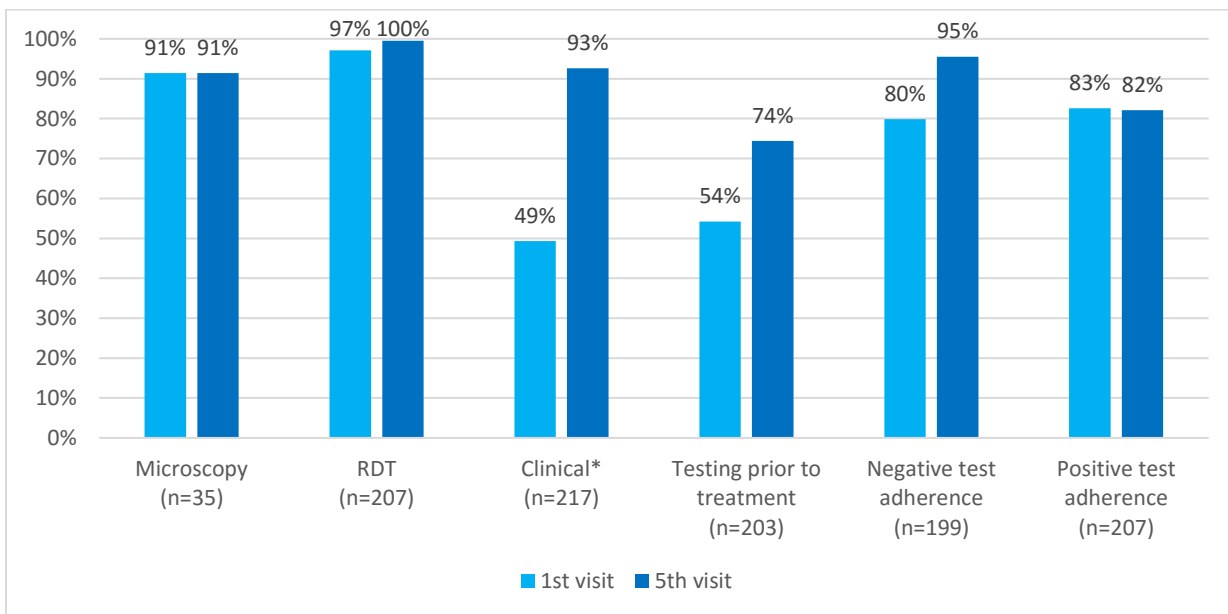
- Immersing slide in Field stain A for three seconds (4 percentage point decrease).

- Immersing slide in Field stain B for five seconds (2 percentage point decrease).
- Correctly reading the slide (2 percentage point decrease).

For RDTs, performance on the minimum standard steps remained consistently high over time—with all above 90 percent at the first visit; however, improvements on some of the other scored steps were seen between the first and fifth visits:

- Checking the expiry date (16 percentage point increase).
- Labeling the cassette (17 percentage point increase).
- Wearing gloves (12 percentage point increase).

Figure 49. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus fifth revised checklist visit, joint outreach training and supportive supervision facilities, Malawi



Note: For four of the six indicators, the percentage of facilities with scores at first and fifth visits was between 58 to 60 percent. For clinical, 87 percent of facilities had scores at both visits. For microscopy, 31 percent of the 113 facilities with microscopy had a score at both visits.

*Compares scores for first and fourth visits conducted after April 2016 when the revised clinical checklist was implemented.

Due to improvements made to the clinical checklist in December 2015, it is not possible to compare overall clinical scores from the first visit using EDS in September 2015. Figure 49 shows the overall clinical scores from the first EDS visit using the revised clinical checklist (completed in March–April 2016) and the most recent OTSS visit conducted in May–June 2017. Among these 217 facilities, performance on clinical case management increased by 44 percentage points.

As overall clinical scores are not available, Table 61 below shows the trends for the four minimum standard steps that have remained consistent in the clinical checklist since the first visit using EDS (completed in September 2015). Improved performance was also seen among this set of facilities on checking for at least one sign of severe malaria, which increased by 43 percentage points. During Malawi’s first LLW held after the introduction of EDS,

district malaria coordinators and supervisors reviewed the results of the clinical management indicators. They observed that checking for signs of severe disease for febrile outpatients was low, with only 50 percent of facilities meeting this standard on average. Independently, supervisors then decided to visit health facilities in between official OTSS visits to further educate clinical providers on the importance of checking for signs of severe disease; by the last visit during PY5, 93 percent of facilities were meeting this minimum standard step. For the other three minimum standard steps, performance remained high at both time points (i.e., first and fifth visits).

Table 61. Proportion of health facilities meeting the minimum standard steps for clinical case management, first versus fifth revised checklist visit, Malawi (n=197)

Step	1 st visit	5 th visit
Checks for at least one sign of severe malaria (or apparent)	50%	93%
Supervisor agrees with whether a malaria test should be ordered	93%	98%
Supervisor agrees with final diagnosis and severity assessment	88%	97%
Correct prescription per test result (if available) and diagnosis	93%	97%

Testing prior to treatment and adherence to negative test results also improved from the first to the fifth visit by 20 and 15 percentage points, respectively. However, with only 74 percent of facilities meeting the performance target for testing prior to treatment, room for improvement remains for this indicator. In addition, the proportion of facilities meeting the minimum performance target for positive test adherence dropped by one percentage point over time.

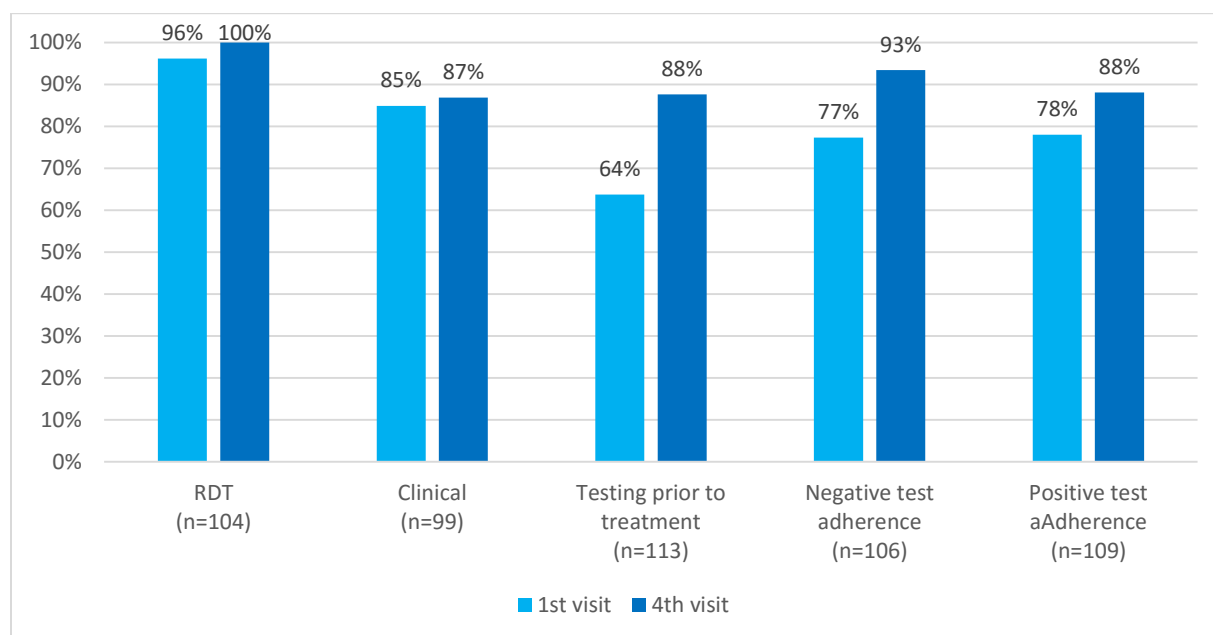
Starting in PY4, clinical OTSS was expanded to lower-level health facilities without laboratories. Of the 146 facilities visited during clinical OTSS visits, 118 (81 percent) were visited during all four rounds of OTSS. Among those 118, performance improved for all five core indicators, with 100 percent of these facilities meeting the minimum standard target during the fourth visit for RDTs (Figure 50).

For clinical care, while overall performance did not greatly increase (85 at first visit to 87 percent at last), improvement was seen in the item checking for a least one sign of severe malaria, with an increase in performance of 5 percentage points, from 86 to 91 percent. Other items of improvement included:

- Asking whether a patient was treated prior to the visit (21 percentage point increase).
- Conducting an eye, ear, nose, and throat exam (15 percentage point increase).
- Conducting a skin exam/checking for rash or dehydration (13 percentage point increase).

However, the greatest improvement among these facilities was seen in testing and adhering to positive test results, which showed increases of 24 percentages and 10 percentage points, respectively.

Figure 50. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus fourth revised checklist visit, clinical OTSS facilities, Malawi



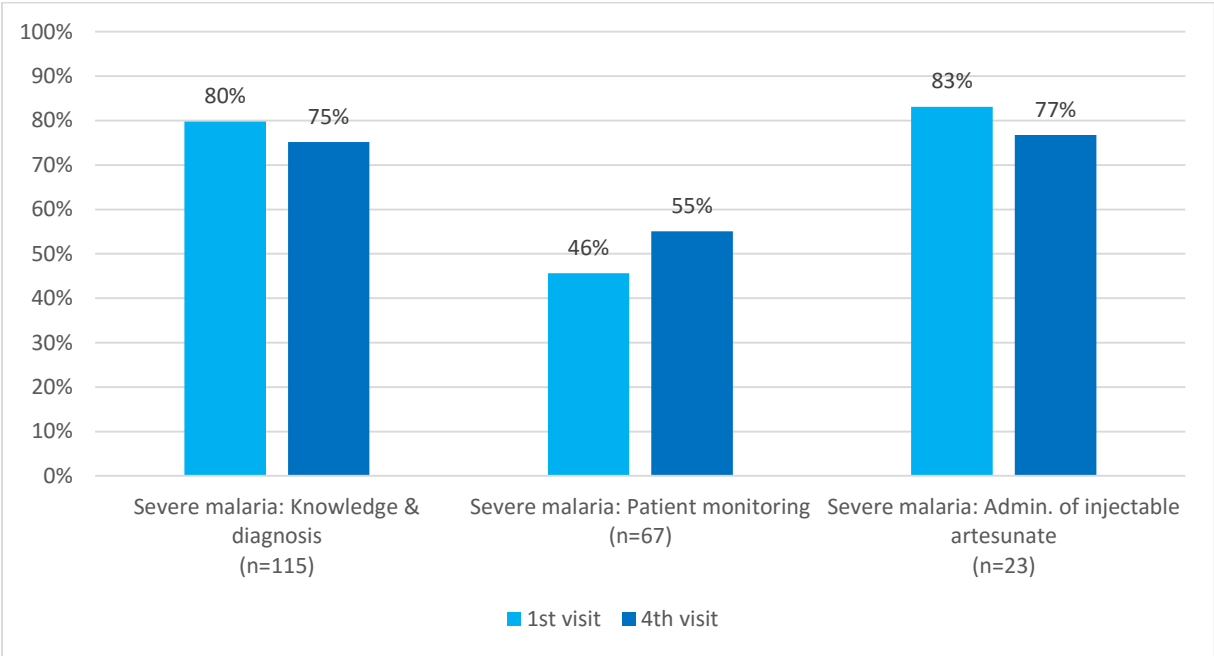
Note: For all five indicators, the percentage of facilities with scores at first and fourth visits was more than 83 percent.

In PY4, MalariaCare began using the newly developed national severe malaria checklist during OTSS visits. For these checklists, there is no minimum performance target for the severe malaria indicators that MalariaCare evaluates (knowledge and diagnosis of severe malaria, severe malaria patient monitoring, and administration of injectable artesunate); therefore, only average scores are presented in Figure 51. Of the 247 joint OTSS facilities visited since the severe malaria checklist was introduced, 87 facilities provided inpatient services and were visited four times. These facilities were evaluated on all three indicators, whereas facilities that do not provide inpatient services were only evaluated on the knowledge and diagnosis of severe malaria.

Performance for patient monitoring improved over time (9 percentage point increase). This may be due in part to MalariaCare’s focus on this area during OTSS and MalariaCare’s distribution of a “critical care pathways” form. This form provides guidance for focused history-taking and clinical examination of patients upon admission, and on monitoring and recording vital signs for inpatients. Despite improvements in some facilities, uptake and continued use of the form has varied due to unavailability of stationary supplies, which made it difficult for facilities to make additional copies of the form as needed.

Performance declined for knowledge and diagnosis of severe malaria (5 percentage point decrease) and compliance to steps in administration of injectable artesunate (6 percentage point decrease). The decline in performance on the latter two indicators is most likely attributed to high staff turnover during the fourth visit. This final visit took place in late April to early May, toward the end of the Malawi governments’ financial year, which ends in June. During this period, many staff retire and newly graduated students take on their positions within the health system; thus, new staff who have not been mentored in previous rounds were being observed for the first time.

Figure 51. Average health facility performance on severe malaria indicators, first versus fourth revised checklist visit, joint OTSS facilities, Malawi



Note: For knowledge and diagnosis, 47 percent of the 247 joint OTSS facilities had scores at the first and last visit. Patient monitoring and administration of injectable artesunate were only assessed in inpatient facilities; 77 and 26 percent of facilities with inpatient units had scores at the first and last visit, respectively.

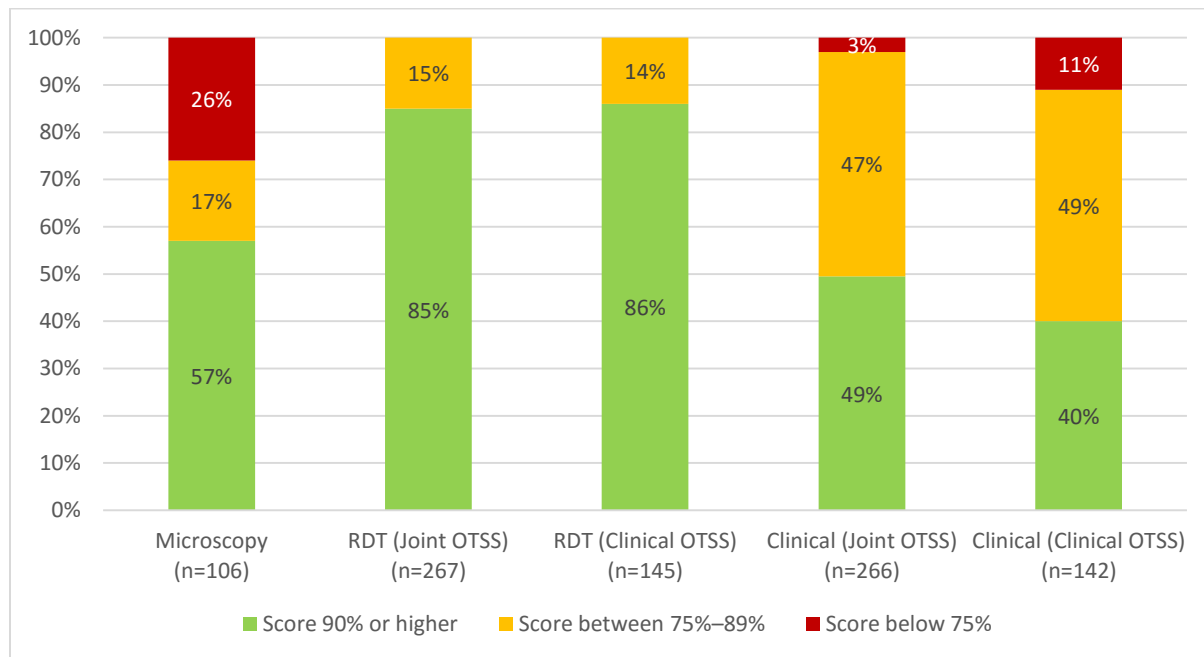
Due to the challenges in supervisors being able to directly observe administration of injectable artesunate, a knowledge assessment was added in the final OTSS round to better assess this skill. Results of the knowledge assessment are presented in the “Most recent visit” section below.

The following section provides an overview of the current status of technical performance (microscopy, RDTs, clinical performance) and adherence (testing prior to treatment, adherence to negative test results, adherence to positive test results) indicators, based on the most recent OTSS visit to each facility in PY5.

Most recent visit

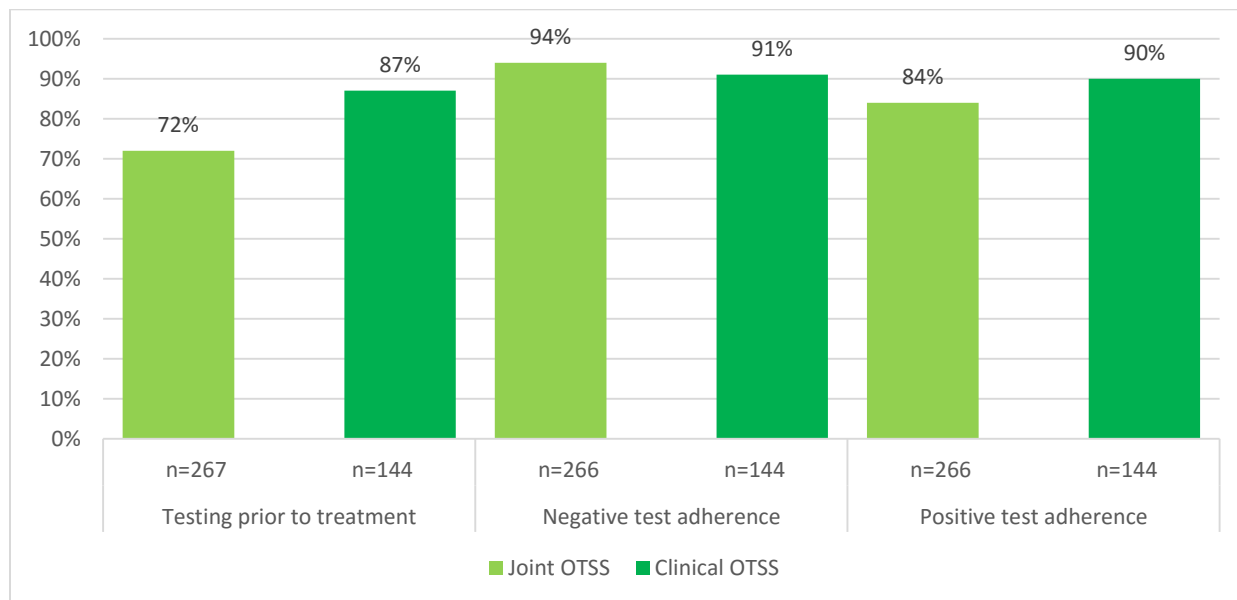
The proportion of facilities meeting the minimum standards at the most recent visit across all facilities was similar to the last visits in the trend analyses, as shown in Figure 52, Figure 53, and Figure 54 below.

Figure 52. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent outreach training and supportive supervision visit, Malawi



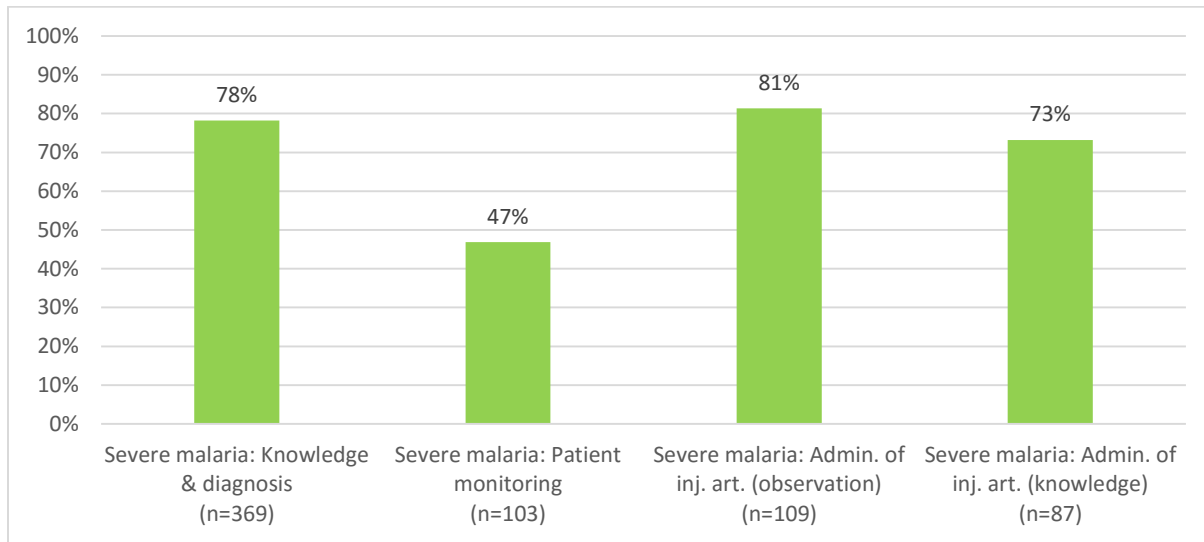
Note: Scores were available for more than 90 percent of facilities.

Figure 53. Proportion of health facilities meeting the overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Malawi*



Note: scores were available for more than 98 percent of facilities.

Figure 54. Average score of facilities on severe malaria indicators during most recent OTSS visit, Malawi



Note: Scores were available for more than 75 percent of facilities.

Challenges

Challenges

Because of poor internet connectivity at most district offices, the trained data-users were hindered from fully exploiting the benefits of EDS to readily analyze data and use outputs for programmatic decision-making.

Development of the NAMS was delayed throughout the project period and steps in the process took longer than anticipated. Also, only negative and *P. falciparum* species were found at the selected sites and validated for inclusion within the NAMS.

Timely iCCM supervision and mentoring of HSAs proved difficult, given that supervisors (SHSAs) and mentors (health facility staff) have routine duties within their own facilities.

Solutions and Recommendation

EDS will be most beneficial with internet connectivity available in district offices. DHOs should also identify alternate structures in their districts with which they can partner to share internet outlets, such as having district malaria focal points work with the HMIS officers, who more often appear to have access to an internet connection.

MalariaCare continued to work with the NMCP and CHSU to adjust to any issues or needs that arose to finalize the slide bank as the project closed out. The NMCP should continue building the NAMS with other species such as *P. malariae*, *P. ovale*, and mixed infections with *P. falciparum*/*P. ovale*/*P. malariae*/*P. vivax*. *P. vivax* is a rare species in Malawi and the NMCP should look for support to fund procurement of these slides from an established research center (e.g., UCAD, the National Institute of Medical Research in Tanzania [NIMR], KHRC, and others) to ensure timely delivery and a cost-effective high-quality product.

MalariaCare had to depend on a combination of head nurses and other staff to complete supervision, without funding to support these visits. Since this is a resource-intensive activity, it is recommended that future approaches consider more efficient ways to structure supervision, like group mentoring of HSAs at the facility during pooled restocking.

Challenges	Solutions and Recommendation
National iCCM reporting tools do not separate out children by age or weight, which makes it difficult to track the proportion of children who received appropriate treatment with pre-referral rectal artesunate against the number of doses dispensed.	Update national iCCM reporting tools to include separate dosage categories for rectal artesunate, as is currently done for ACTs.
Widespread use of RDTs likely contributes to declining microscopy competencies. While PT can maintain slide-reading skills through practice, no intervention for continued practice of slide preparation and staining existed.	<p>In PY5, MalariaCare worked with the NMCP to finalize the national guidelines for laboratory diagnosis of malaria in Malawi, which outline a QA system with well-defined roles and responsibilities for the national, intermediate (regional/district), and peripheral (district, township, or village) level structures.</p> <p>Given the high sensitivity and specificity of RDTs when performed well, RDTs could be the main diagnostic tool at the lower-level facilities, while microscopy could be reserved for referral facilities. Periodic microscopy QA training and supervision activities could target uniquely these facilities.</p>

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Malawi, the following recommendations may be considered:

- Provide ongoing microscopy skills assessment for laboratory supervisors, laboratory technicians, and laboratory assistants. With the NAMS now available, the NMCP could constitute PT panels for regularly testing the technical skills of supervisors and laboratory staff. The NMCP could consider using the results from the PT panel to select the highest performers to act as supervisors or national trainers and identify candidates to undergo ECAMM certification or recertification. Poor performers could also be identified for retraining. Facilities with consistently low performing technicians should consider discontinuing microscopy and rely on RDTs until capacity to perform quality assured microscopy in the facility is built through refresher training and/or OTSS.
- Even though current staff are performing RDTs well, skills may decline or new untrained staff may be added to health facilities, which would affect facility performance. Each facility should be assessed at least once a year, and continued RDT training should be organized at the district level for untrained and poorly performing health facility workers who administer RDTs.
- As much as OTSS has proven to be an effective approach in improving the quality of case management, sustaining OTSS at a level that allows for reaching all facilities in need at all times is not feasible. This calls for creative thinking to fine-tune the OTSS approach to be more practical, less resource intensive, focused on specific needs, and streamlined across various implementers. A pool of competent supervisors with strong mentorship skills should be maintained at each district to conduct OTSS to health facilities in the district. Training of such district supervisors must include both technical skills (including patient evaluation, accurate testing, and appropriate use of test results), as well as skills in mentoring and data use. Strong skills in data interpretation and use will allow district supervisors to target OTSS to low-performing facilities and to focus on the weak areas identified.

- The NMCP should periodically review the training curricula of pre-service training institutions to ensure they are aligned with the national guidelines, particularly when new guidelines are introduced. Institutions that have gaps should be supported to update their curricula. Continuing to collaborate with pre-service training institutions will ensure that new graduates enter the workforce with knowledge and skills that meet current guidelines.
- Given that iCCM cuts across several departments within the MOH, there is need for all departments to conduct joint planning and coordinate implementation, monitoring, and evaluation of iCCM activities to ensure harmony and across-the-board learning. MalariaCare recommends improving coordination between the clinical, nursing, and environmental health departments of the MOH at the national and district levels. iCCM is implemented by HSAs (who are under the environmental health department), but they are supervised and mentored by clinicians and nurses (who are under the clinical and nursing departments).

Transition and sustainability

- MalariaCare held a national level close-out meeting on August 17, 2017, to share and discuss the project's approach, achievements, key products, and how activities would be continued following the project's end. A total of 82 participants attended the meeting and included representatives from the NMCP, PMI, MOH, Save the Children, WHO, pre-service training institutions, district management staff, OTSS supervisors and mentors, and other stakeholders. By the end of the meeting, the NMCP and implementing partners demonstrated a strong commitment to sustaining the activities implemented and transitioned under the MalariaCare project to the respective responsible parties.
- Four iCCM close-out meetings were conducted before the end of the project period, one in each district where iCCM QA activities were implemented. During these meetings, the MalariaCare project team shared with DHOs and the IMCI unit, which will take on iCCM activities through the Global Fund support program, achievements and challenges encountered. As a result of the close-out meetings, participants proposed to incorporate MalariaCare iCCM QA activities into district implementation plans. This would strengthen mentorship and supervision activities by allowing DHOs to have an active role in reinforcing mentoring by the DHMTs, zone office, and the national level.
- MalariaCare contributed lessons learned and recommendations in a meeting with iCCM stakeholders to support the MOH in the sustainability and improvement of iCCM services in Malawi. As a result, the MOH developed an iCCM road map that outlines activities and interventions to be undertaken by the MOH and partners from 2017–2021 to address the critical issues identified.
- The NMCP has fully adopted MalariaCare's malaria case management QA approach and will provide nationwide coordination and continue to implement supervision in 19 of the 29 districts. During the project period, MalariaCare supported the NMCP to lead OTSS visits and co-facilitate training and LLWs as a capacity-building measure. MalariaCare also supported the NMCP during the development of the Malawi Global Fund application for 2018–2020 to include key components of the MalariaCare approach. The Global Fund proposal integrated the NMCP's plan to continue implementation of the case management QA approach at the health facility level in the 19 districts using MalariaCare's OTSS model, supporting EDS, and continuing and expanding the iCCM QA system. The NMCP will continue to lead RDT training, microscopy

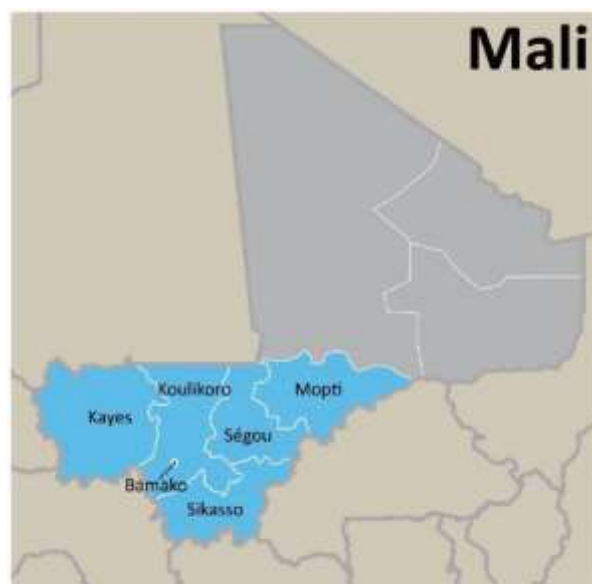
training, OTSS implementation, severe malaria mentorship, and iCCM activities through this support of the Global Fund.

- ONSI will implement OTSS in the ten remaining districts not covered by the NMCP, using the MalariaCare approach and tools. ONSI will also continue to conduct refresher training for EDS end-users and data-users, as needed. MalariaCare trained 18 district malaria coordinators and technical staff on the malaria case management QA approach, use of the EDS-based supervision checklist, and data use. These staff will continue future OTSS support to remaining districts. ONSI began funding the EDS server for the Malawi government on December 31, 2017, at the end of the MalariaCare project.

Mali

Introduction

MalariaCare began work in Mali in March 2015 (PY3) and continued to implement activities through December 31, 2017. MalariaCare supported the PNLP and the National Institute of Public Health Research (*Institut National de Recherche en Santé Publique*, or INRSP) to strengthen the competence of providers in diagnosis and treatment of malaria according to the national guidelines in the District of Bamako and the regions of Kayes, Koulikoro, and Sikasso in PY3. Beginning in PY4, MalariaCare's scope moved to concentrate on implementation in the regions of Mopti and Ségou. In PY4 and PY5, MalariaCare also provided technical assistance to other partners, including SSGI, in the southern regions of Kayes, Koulikoro, Sikasso, and Bamako and PSI/Global Fund in the northern regions of Gao, Kidal, and Tombouctou to implement case management QA activities in their focus regions.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Initiated work in Mali with a rapid situational analysis in 16 health facilities in Bamako, Kayes, Koulikoro, and Sikasso. Information on provider practices, attitudes, and performance challenges was gathered through direct observation, interviews, review of patient records, and an assessment of the availability of drugs and equipment. The report found that 86 percent of health facilities surveyed met the minimum diagnostic proficiency standards for slide preparation, staining, and reading by microscopy and 86 percent of facilities met the minimum standards for correct use of RDTs. Additionally, 63 percent of health facilities met the minimum treatment proficiency standards, which include key steps critical to performing accurate clinical

assessment and treatment of malaria. Results of the analysis were used to refine MalariaCare’s strategy in the country to address the identified weaknesses.

- Created a cadre of expert microscopists in collaboration with the PNL and INRSP through eight sessions of basic MDRT for 145 laboratory technicians from district reference facilities and community health centers (*centres de santé communautaires*, or CSCoM) with laboratory capacity, covering all nine regions in Mali. MalariaCare either organized the training directly or provided technical support to another implementing partner (Table 62) organizing the training. In addition to developing microscopy skills at reference-level facilities, MDRT was also used to reinforce diagnostic competencies of supervisors in advance of supervisor training, which focuses on on-site training and mentoring skills.

Table 62. Malaria diagnostic refresher training conducted or facilitated by MalariaCare, Mali

Regions	Implementing Partner	Project Year	Number of sessions	Number of participants*
South (Bamako, Kayes, Koulikoro, Sikasso)	MalariaCare (PY3) SSGI (PY5)	PY3, PY5	5	97
Central (Mopti, Segou)	MalariaCare	PY4, PY5	2	40
North (Gao, Kidal, Tombouctou)	PSI	PY5	1	11
Total		PY3–PY5	8	148

*These numbers represent the total participants attending each of the sessions; six individuals attended two sessions.

- Table 63 compares pre- and post-test performance for the 145 participants with both scores. Average scores for parasite detection improved by 16 percentage points, for species identification by 6 percentage points, and parasite counting by 12 percentage points. Species identification and parasite counting still had ample room for improvement: at post-test, although 70 percent of participants attained Level A or B for parasite detection, only 3 percent met the standard for species identification and 23 percent for parasite counting.

Table 63. Basic malaria diagnostic refresher training pre- and post-test results, Mali (n=145)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	71% (77% [15%–100%])	87% (89% [54%–100%])	16
Species identification	41% (38% [8%–89%])	47% (48% [8%–95%])	6
Parasite counting	9% (0% [0%–75%])	21% (20% [0%–80%])	12

- Developed a cadre of internationally accredited expert microscopists capable of handling microscopy QA in the country in PY4 by supporting the WHO accreditation of four expert microscopists. These four microscopists were selected as the best performing participants of the PY3 MDRT, and they participated in an intensive pre-ECAMM preparation course. Over three days, the course sought to reinforce microscopy skills and competencies in malaria microscopy immediately prior to participating in the ECAMM. While the competencies of these microscopists were already fairly high, particularly in parasite detection (average pre-test score was 92 percent), significant improvement was made in parasite counting, with an increase in average score by 27 percentage points (from 33 to 60 percent) and an increase in average score for species

identification from 67 to 74 percent. Following the preparatory course, the participants traveled to Dakar, Senegal, to undergo ECAMM. Two received WHO L1 accreditation, one received L2 accreditation, and the fourth achieved L3 competency.

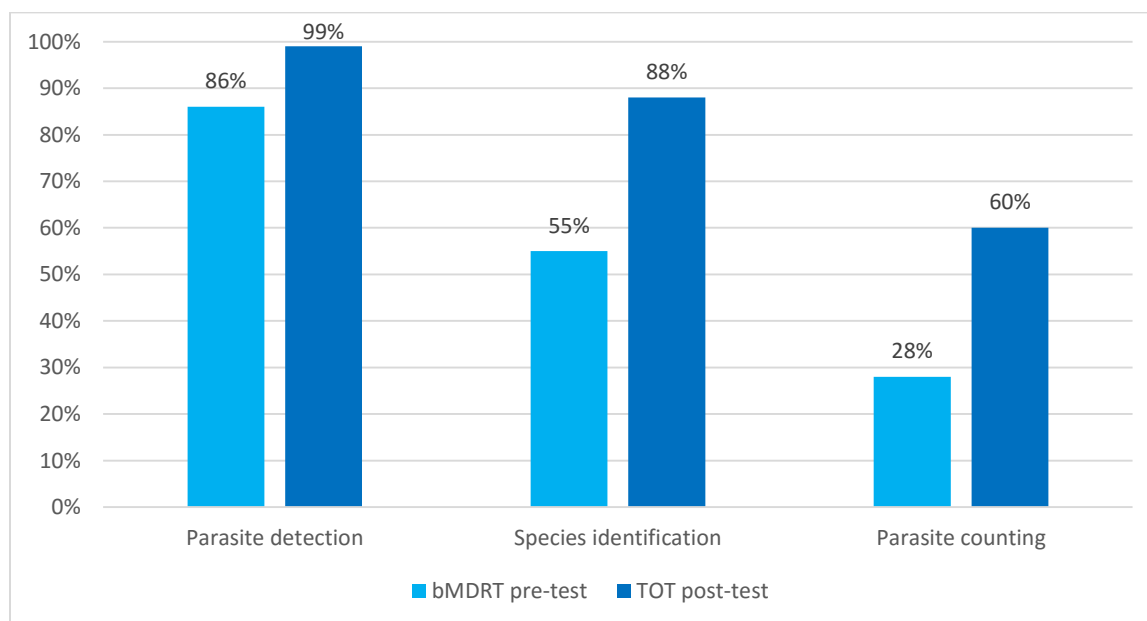
- Drew upon the group of trained microscopists to create a national cadre of ten microscopy trainers through a TOT in PY5. The participants, who included the two WHO-certified L1 experts and one L2 expert, were selected from the group of microscopists who previously received training from MalariaCare. These participants were drawn from the INRSP, PNLN, and district reference facilities in Bamako, Kayes, Koulikoro, Mopti, Ségou, and Sikasso. As evaluated by a pre- and post-test, participant performance increased significantly over the course of the TOT (see Table 64). By the end of the training, all participants attained Level A scores for parasite detection, and eight out of ten did so for parasite counting. Six of ten participants attained L2 or higher for species identification. These participants now make up a cadre of expert laboratory personnel capable of conducting regional- and national-level training on malaria microscopy.

Table 64. Malaria diagnostic refresher training microscopy practical pre- and post-test results, training of microscopy trainers, Mali (n=10)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	85% (85% [69%–100%])	97% (100% [92%–100%])	12
Species identification	55% (56% [12%–81%])	80% (85% [50%–100%])	25
Parasite counting	30% (30% [0%–60%])	58% (60% [30%–80%])	28

Six of the ten trainers participated in the basic MDRT. Figure 55 shows the progress in performance among these six participants between the pre-test at their first MDRT and the TOT.

Figure 55. Mean scores, basic malaria diagnostic refresher (MDRT) training pre-test versus advanced training-of-trainers MDRT, Mali (n=6)



- Reinforced malaria microscopy skills among district-level laboratory supervisors during the joint laboratory and clinical OTSS visits conducted at district hospitals in PY5. Regional lab supervisors administered follow-up malaria microscopy PT with a standardized set of ten slides to 11 district laboratory OTSS supervisors who participated in MDRT sessions during PY4. After the district lab supervisors read the standardized slides, the regional lab supervisors provided additional mentoring and guidance. When comparing competencies between the district supervisors' MDRT and most recent on-site PT visit, average scores for parasite detection remained essentially the same (79 percent during MDRT, 81 percent during PT), while species identification improved from 42 percent to 60 percent, and parasite counting declined from 22 percent to 8 percent. These results suggest that parasite counting may be a particularly challenging skill to maintain over time, especially when the laboratory technicians at the district hospital level do not incorporate this into their daily exercise when reading slides.
- Reinforced the capacity of supervisors to provide quality RDT supervision and mentoring by providing RDT QA training for 12 clinical and laboratory supervisors from reference and regional hospitals, who then cascaded the training to 37 district supervisors in Ségou and Mopti. The course focused on reinforcing the participants' knowledge and skill in RDT QA, as well as observing a health worker conducting an RDT to assess competency and address weaknesses. The supervisors were tasked with providing the RDT QA training to at least three personnel in each health facility visited during the two rounds of OTSS conducted in PY5. In total, these supervisors reported training more than 450 health facility staff following the RDT QA training for supervisors. MalariaCare also provided technical assistance to SSGI to conduct the same training for 21 district-level supervisors in Kayes region.
- Provided technical assistance to PSI/Global Fund to conduct OTSS and PT visits to three health facilities in Tombouctou region (CSCoM Sankoré, CSCoM Bellafarandi, and the reference health center—called *centre de santé de référence*, or CSRef—Tombouctou). Visits in the region were limited to facilities in the regional capital due to ongoing security concerns. The same activity was planned to occur in Gao and Kidal; however, security concerns also there limited PSI's ability to schedule the activity before the closure of MalariaCare.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

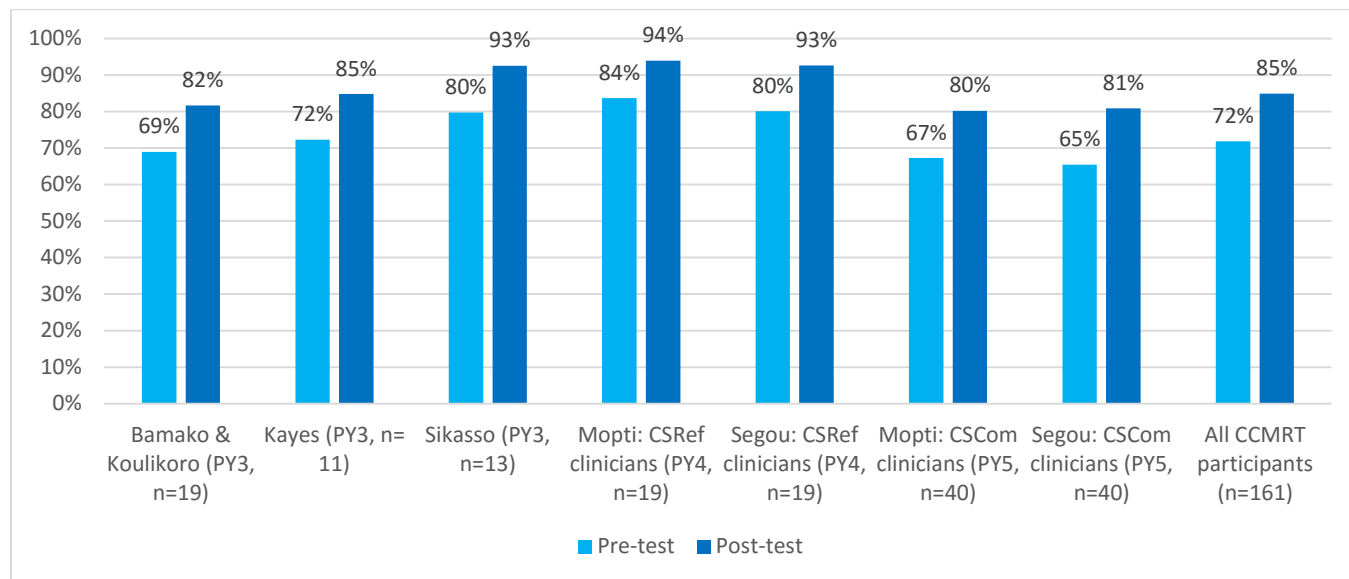
- Improved the competencies of 161 clinicians to provide quality assured clinical management of malaria, including testing before treating, through nine sessions of CCMRT. Over the course of three days, participants were trained on management of malaria in accordance with the national guidelines, with emphasis on the early

Veteran health worker Souleymane Sanogo reports, "When I was called for training in malaria case management, I hesitated and asked myself: 'I have many years in the field, what can I learn about malaria case management? Should I attend or should I send someone who may get more benefit?' But I decided to go and I am glad I did! During the training I realized that I had many deficiencies, especially regarding the danger signs of severe malaria and prescription of antimalarials. Upon returning to my CSCoM, I plan to share all that I have learned with my colleagues.

Our training group extends our thanks to the Mopti Regional Health Authority, the NMCP, and especially to MalariaCare for the quality of this training. We learned a lot, and our expectations were certainly met."

diagnosis of uncomplicated malaria, appropriate pre-referral treatment, and management of severe malaria. Participants were evaluated during the training with a pre- and post-test which indicated that the average score increased by 13 percentage points, from 72 percent at pre-test to 85 percent at post-test (see Figure 56 below for a summary of performance).

Figure 56. Malaria clinical case management refresher training pre- and post-test results by training session and overall, Mali (n=161)



Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Established a cadre of regional and district OTSS supervisors in all nine regions of Mali, by training clinicians and lab technicians to use OTSS tools for supervision, mentoring, and feedback. Between PY3 and PY5, MalariaCare conducted OTSS supervisor training for clinical and laboratory supervisors (at least two regional supervisors per region and two district supervisors per district per training session) for 182 participants across ten sessions. Over the course of three days, participants were equipped with the mentoring and training skills to conduct on-site supportive supervision visits to strengthen health provider performance. Of the ten sessions conducted, MalariaCare directly implemented five, while providing technical assistance to SSGI through facilitation of three sessions in their focus provinces and to PSI for two sessions in the northern regions. Beginning in PY4, the supervisor training package included a two-day EDS end-user component to orient supervisors on capturing checklist data on tablets and submitting them remotely. General introductions to the tablets and EDS were followed by role play and practice sessions in completing the electronic checklist during observations. The second day was used to complete a trial EDS-based OTSS visit in a selected number of facilities. This began for Mopti and Ségou supervisors prior to their second round of OTSS in PY4 and was conducted for Bamako, Kayes, Koulikoro, and Sikasso supervisors (under SSGI) in PY5.
- To further expand reach of the OTSS, conducted supervisor training for 15 nurse supervisors. MalariaCare used the trained midwives to test its QA approach at private community-level health facilities in Bamako. As

a first step, MalariaCare supported a clinical supervisor training for 15 midwife supervisors responsible for the quality of care in a network of private health facilities under PSI franchising to introduce them to the clinical OTSS tool and methodologies, as well as to train them on key supervision and mentoring skills. The five highest-performing midwives were selected to act as supervisors in a pilot round of OTSS, which was conducted in late PY4. This being their first use of the OTSS tool, some midwives did not complete the checklists accurately, preventing the data from being analyzed. Facilities that participated in the pilot requested continued support, but the activity was discontinued due to a need to prioritize support to the public sector. MalariaCare recommended that PSI explore implementing regular supervision in private health facilities.

- Directly implemented one round of joint clinical and laboratory OTSS to 136 health facilities in Bamako, Kayes, Koulikoro, and Sikasso following OTSS supervisor training in PY3. To assist in the transition of OTSS in these regions to SSGI in PY4, MalariaCare staff provided TA to that project as it conducted its first round of OTSS in the four districts using EDS. MalariaCare provided one week of on-the-ground technical assistance in each region, supporting the creation of supervisor accounts and providing ongoing technical support to SSGI M&E staff to use EDS, to troubleshoot any arising issues, and to monitor and analyze incoming data using the EDS dashboards. In PY4 and PY5, MalariaCare implemented four rounds of joint OTSS involving 144 enrolled CSRefs and CSComs in Mopti and Ségou regions, with three of these rounds conducted by supervisors entering checklist data directly into EDS via tablets.
- The quality of an OTSS visit depends on the competencies of supervisors to observe and mentor providers on the job. To assess the level of competence of OTSS supervisors to conduct supportive supervision and facilitate the development of action plans, MalariaCare evaluated 31 laboratory and clinical supervisors during OTSS visits in the final year of the project. Almost all supervisors evaluated had conducted at least two rounds of OTSS visits at the time of the evaluation. At the end of each supervisor's evaluation, MalariaCare staff provided structured feedback (both positive and negative) to each evaluated supervisor. The evaluation found that all supervisors went through the process correctly of prioritizing problems and working with facility staff to develop action plans. Almost all supervisors evaluated (97 percent) also provided appropriate explanation for the changes that they suggested and ensured that staff understood the feedback provided. The areas performed least consistently were 1) reviewing facility data from the previous OTSS visit (39 percent of supervisors were found to have done this), and 2) arriving at the facility early enough to complete the checklist and provide mentoring (58 percent).
- To accelerate improvements in clinical and diagnostic services and strengthen provider clinical and diagnostic competencies, MalariaCare supported targeted intensive mentoring to seven low-performing facilities. Following a pilot in Ségou in early PY5, MalariaCare supported intensive mentoring between the year's two OTSS rounds across Mopti and Ségou. The health facilities with the lowest clinical and laboratory



An OTSS supervisor provides feedback to staff at CSCom Oulan at the end of his supervision visit.

Photo credit: Mamadou Ouane

observation scores during the January–February 2017 OTSS round were selected to receive, over the course of two to three days, additional mentoring visits from high-performing regional clinical and diagnostic supervisors. Following that criterion, in Ségou, three CSCComs (Peleguana, Koulandougou, and Téryabougou) received intensive clinical mentoring and two CSCComs (Dioro and Téné) received laboratory mentoring. In Mopti, two facilities (CSRef Mopti and CSCCom Sangha) received clinical mentoring. The mentors focused their work in the facilities on weak areas identified during OTSS, the results of a pre-test that was administered at the beginning of the intensive mentoring visit, and issues observed over the course of the visit. The facilities that received intensive mentoring, on average, improved their clinical or microscopy scores to a level comparable to that of the previously higher-performing facilities that did not receive it. These promising results from this small sample of facilities suggests that intensive mentorship should be tested further in Mali among a greater number of facilities.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Built capacity within the health system to collect, analyze, and use OTSS data for programmatic decision-making in collaboration with PNLP and regional health authorities, by conducting four LLWs over the life of the project. At these workshops, PNLP representatives, key regional representatives, and regional- and district-level supervisors gathered to share experiences and data from OTSS visits. Results on key OTSS indicators were presented and discussed, and participants received an orientation to the methodologies used to calculate the key indicators. Additionally, on-the-job training and mentoring practices were reviewed, and participants developed action plans to improve on identified weaknesses. At the end of PY5, MalariaCare also conducted one-day regional close-out meetings in Mopti and Ségou to review the final round of OTSS data and project accomplishments with supervisors and the regional health directorate teams. MalariaCare also supported SSGI to conduct LLWs and EDS end-user training for 64 clinical and laboratory OTSS supervisors in Kayes and Sikasso, during which they analyzed results on key OTSS indicators from the two OTSS rounds conducted in 2015 and 2016 to identify problems and work together to identify solutions. Following the LLWs, the supervisors were trained to conduct OTSS visits and provide mentorship using the EDS application.
- Organized a three-day training to equip ten staff from the NMCP, SSGI, Measure Evaluation, and the National Directorate of Health with the capacity to review and use EDS data for decision-making. During the training, participants focused on MalariaCare’s key performance indicators, using dashboards in the DHIS2-based database to review and analyze OTSS data, and using the data for planning and decision-making. Following this training, a second three-day session was conducted



Participants during a dashboard exercise with the support of facilitators.

Photo credit: MalariaCare Mali

for 20 regional and district malaria focal points and regional health information system managers in Mopti and Ségou.

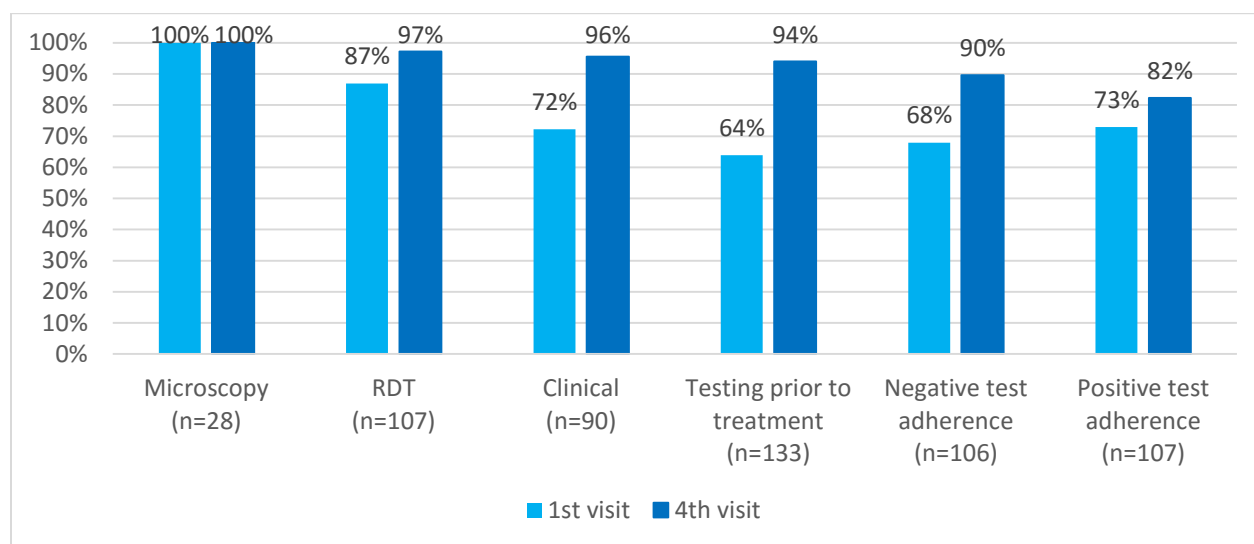
- Transitioned management of EDS to the NMCP and partners by convening informational meetings on the transition process, outlining avenues for moving forward, and presenting key technical decisions that the NMCP needed to make in order to move forward, such as where the EDS server will be hosted and who will be responsible for paying for server maintenance in the future. For the next year, SSGI will support hosting costs for the server and manage EDS for OTSS implementation in its regions while PSI/Global Fund will continue to conduct OTSS using paper-based checklists in the northern regions. Because OTSS in the PMI regions will continue to be implemented through partners with support from the NMCP in the near term, MalariaCare conducted systems administration training for three key staff each from SSGI and the NMCP. Staff were trained on handling administrative tasks in EDS, such as creating user accounts, adding data elements to checklist modules, and adding health facilities to the system. Because PSI/Global Fund uses the paper version of the MalariaCare OTSS checklist, an orientation session was held for PSI/Global Fund staff to familiarize them with the system, should they elect to use the DHIS2-based EDS dashboards in the future.
- Improved capacity at training facilities through the provision of 11 Olympus CX training microscopes, a microscope camera, and projection equipment. These were turned over to the INRSP and distributed to training facilities around the country to support improved microscopy training and QA activities in Mali.

Progress made on key MalariaCare indicators

Trend analysis

This section reports on the progress made among the 143 health facilities in Mopti and Ségou that received four OTSS visits in PY4 and PY5. A total of 144 facilities were eligible for visit, but 1 facility was not visited in the final round due to insecurity issues. Figure 57 compares the proportion of facilities that met the minimum standard for the first visit compared to the fourth and final visit, for five of the six key MalariaCare indicators. Results for the sixth indicator, microscopy, compare the second visit to the fourth visit because initial difficulties in filling out the microscopy observation section of the paper checklist resulted in only four facilities having sufficient information to obtain a score during the first visit. When comparing microscopy performance for the second visit—which had more facilities with complete observations—to the fourth visit, all facilities met the minimum standard at both visits; however, the proportion that met the overall target (score of 90 percent or higher) improved from 64 percent to 93 percent (n=28).

Figure 57. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first visit versus fourth visit, Mali



Note: Baseline results for microscopy were not available for the majority of facilities; instead, results for the second visit are shown. For all indicators shown, trend data was available for more than 62 percent of facilities.

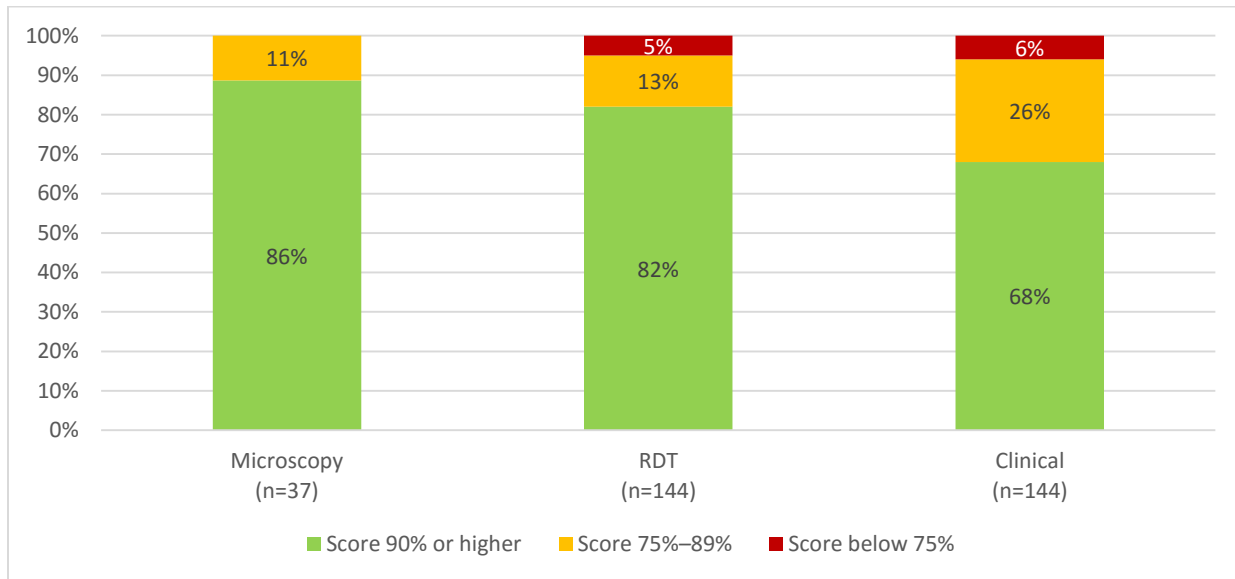
Of the 143 facilities receiving four OTSS visits, the number that had scores for both the first and last visit ranged from 90 facilities for clinical case management (62 percent) to 133 facilities (93 percent) for testing prior to treatment. Most of the missing scores were from the first facility visit, when paper checklists were used; data completeness improved during subsequent visits when EDS was used. Significant improvements in scores were seen for all scores (RDT and clinical competencies, as well as the three adherence measures). RDT performance overall was relatively high at baseline, with 87 percent of facilities meeting the minimum performance target; however, average facility performance on individual steps such as checking the expiry date, labeling the cassette, and disposing of blood-contaminated material appropriately improved by over 20 percentage points.

The dramatic improvement in clinical scores was largely due to significant increases in each of two of the minimum standard steps: checking for at least one sign of severe malaria (average facility performance increased from 71 percent to 93 percent), and correctly prescribing medication in accordance with the final diagnosis and disease severity (from 81 percent to 96 percent). During the clinical observation, supervisors almost universally agreed with the health provider’s decision on ordering a malaria test during both the first and last visit; however, the score with the greatest improvement in meeting MalariaCare targets was testing prior to treatment: 64 percent of facilities met the MalariaCare target for testing prior to treatment during the first OTSS visit; by the final visit, 94 percent did.

Most recent visit

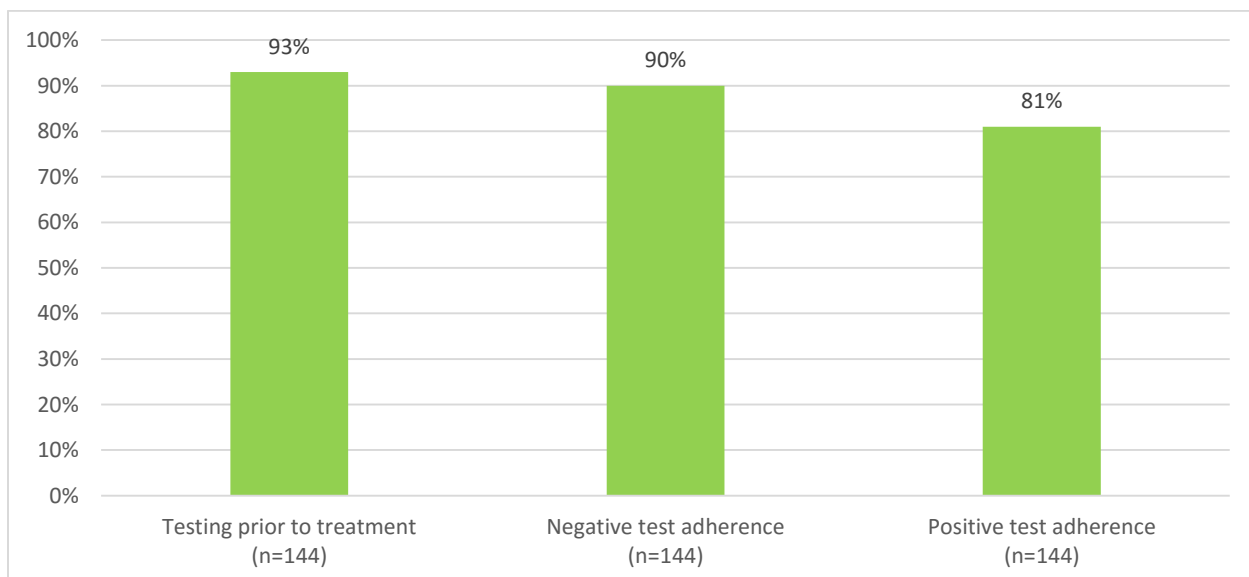
When reviewing the most recently available scores for all facilities, the proportion meeting minimum targets for technical competencies (Figure 58) and adherence (Figure 59) was similar to that of the fourth visit among those with trend data. For all scores, the proportion meeting these targets were 80 percent or greater. The following section provides an overview of the most recent results on MalariaCare’s key indicators, among all 144 health facilities visited in Mali using the most recent checklist.

Figure 58. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Mali



Adherence results as reported in Figure 59 can theoretically be influenced by stock-outs of RDTs (for testing prior to treatment) and ACTs (positive test adherence). MalariaCare analyzed the OTSS data on stock-outs to see whether these measures were correlated in the case of Mali. Stock-outs of RDTs lasting more than one week were more common among facilities that did not meet the target for testing prior to treatment (3 out of 10 facilities, or 30 percent), compared to those facilities that did (12 out of 134 facilities, or 9 percent). However, of the facilities not meeting the target for positive test adherence, none reported a substantial stock-out of ACTs, suggesting that not meeting the target was due to inconsistent record-keeping or provider adherence to protocol, rather than an inconsistent supply of antimalarials.

Figure 59. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Mali (n=144)



Challenges

Challenge	Solution/recommendations
Quality of care in the country is evolving at different rates, due to different implementation priorities and capacity of implementing partners.	We recommend that the PNLP follow up and provide technical assistance to implementing partners to conduct OTSS in all regions using the experienced supervisors from Mopti and Ségou to reinforce supervision teams.
Up to 40 percent of patients receive care from the private sector. The fact that MalariaCare interventions did not extend to these facilities diluted the impact of interventions at the population level.	We recommend that the PNLP and partners consider expanding the MalariaCare QA approach to the private sector, using the PSI franchising platform as a starting point.
Sustaining high performance of clinical and diagnostic providers requires constant follow up with training and supervision.	We recommend that the PNLP include components of the MalariaCare approach in the Global Fund application to ensure harmonization and sustainability of interventions. We also recommend exploring innovative and cost-effective activities, such as regular remote monitoring and mentoring, to help improve case management performance.
National case management guidelines are not available in all health facilities.	Regional health directorates should disseminate the national case management guidelines and job aides provided by MalariaCare to all lower level health facilities in areas not covered by MalariaCare OTSS.

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Mali, the following recommendations may be considered:

- Implementing partners should continue to work toward PNLP institutionalization of OTSS nationwide by strengthening regional health directorate capacity to plan and implement OTSS, and by reinforcing national and regional level data use for decision-making.
- The positive impact of supportive supervision can be expanded by extending OTSS to additional health facilities:
 - Use OTSS data to target low-performing health facilities and to reduce the number of OTSS visits to facilities reaching performances targets to once per year.
 - Explore integration of supervision with other activities to reduce time and cost requirements.

Transition and sustainability

- MalariaCare held a national-level close-out meeting for regional health directorates, representatives from PMI, PNLP, INRSP, and other implementing partners to present and discuss project experiences and outcomes, challenges encountered during implementation, lessons learned and best practices, and project data,

and how activities will be continued following project close-out. OTSS will continue in Gao, Kidal, and Tombouctou with the support of PSI/Global Fund; in Bamako, Kayes, Koulikoro, Sikasso, Mopti, and Ségou using EDS with the support of PMI through SSGI for its four target regions and a yet-to-be-determined mechanism for Mopti and Ségou. SSGI is supporting the use of the EDS server after the ending of MalariaCare on December 31, 2017.

Mozambique

Introduction

MalariaCare worked with the national malaria control program (*Programa Nacional de Controlo da Malária*, or PNCM) in Mozambique to focus on high-priority areas of capacity-building at the national and provincial levels: early and adequate diagnosis of malaria using both microscopy and RDTs; appropriate treatment, referral, and management of complications of severe malaria; and developing responsive M&E systems capable of providing real-time data on quality of care for use at all levels of decision-making.

Implementation of activities in Mozambique began in PY3 in the two high-burden provinces of Zambezia and Nampula. In PY4, the work was expanded to two additional high-burden provinces, Cabo Delgado and Tete.

To support operations, the project hired a provincial coordinator for each province. Coordinators in Cabo Delgado, Tete, and Zambezia were based in the Provincial Health Directorate/*Direcção Provincial de Saúde* (DPS) offices in their respective provinces to provide direct technical assistance to these officials. Due to limited space at the Nampula DPS, the coordinator operated from a different location. MalariaCare established an office in Maputo where the country program coordinator, finance officer, and program assistant managed project activities.

MalariaCare supported the PNCM in Maputo through the secondment of a data manager and laboratory supervision specialist who provided technical assistance for planning and implementation of diagnostic and data QA activities.

The close-out of activities was phased by province, starting with Zambezia in December 2016 where case management capacity-building was transitioned to the USAID-funded Maternal and Child Health Program (MCSP). Activities in Nampula ended in March 2017 and activities in the remaining two provinces—Cabo Delgado and Tete—ended in June 2017. Support to the national level ended in July 2017.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Built technical competency of laboratory supervisors. MalariaCare used MDRT to build competencies of 67 laboratory technicians as supervisors and mentors. In PY3, all 42 laboratory supervisors recruited from Zambezia and Nampula participated in an aMDRT. Scores at post-test were low, with only 9 of the 42 participants (21 percent) meeting the L2 standard for both parasite detection and parasite counting and none meeting the L2 standard for species identification. Therefore, in PY4 MalariaCare changed the approach and had newly recruited supervisors undergo a basic MDRT prior to the aMDRT. A total of 37 laboratory staff participated in the basic MDRT. Of these, 25 went on to participate in the aMDRT to become supervisors for the new provinces or replace supervisors lost to attrition in Nampula and Zambezia. Of the participants who went on to take the aMDRT, ten (40 percent) met the L2 standard for both parasite detection and parasite counting—nearly double the percent meeting this standard compared to the previous aMDRT. However, none of the participants met the L2 standard for species identification. Results for all 67 aMDRT participants trained in both PY3 and PY4 are presented in Table 65.

Table 65. Advanced malaria diagnostic refresher training pre-test to post-test scores, Mozambique (n=67)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	72% (73% [0%–100%])	81% (83% [46%–98%])	9
Species identification	30% (25% [0%–80%])	39% (40% [4%–65%])	9
Parasite counting	24% (20% [0%–75%])	31% (29% [0%–71%])	7

- Supported global malaria microscopy WHO accreditation of national and provincial laboratory staff. MalariaCare supported 12 laboratory staff to attend the WHO ECAMM. Participants who achieve an L1 or L2 according to the WHO-approved grading system are expected to conduct and facilitate training in malaria microscopy and to support national QA programs. To identify candidates to attend the WHO ECAMM, the project conducted an aMDRT for 16 laboratory technicians—2 from each of the four PMI intervention provinces (Nampula, Tete, Cabo Delgado, and Zambezia) and 8 from the national level. Eleven of the highest-performers, along with the national diagnostic advisor, were selected to participate in a pre-ECAMM training to further prepare them for the ECAMM. This training was structured similar to an aMDRT, but more heavily focused on key competencies assessed at the ECAMM—parasite detection, parasite counting, and species identification.
- Following the pre-ECAMM training, the 12 participants attended the ECAMM, facilitated by two WHO-accredited trainers from Amref Health Africa and MalariaCare. Of the 12 participants, 6 were accredited as L1, 4 as L2, 1 as L3, and 1 as L4, with the L1 accreditations being the first of that level in Mozambique.
- Table 66 shows the progression in microscopy skills of the 12 ECAMM participants from the aMDRT pre-test in PY3 to the ECAMM final assessment. Average scores on microscopy skills progressed substantially,

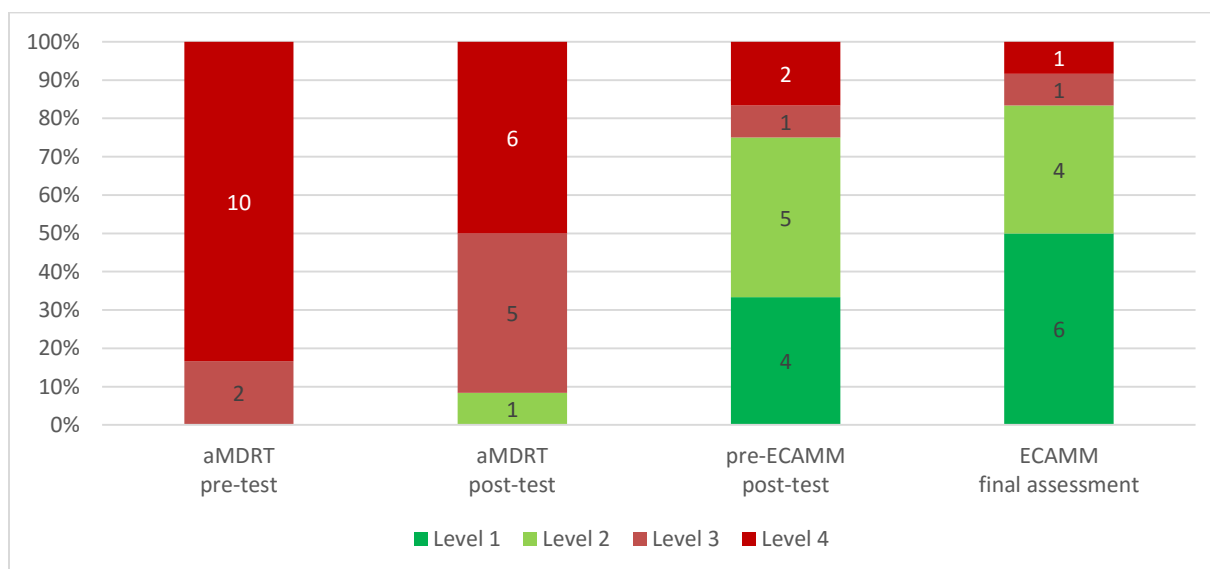
with the largest gains seen in species identification. These gains most likely attributed to the number of participants reaching the L1 and L2 accreditation levels by the end of ECAMM (Figure 60). After the initial aMDRT, only 1 participant met an L2 accreditation level for species identification; however, by the final ECAMM assessment, 11 of the 12 (92 percent) participants met the standard. While average performance on parasite counting increased by the final ECAMM assessment, it fluctuated over time.

- As participants underwent two weeks of back-to-back training prior to the ECAMM the following week, these gains may be a result of an increased frequency in practice of skills. Given this extensive training in such a short period of time, it is unclear if these levels of competency will be sustained over time. Therefore, it is recommended that these training and assessments should be spaced out, rather than during three consecutive weeks.

Table 66. Progression of microscopy skills from aMDRT pre-test to ECAMM final assessment, Mozambique (n=12)

Competency area	aMDRT pre-test	aMDRT post-test	Pre-ECAMM post-test	ECAMM final assessment	Percentage point change in mean score
	Mean (median [range])				
Parasite detection	83% (89% [0%–100%])	91% (96% [35%–100%])	96% (98% [83%–100%])	99% (100% [94%–100%])	16
Species identification	49% (50% [0%–83%])	68% (70% [29%–89%])	84% 87% [54%–97%])	91% (91% [79%–100%])	42
Parasite counting	36% (33% [0%–67%])	53% (56% [22%–78%])	45% (50% [14%–68%])	58% (61% [29%–79%])	22

Figure 60. Progression of participants meeting the World Health Organization level accreditation levels—advanced malaria diagnostic refresher training pre-test to external competency assessment for malaria microscopy final assessment, Mozambique (n=12)



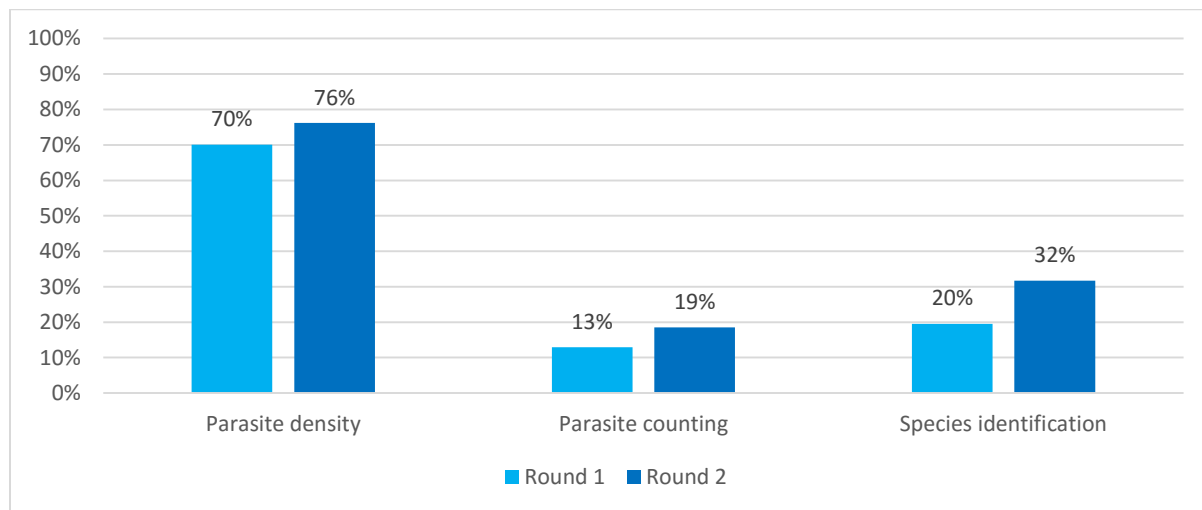
- Supported the PNCM and partners to collect specimens and prepare a bank of slides for training and testing. In PY3, the project collaborated with the National Institute of Health (*Instituto Nacional de Saude*, or INS) to collect 3,500 specimens to prepare permanent slide sets for training and PT. A total of 15 slide sets (with more than 200 slides each), validated by national experts, were prepared.

- Strengthened capacity at the national level to manage a PT scheme. In PY4, the project used the slide sets prepared in PY3 to support the INS in conducting two rounds of diagnostic proficiency panel testing across laboratories in the four provinces. Panels of ten slides were sent out via the national post service to select laboratories where the staff worked as a team to report results on parasite detection, species identification, and parasite counting for each slide in the set. Once compiled, the laboratory sent results to the accredited central-level expert microscopists who reviewed and scored them. Scoring rubrics for PT performance were linked to existing WHO malaria microscopy competency levels.

The rounds of panel testing were conducted in January and June 2016, respectively. A total of 68 facilities were sent a panel of ten slides across the two rounds, with 65 facilities receiving panels in both rounds. Of these, 64 facilities sent back their results at least once and 27 (41 percent) sent back their results for both rounds.

Among the 27 facilities with scores for both rounds, the average performance increased between first and second round for all three competency areas (Figure 61). Average scores for both parasite density and parasite counting increased by six percentage points between rounds. Greater improvement was seen in species identification, with average scores increasing by 12 percentage points. Similar results were seen for the most recent PT panel submitted for all 64 facilities that returned results at least once: average scores were 74 percent for parasite detection, 16 percent for parasite counting, and 29 percent for species identification.

Figure 61. Average performance on the proficiency panel testing, first round vs. second round, PY4, Mozambique (n=27)



- In PY5, MalariaCare procured 300 high-quality reference slides, validated by WHO, from UCAD, to supplement the slides collected in PY3. The slides were arranged in 24 sets of 10 slides each. Using these new panels, MalariaCare supported a third round of PT in Cabo Delgado and Tete. To improve upon the response rate achieved in previous rounds when the post office service was used for distribution and collection, MalariaCare staff and supervisors distributed PT materials and collected results during OTSS. Supervisors distributed the PT panels during an OTSS visit and picked them up alongside the responses within three days. This increased the response rate from 66 percent in earlier PT activities when slides were distributed through the post service to 90 percent when distributed through OTSS, with 18 of the 20 participating facilities (10 in each province) reporting results.

- The facilities participating in the first PT rounds were different from those reached during the PT scheme implemented through OTSS. Also, the compositions of the panels were not comparable due to the introduction of the new PT panel slides from UCAD. This made a direct comparison between the two approaches difficult. However, performance on all three competency areas was similar in both PY4 and PY5, with the 18 facilities evaluated during PY5 performing best on parasite detection (average score of 86 percent) in comparison to parasite counting (5 percent) and species identification (46 percent).

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Built competencies of 2,411 providers in RDT performance through RDT QA training. In PY3, MalariaCare trained 28 OTSS laboratory supervisors (15 from Nampula and 13 from Zambezia). The training included facility-based training in RDT use, discussion on lessons learned, and supervisory and mentoring techniques. Using a brief checklist, supervisors then visited health facilities to gain experience supervising health workers on the use of RDTs. All of these supervisors scored 85 percent or above on the RDT competency post-test, with the exception of one who scored 80 percent. The aggregate score improved by nine percentage points from pre- to post-test.
- The trained supervisors then cascaded training to 37 districts during OTSS, during district LLWs, and during stand-alone, on-site RDT training. Training during OTSS was conducted as part of the feedback session at the close of the visit. These sessions included all clinical and laboratory staff members to the greatest extent possible, without sacrificing service availability in the facility. Supervisors first demonstrated use of the RDTs, and then required participants to demonstrate correct use in groups with one serving as provider and one as patient, while another used the OTSS RDT observation checklist to note errors. Weak areas in RDT performance identified among staff at each facility were discussed and addressed during this time. Supervisors also conducted similar refresher training during district LLWs to train participating health facility staff.
- In PY4 and PY5, supervisors continued RDT on-site refresher training for health care workers during OTSS. Across the three years, a total of 2,411 health workers were trained in RDT refresher training (Table 67).

Table 67. Summary of rapid diagnostic test quality assurance training participation, project years 3–5, Mozambique

Province	Refresher Training	PY3		PY4	PY5	Total
		OTSS	LLW	OTSS	OTSS	
Zambezia	402	114	117	92	0	725
Nampula	237	127	152	176	201	893
Cabo Delgado		N/A		171	177	348
Tete		N/A		261	184	445
Total	639	241	269	700	562	2,411

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

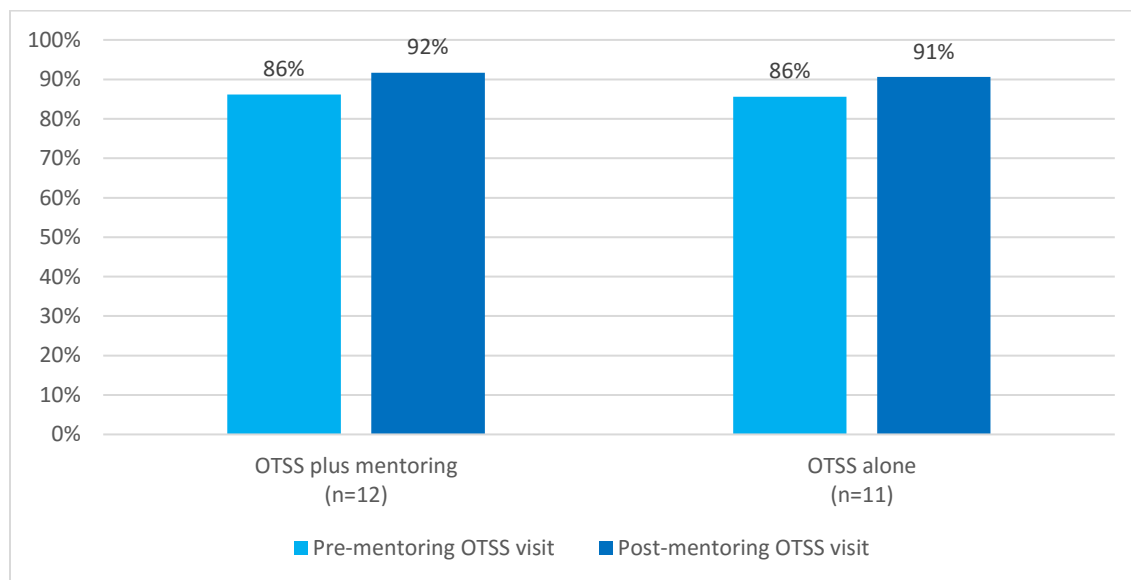
- Strengthened malaria case management clinical competencies of clinical supervisors and other clinicians. In collaboration with the PNCM, the project trained 66 supervisors in clinical case management—20 from Zambezia, 10 from Tete, 11 from Cabo Delgado, and 25 from Nampula. In PY3, 30 clinical supervisors were trained as part of the TOT in Nampula and Zambezia. In PY4, an additional 36 supervisors were trained as part of the CCMRT, as well as 34 participants from Tete health facilities per the request of the Tete DPS, which supported them. Across all training (n=100), mean participants' scores increased from 65 percent at pre-test (median 66 percent; range 25 to 88 percent) to 78 percent at post-test (median 80 percent; range 40 percent to 100 percent).
- Created a pool of 112 OTSS supervisors to mentor providers and build competencies on the job through OTSS in Zambezia, Nampula, Cabo Delgado, and Tete. Following completion of technical training (aMDRT and CCMRT), these 112 provincial- and peripheral-level clinical and laboratory supervisors participated in a supervisor training. The training included a day focused on mentoring and supervision skills, a day introducing and reviewing the electronic checklist, and a third day of practical application at local health facilities. In addition, several modules focused on important topics that are critical to effective case management across both clinical and laboratory staff, including identification and basic management of severe malaria and confirmation using malaria microscopy test results (specifically, parasite density and species identification). These joint sessions were especially valuable in demonstrating the importance of clinical staff ordering parasite density as part of the clinical consultation of fever cases.
- Conducted 558 OTSS visits to 179 facilities over nine rounds throughout the project period. Of these nine rounds, MalariaCare conducted eight rounds of provincial OTSS and one round of peripheral OTSS. Provincial OTSS focused on district reference facilities in the four intervention provinces and included supportive supervision and mentoring for both laboratory technicians and clinical staff. In PY3, provincial OTSS was conducted in Nampula and Zambezia, and then expanded to Cabo Delgado and Tete in PY4. In PY4, MalariaCare also conducted peripheral OTSS in Cabo Delgado, Nampula, and Tete, focusing on clinical case management and the use of RDTs in lower-level facilities without laboratories. A total of 108 facilities (60 percent) were included during provincial OTSS, while 71 facilities (40 percent) were covered by peripheral OTSS. Of the 179 facilities ever visited, 170 facilities (99 provincial facilities and all 71 peripheral facilities) were visited at least once between September 2015 and June 2017 using the tablet based revised OTSS checklist as part of the MalariaCare-developed EDS.
- To accelerate building competencies of providers in low-performing facilities, introduced intensive mentoring in PY4 as a complementary activity between OTSS visits. During the first round of mentoring, MalariaCare selected 16 OTSS supervisors (2 clinical and 2 laboratory supervisors from each of the four provinces) to act as mentors. They were selected based on their mentoring capacity demonstrated during OTSS, and then participated in a two-day training to build their mentoring skills further.

A pool of the 32 lowest performing facilities (8 per province) were selected based on RDT, clinical, and three adherence performance scores from OTSS visits conducted between November 2015 and January 2016.

Microscopy performance was high in all facilities, and therefore it was not considered as a criterion for selection. Of the 32 facilities, 16 (4 per province) were randomly selected to receive intensive mentoring. Mentoring teams were made up of two OTSS supervisors—1 clinician and 1 laboratory supervisor—and each team spent five days each in 15 facilities (1 facility in Zambezia could not participate due to an unrelated on-site evaluation being conducted).

To assess whether the intervention had an impact on overall facility performance, average OTSS scores on the five key indicators used for facility selection were analyzed from the OTSS visit prior to mentoring and the OTSS visit following the mentoring visit. These results were then compared against OTSS scores from low-performing facilities that received a similar number of OTSS visits alone, without intensive mentoring. Among the 12 intervention facilities with complete data at both time points, the average facility performance increased from 86 percent to 92 percent, compared to 86 percent to 91 percent among the 11 control facilities (Figure 62). Using a regression analysis, it was determined that no significant effect of the intensive mentoring intervention was detected.

Figure 62. Average OTSS performance on RDT, clinical management and adherence in facilities receiving mentoring versus those not receiving mentoring, Mozambique (PY4)



- To continue the evaluation of a potential benefit of adding intensive mentoring to OTSS over OTSS visits alone, a second round of intensive mentoring was conducted in PY5. In this round, five low-performing facilities from Cabo Delgado and five from Tete were selected to receive mentoring, and the focus was changed to focus on clinical management, as only 49 percent of facilities in these provinces were meeting the 75 percent minimum standard target. While clinical management was the primary focus of these visits, two facilities that were not meeting the 75 percent minimum standard target for microscopy also received intensive laboratory mentoring provided by laboratory mentors.

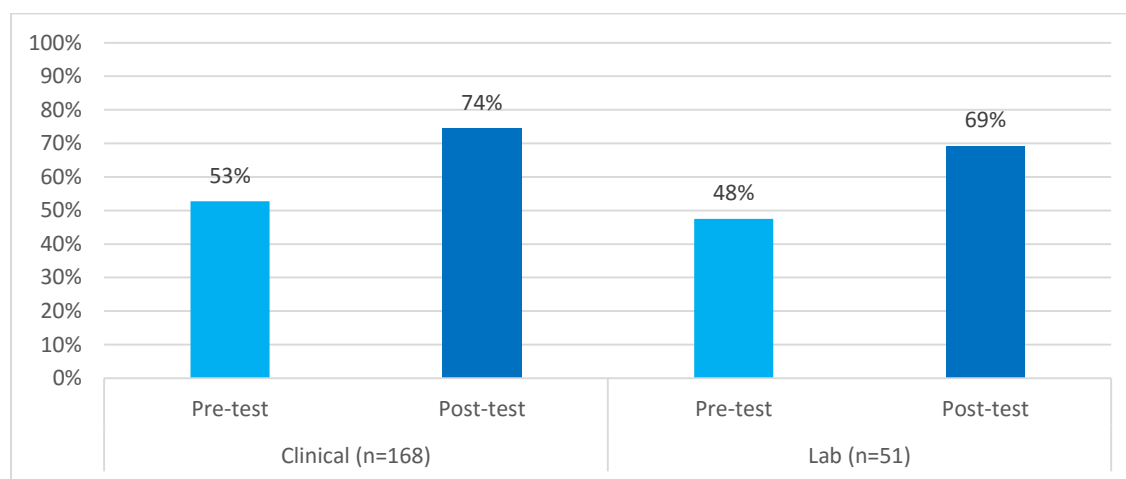
During the final OTSS visit, the project country team decided to focus observation only on providers who had received prior OTSS mentoring, while during previous visits all staff at the facility were observed. Therefore, the data from the OTSS visits does not adequately reflect facility performance. Data before and after

mentoring is not presented here because it is not comparable, and the additional effects of mentorship on facility performance cannot be assessed.

Across both rounds of intensive mentoring, 219 health workers were mentored (168 clinical staff and 51 laboratory staff). Mentees were administered a knowledge pre-test at the start of intensive mentoring, and a knowledge post-test when mentoring was complete to assess improvements in case management or diagnostic knowledge over the course of the mentoring visit. As shown in Figure 63, the average scores increase was 21 percentage points both for providers mentored in clinical management (n=168), and those mentored in laboratory competencies (n=51).

While intensive mentoring did increase knowledge of participants, there is no evidence to conclude that intensive mentoring improved providers' practice at the facilities. Given the lack of evidence, it is not recommended that intensive mentoring should be implemented in the future as a way to build competencies among low-performing facilities.

Figure 63. Average intensive mentoring mentee pre- and post-test scores, clinical and laboratory, Mozambique (n=219)



- To sustain OTSS gains within facilities by strengthening IQA, MalariaCare worked in collaboration with provincial health authorities to establish facility-based committees. Malaria case management committees (MCMCs) were established in 27 district and provincial reference facilities in all four intervention provinces (Table 68). These established committees met monthly to address issues related to facility adherence to national guidelines for malaria case management and quality of care in general, with MalariaCare and DPS monitoring committee functionality over time.

Table 68. Malaria case management committees established by province, Mozambique

Province	Number of district reference facilities	Number of established committees
Zambezia	13	5 (38%)
Nampula	22	5 (23%)
Cabo Delgado	10	10 (100%)
Tete	11	7 (64%)
Total	56	27 (48%)

- Examples of discussion points during these committee meetings include reviewing 1) the amount of ACT used versus the number of confirmed malaria cases to identify any issues with stock levels or inappropriate use of ACTs, 2) register review results from OTSS to identify areas for improvement, 3) record-keeping issues, and 4) malaria-related deaths to identify how these may have been prevented through more appropriate severe malaria case management. There was greater support by DPS officials for these committees in Cabo Delgado and Tete, leading to a larger number of committees established there (81 percent of all district reference facilities) than there was in the early intervention provinces of Zambezia and Nampula (29 percent).

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Strengthened the capacity of provincial and district health managers to use data for analysis of facility performance and decision-making. To improve data quality and facilitate data analysis and use, MalariaCare transitioned in PY3 from using a paper checklist to an electronic data collection and analysis platform—EDS. The EDS was piloted in Zambezia at the end of PY3, with rollout to all provinces at the start of PY4. A total of 86 supervisors, MalariaCare staff, PNCM staff, and DPS staff were trained as EDS end users. Of these, 16 were trained as part of the EDS pilot in Zambezia, 20 were trained during a stand-alone EDS training in Nampula for supervisors recruited in PY3, and 50 were trained in PY4 as part of the TOT for new supervisors in Cabo Delgado, Tete, and Nampula. The training included an introduction to the tablet and checklist content, a practical session using the tablets in local health facilities, and a TOT session to prepare a subset of participants to facilitate similar training in the future. Supervisors used the electronic checklist during OTSS in PY4 and PY5 to collect data from all facilities visited. MalariaCare further conducted an EDS data-user training for ten national-level representatives and MalariaCare staff. This three-day training demonstrated the use of the EDS DHIS2 data user interface to read and interpret data output during OTSS and the use of the platform to generate data for decision-making.
- To facilitate discussion and action based on data from OTSS visits, MalariaCare conducted provincial-level and district-level LLWs. Each provincial-level LLW included representatives from the national, provincial, and district levels, among whom were OTSS supervisors, malaria focal point persons, and provincial health management, whereas district-level LLWs were limited to provincial and district level representatives. During LLWs, participants reviewed and analyzed OTSS data—identifying gaps in performance and designing action plans to address these gaps. Examples of action identified during the workshop (and implemented almost immediately by the DPS) include the following: all malaria focal point persons should be clinicians; introduce monthly MCMC meetings at the facility level, especially in the bigger reference hospitals in the periphery; audits of data on severe malaria should be conducted to assess accurate reporting of severe malaria outcomes.
- In PY3, MalariaCare facilitated a provincial-level LLW in Nampula and four district-level LLWs in the provinces of Zambezia and Nampula. In PY4, the project conducted a provincial-level LLW in each of the four provinces after the fifth OTSS round. See Table 69 for a summary of LLW participation.

Table 69. Summary of lessons learned workshop participation, PY3 and PY4, Mozambique

Province	PY3		PY4	Total
	Provincial	District	Provincial	
Zambezia	N/A	117	36	153
Nampula	63	89	63	215
Cabo Delgado	N/A	N/A	33	33
Tete	N/A	N/A	27	27
Total	63	206	159	428

- Assessed case management capabilities in Cabo Delgado and Tete prior to activity implementation in these provinces. Four facilities were evaluated in each province using a standardized health facility assessment checklist.

Progress made on key MalariaCare indicators

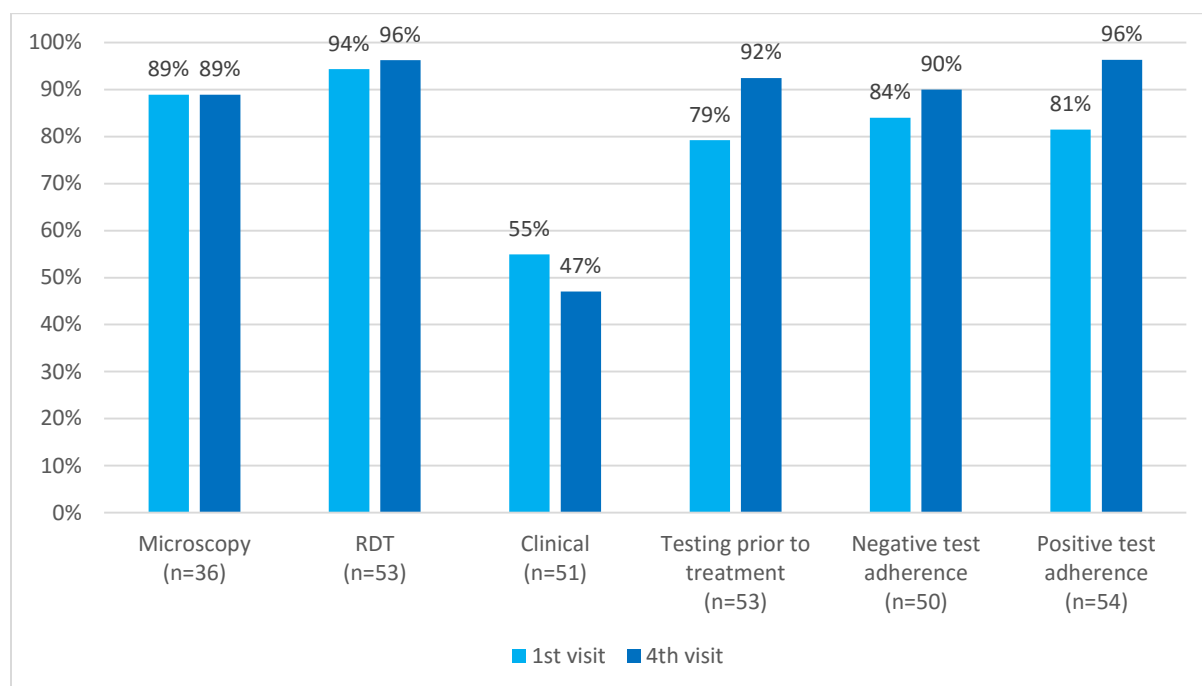
Trend analysis

Trend data on MalariaCare indicators is presented below. Due to poor-quality data during the initial rounds of OTSS when paper-based checklists were used, performance trends for the majority of facilities visited during OTSS are only available for those visits conducted using the EDS tool. Only data from provincial OTSS is included since only one round of district OTSS was conducted and no trends are available.

Since the introduction of EDS, 99 provincial facilities received at least one OTSS visit. Figure 64 summarizes performance trends among the 58 facilities that received four provincial OTSS visits using the revised checklist in the EDS tool in Cabo Delgado, Nampula, and Tete. Since Zambezia closed out earlier than the other provinces, the maximum number of visits with the EDS checklist that this province's facilities received was three. Results for Zambezia facilities visited three times are presented in Figure 65. Figure 74.

In Cabo Delgado, Tete, and Nampula, facilities were visited for a fifth time during the final OTSS round, but results are not included in the trend analysis due to differences in how the OTSS visits were conducted. In the last OTSS round in these three provinces, supervisors observed only those providers who had received previous OTSS mentorship, while in previous rounds any staff at the health facility were observed. This resulted in a dramatic increase in the proportion of facilities meeting the 75 percent minimum performance target for clinical management, which rose from 44 percent of facilities to 100 percent. From the first to the fourth visit, facilities showed improvement in four of the six core indicators with one of these being a marginal increase (Figure 64) with the greatest improvement seen in positive test adherence, which increased from 81 percent to 96 percent of facilities meeting the target by the fourth visit.

Figure 64. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first visit versus fourth visit, Cabo Delgado, Nampula, and Tete, Mozambique



Note: Zambezia results presented in the next figure, as the facilities received three visits due to early close-out. For all six indicators, the percentage of facilities with four visits that had scores at both visits was above 69 percent.

Although microscopy performance is high during OTSS, aMDRT and PT panel scores are low. However, it must be noted that performance outputs from MDRTs and PT panels focus only on slide reading competencies including parasite detection, species identification, and parasite counting, while the OTSS microscopy score focuses on a broader range of competencies including slide preparation, staining, and reading, with only parasite detection being scored as part of reading.

Between the first and fourth visit, the proportion of facilities meeting the minimum performance target for clinical case management decreased from 55 percent to 47 percent. While there were some declines in two of the minimum standard steps, there were larger declines in performance of clinical history-taking and conducting a physical exam. In particular, average facility performance declined in:

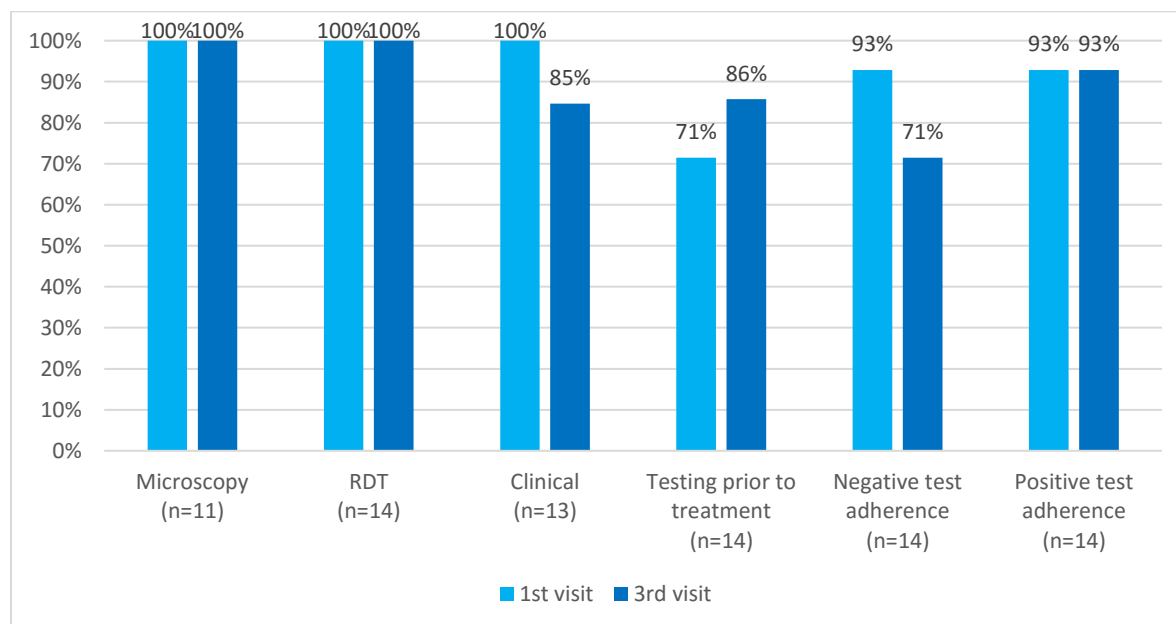
- Conducting an eye, ear, nose, and throat exam (30 percentage point decrease).
- Asking if the patient is pregnant for females between the ages of 15 and 49 (30 percentage point decrease).
- Checking for altered state of consciousness (26 percentage point decrease).

It was observed that there was a lot of staff movement during the last rounds of OTSS due to the economic downturn that the country experienced, with several facilities having newly recruited staff, which could explain the decline. Additionally, this low performance underscores the need for continued clinical mentoring to align clinical performance with the high diagnostic performance in order to assure the quality of case management.

Of the 191 facilities in Zambezia visited using the revised EDS checklist, all 19 were visited three times. Performance improved or remained the same for four of the six core indicators, with the greatest improvement

seen in testing prior to treatment (15 percentage point increase) (Figure 65). It is likely that all facilities met the minimum performance target for microscopy and RDT during both visits since many of these facilities received OTSS visits prior to the introduction of the revised EDS checklist. Declines in performance were seen in clinical case management (15 percentage point decrease) and negative test adherence (22 percentage point decrease). For clinical performance and negative test adherence, three facilities contributed to the decline in performance. At the third visit, two of these facilities were staffed by students who were completing their residency and had not received prior OTSS mentoring.

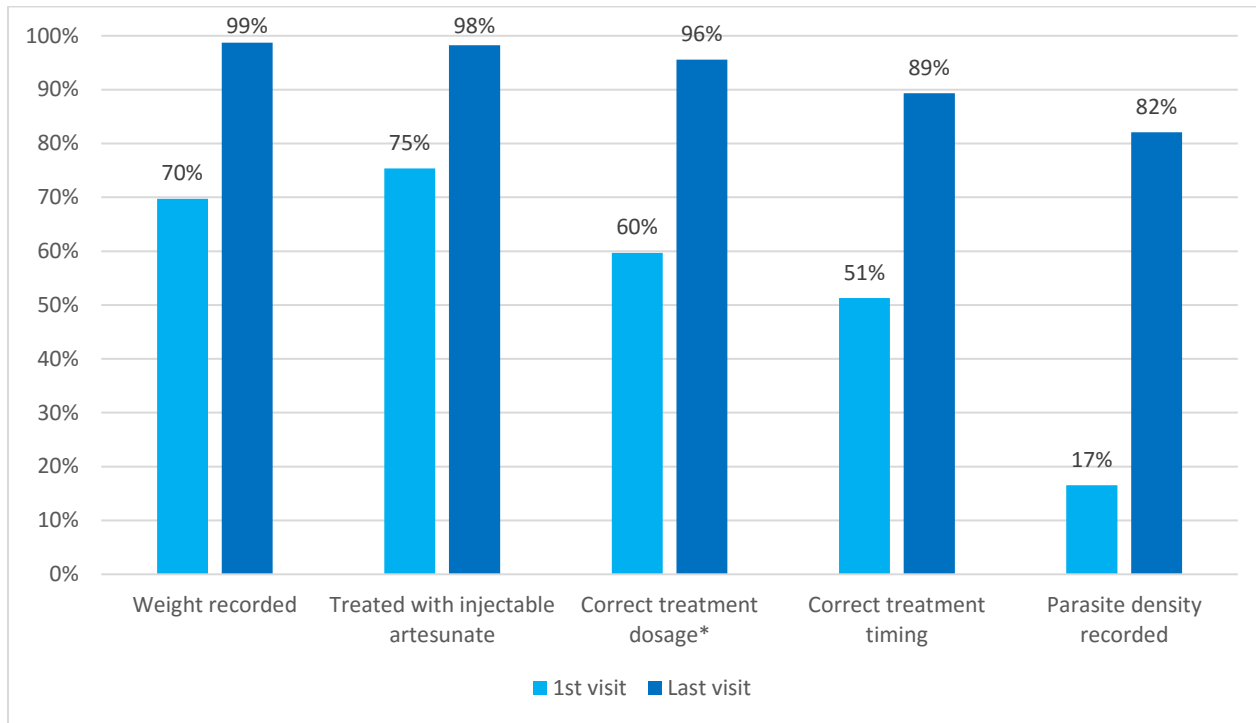
Figure 65. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first visit versus third visit, Zambezia, Mozambique



Note: For all six indicators, the percentage of facilities with four visits that had scores at both visits was above 73 percent.

To uncover gaps and further strengthen provider competencies in appropriate classification, monitoring, and treatment, MalariaCare assessed adherence to severe malaria management guidelines as part of a supplemental register review during OTSS. This assessment was conducted in all provinces at 57 higher-level facilities that provided inpatient care, starting during the third round of OTSS in PY3 and continuing through the final round in PY5. Facilities were assessed four times in Cabo Delgado, Tete, and Zambezia, and six times in Nampula. Supervisors used a separate paper-based tool that was not included as part of OTSS using EDS to review 20 inpatient charts for adherence to quality severe malaria management standards, including recording of patient weight, use of injectable artesunate, timing and dosage of malaria treatment, and recording of parasite density as part of microscopy results. Following the review, supervisors provided feedback and mentoring to health workers to correct specific errors. Each of the five severe malaria indicators showed improvement from first to last visit, ranging from 23 to 65 percentage points (Figure 66).

Figure 66. Average health facility performance on adherence to severe malaria guidelines, Mozambique (n=51)

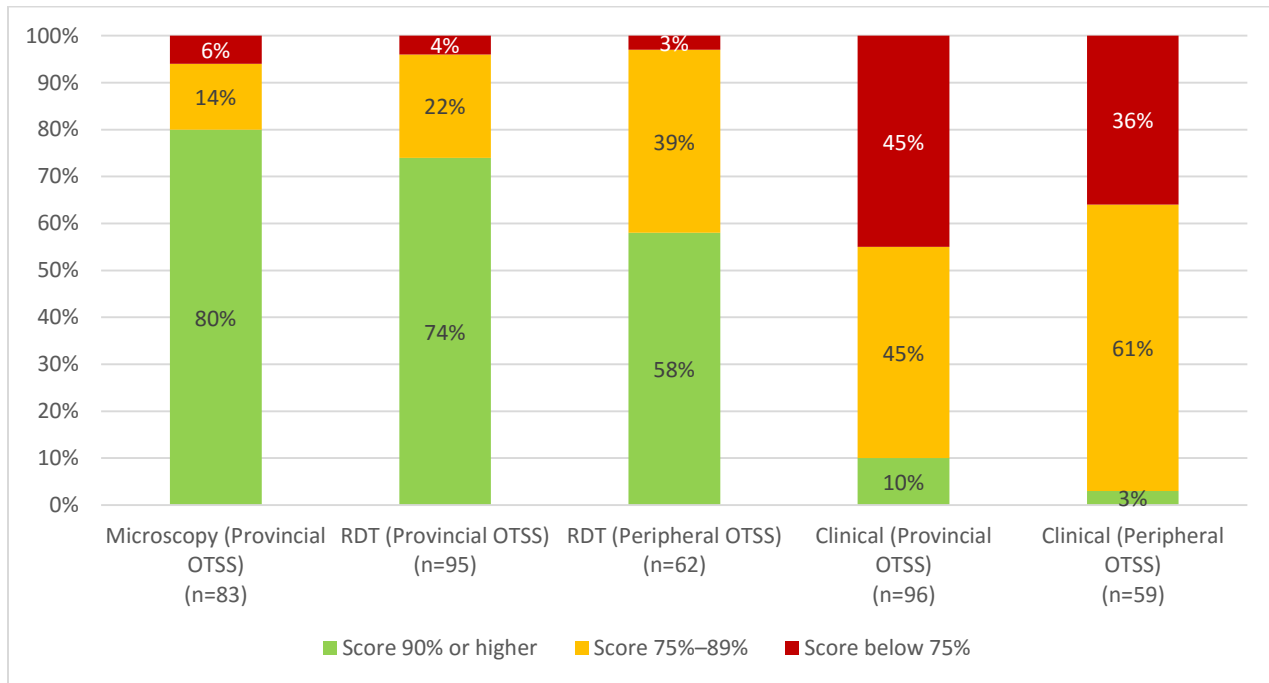


Note: Correct treatment dosage not captured in Zambezia, n=45.

Most recent visit

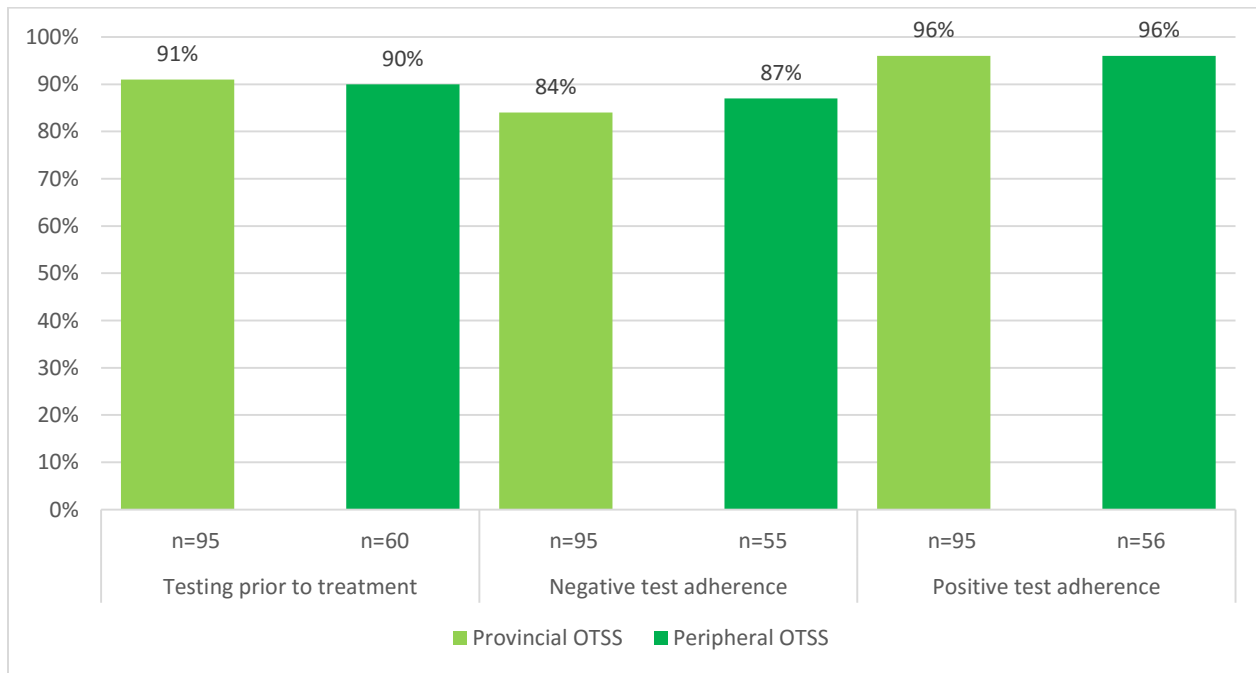
The proportion of facilities meeting the minimum standards at the most recent visit for all provincial-level facilities was similar to the last visits in the trend analyses, as shown in Figure 67 and Figure 68 below. More than 90 percent of facilities met the minimum standard (scoring at least 75 percent) for microscopy and RDT. The proportion of facilities scoring 90 percent or higher was greater for microscopy (80 percent) than for RDT (74 percent for provincial facilities; 58 percent for peripheral facilities). However, for clinical management, only 55 percent of provincial facilities and 64 percent of peripheral facilities met the minimum performance target, and only 10 percent of provincial and 3 percent of peripheral facilities performed at or above the 90 percent overall target. For all three adherence indicators, performance was high among both the provincial- and peripheral-level facilities (Figure 68).

Figure 67. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Mozambique



Note: Two indicators had completeness rates above 90 percent for both sets of facilities. For microscopy, 95 percent of the 87 facilities with microscopy had a score at the most recent visit.

Figure 68. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Mozambique



Note: All three indicators had completeness rates at or above 88 percent.

Challenges

Challenge	Solution/recommendations
<p>Due to an economic crisis in Mozambique, a high turnover of facility staff (particularly clinicians) was observed, which meant that frequently different health care workers were mentored during each visit. This effectively limited the potential for cumulative mentoring benefits achieved over multiple OTSS visits.</p>	<p>While our data remains limited, we believe that due to rotation of health workers the benefits of OTSS are most sustainable when the lessons are institutionalized within a facility—for example through creating MCMCs. The role of these committees should be further explored and developed. Additionally, the PNCM may consider a general review of curriculum of training institutions to ensure that the content is aligned with the most updated national guidelines. Trained clinical supervisors/mentors can be leveraged as a resource to close clinical training gaps by training health facility workers in clinical case management.</p>
<p>During initial aMDRT few supervisors met the Level A or B standards.</p>	<p>By first holding a basic MDRT prior to the aMDRT, MalariaCare was able to increase the proportion of supervisors meeting Level B competency standards.</p>
<p>With many competing priorities, it was difficult to get commitment from DPS staff to participate in activities.</p>	<p>MalariaCare worked to address this by participating in provincial planning meetings and providing activity calendars to DPS as far in advance as possible to allow for the greatest amount of planning against other priorities. MalariaCare and DPS also set up regular meetings to review these calendars. Per recommendations of MalariaCare, the DPS hired OTSS supervisors to serve as additional staff on the managerial team and to help in shifting the workload.</p>
<p>Providers have higher performance in parasite detection during MDRTs and PT panels, but gaps remain in species identification and parasite counting, which is most important when managing severe malaria.</p>	<p>MalariaCare continued to build these skills through the introduction of PT panels and OTSS. However, ongoing microscopy training should focus on challenging skills such as low density <i>P. falciparum</i>; accurate parasite counting through periodic, focused MDRTs; the use and expansion of a well-structured, on-site PT program with well characterized slide sets; and targeted follow-up and use of recently WHO-accredited microscopy experts for key referral centers.</p>
<p>Given the vast geographic span of Mozambique, MalariaCare and PNCM were not able to conduct OTSS visits to as many facilities as could have benefited from the approach. MalariaCare strived to maintain a balance between pragmatism and achieving the minimum standards required for quality health service delivery. Local capacity/resources may, currently, be insufficient to maintain that balance, and continued support is likely needed.</p>	<p>MalariaCare created a pool of supervisors and managers conversant with the OTSS approach and improved the availability of OTSS data for decision-making. The PNCM and provincial staff could continue to use this pool to sustain and build the skills of additional staff and use them to scale up OTSS over time to cover the high-burden regions. Given the progress made in Mozambique and elsewhere, caution should be exercised when integrating case management QA into broader supportive supervision activities, as this could risk the loss of gains made in specific malaria knowledge and skills.</p>

Challenge	Solution/recommendations
Gaps remain in clinical case management competencies resulting from a revolving workforce and introduction of insufficiently trained staff.	The PNCM may consider a general review of curriculum of training institutions to ensure that the content is aligned with the most updated national guidelines. Trained clinical supervisors/mentors can be leveraged as a resource to close clinical training gaps by training health facility workers in clinical case management.

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Mozambique, the following recommendations may be considered:

- Overall, improving clinical performance will require implementation of strategies to improve focused physical examination skills, ensuring that tests are ordered for suspected malaria cases and appropriate use of both positive and negative test results.
- The review of performance data and formulation of well-defined action plans to improve outcomes is important for addressing challenges and optimizing lessons learned. At the facility level, supervisors should be well trained in developing these plans with the facility staff—supervisor training should include significant time spent on this. Accountabilities must be established to support completion of defined action items at each level. LLWs should include key decision-makers to ensure that action items are effectively communicated to the appropriate people.
- Strong supervisor performance is key to facility improvement, and national and provincial leadership should define clear and specific criteria to encourage thoughtful selection and training of the right people.
- Commodity stock-outs, limited resource availability, and the limited willingness and ability of district, facility, and department leadership to engage in a continuous cyclic QA process are all potential roadblocks to improving performance. These challenges may be addressed through improved coordination at the facility, regional, and national level and by introducing leadership and management training for key positions within the system.

Transition and sustainability

- PT slide set procured in PY5 and accompanying database have been handed over to the PNCM for future training purposes. Laboratory staff from the INS, which included several of the recently WHO-accredited laboratory technicians, were trained on using the database, including how to organize slides, pull PT panels, enter results, and calculate reports.
- As there was no formal transition of EDS in Mozambique, MalariaCare drafted and shared a guidance document with the PNCM outlining EDS options and associated next steps that could be referenced if the PNCM or another implementing partner would decide to establish a country-managed EDS.
- The project also shared all EDS training materials, in both English and Portuguese, with the PNCM for future reference if EDS is pursued with other resources. This included facilitator and participant resources for the end-user training, data-user training, and systems administrator training.

- MalariaCare conducted a provincial-level close-out meeting in Zambezia and Nampula to review project accomplishments and lessons learned as well as discuss transition of case management activities. A total of 36 attendees participated in the Zambezia meeting, and 51 attendees participated in the Nampula meeting. Attendees included representatives from the PNCM, DPS, MCSP, and PMI, as well as select OTSS supervisors.

Nigeria

Introduction

Support to Nigeria began in PY1 with preliminary planning activities. Starting in PY2, MalariaCare partnered with the Expanded Social Marketing Project in Nigeria (ESMPIN), led by the Society for Family Health (SFH), and the FMOH to develop, implement, and evaluate a pilot using PPMVs for iCCM services. The pilot aimed to demonstrate that case management of common childhood illnesses (malaria and other febrile illnesses) can be substantially improved on a population basis by using proprietary patent medicine vendors (PPMV) to provide high-quality case management of these diseases.



ESMPIN was responsible for direct implementation, including training, mentorship, and marketing activities, while MalariaCare provided technical assistance to ESMPIN and supported the monitoring during implementation of the pilot. MalariaCare also led the evaluation of the pilot with baseline and endline evaluations, conducted a cost analysis, and disseminated the results to key stakeholders.

To monitor PPMV case management knowledge and practices throughout actual implementation of the nine-month pilot intervention, MalariaCare designed an electronic management and information system, which was utilized by canvassers to collect data via electronic tablets. MalariaCare also led a cost analysis to provide the FMOH with information on the costs of the pilot implementation to guide national decision-makers whether to expand the program to other target areas within Nigeria.

The pilot used a training and mentorship model to improve case management of malaria and other common childhood illnesses at PPMV shops in selected local government areas (LGAs) in Ebonyi State. PPMVs are defined as “a person without formal training in pharmacy who sells orthodox pharmaceutical products on a retail basis for profit.”³ The pilot implementation consisted of training PPMVs in case management of febrile illnesses using the FMOH national iCCM curriculum that covers malaria, diarrhea, and pneumonia. Although other interventions have trained PPMVs on effective case management, this pilot intervention was novel in that it trained PPMVs on performing RDTs and prescribing amoxicillin to treat pneumonia. Following iCCM training, PPMVs were continuously mentored on effective case management during regular monitoring visits. To ensure that market conditions such as stock-outs and price surges did not interfere with the outcomes of the study,

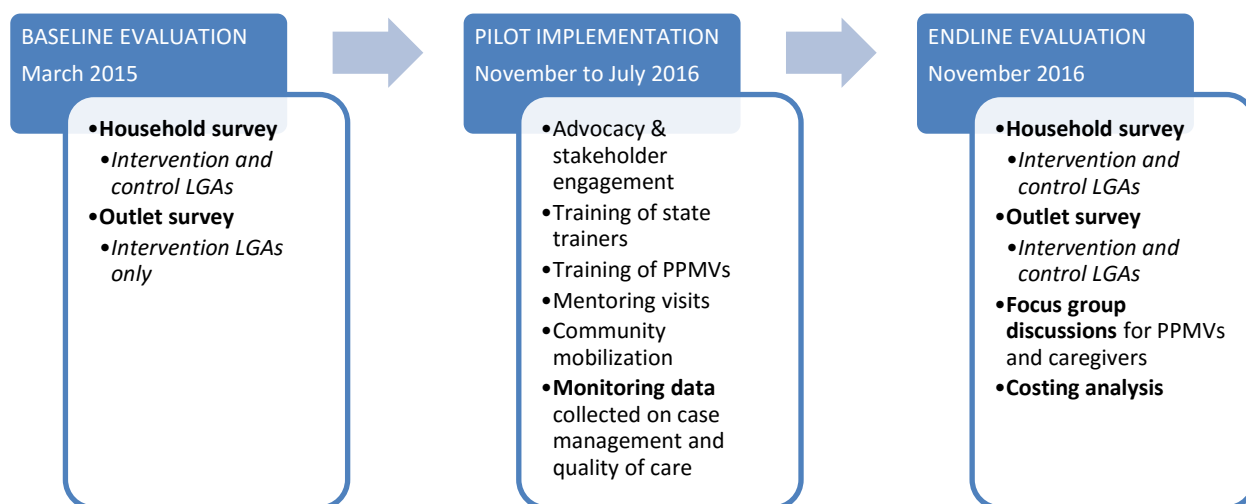
³ Brieger WR, Osamor PE, Salami KK, Oladepo O, Otusanya SA. Interactions between patent medicine vendors and customers in urban and rural Nigeria. *Health Policy Plan* 2004;19:177–182.

ESMPIN, through its canvassers, provided PPMVs with ACTs, RDTs, oral rehydration salts, and zinc, based on stock data collected during monitoring visits.

Key accomplishments

As part of M&E, MalariaCare led a baseline and endline evaluation that included household surveys, outlet surveys, and focus group discussions; developed and provided technical assistance for a QA system to monitor program implementation; and conducted a cost analysis. The baseline evaluation was completed before the commencement of the pilot to provide preliminary data for eventual comparison to endline data, while the endline was conducted following the close of the pilot intervention. A timeline of all pilot activities, including M&E components supported by MalariaCare in bold type, is presented in Figure 69 below.

Figure 69. Timeline of major pilot activities, Nigeria



Note: LGA=local government area; PPMV=proprietary patent medicine vendors.

In addition to M&E, MalariaCare also provided technical assistance in development of the pilot concept and in implementation of the pilot itself. The following section outlines accomplishments across the five years in which MalariaCare provided support to the pilot.

PY1 accomplishments

In the first year of implementation MalariaCare began planning for the pilot with key stakeholders:

- Traveled to Abuja, Nigeria, from February 18 to March 4, 2013, to meet with USAID and partners. The team discussed the concept for the pilot and MalariaCare’s potential role.
- Participated in a roundtable meeting organized by Nigeria’s Malaria Control Program in Abuja in February 2013 to discuss the country’s malaria transition and long-term planning following the ending of the Affordable Medicines Facility program. MalariaCare presented lessons learned and best practices in malaria case management within the private sector during the time slot allocated to PMI.

- Conducted a follow-up visit to Abuja in May 2013 to harmonize protocol documents and determine funding needs.
- Worked with PMI to determine MalariaCare’s role in the pilot and evaluation and submitted a scope of work to PMI in July 2013.

PY2 accomplishments

- Conducted two technical assistance visits to discuss the research design with stakeholders and finalize the pilot implementation site. After consultation with the NMCP and the USAID Mission, Ebonyi State was chosen based on its long peak malaria transmission period and because no other pilot projects focused on the private sector are currently being implemented. Within Ebonyi State, two LGAs were proposed to serve as the two intervention sites, with two other LGAs serving as control sites. During the second technical assistance visit, the team finalized the budget and further refined project design and evaluation plans.
- Recruited a field-based program coordinator and a local survey company to support the baseline evaluation.
- Conducted an advocacy visit with Ebonyi State health authorities, including the commissioner of health.
- Finalized the pilot protocol, revised survey tools, and developed a subcontract with the local survey company.

PY3 accomplishments

- Received approval from the Nigerian National Research Ethics Committee of the FMOH to conduct the pilot study, which included endorsement of all pilot materials and approval to conduct the baseline and endline evaluations.
- Worked with ESMPIN to adapt the FMOH iCCM training materials for the PPMV pilot. The materials were used by the FMOH to train the PPMVs in iCCM interventions. MalariaCare provided input into the design of job aids for canvassers to mentor PPMVs during monitoring visits. These materials were programmed in the tablet-based application for ease of accessibility while canvassers are collecting data.
- Developed, tested, and finalized IEC materials to supplement the FMOH’s iCCM training materials for providers and caregivers. To field-test the materials, MalariaCare facilitated three focus groups in Ebonyi State, including two groups of PPMVs and one group of caregivers.
- With the support of a local survey company, completed a baseline household survey of care-seeking behavior for sick children under the age of five in all four LGAs to be included in the pilot—two intervention LGAs (Abakaliki and Afikpo North) and two control LGAs (Onicha and Ikwo). A baseline outlet provider survey and knowledge assessment were also completed in the two intervention LGAs. A total of 2,513 households were surveyed, and 420 PPMV shops participated in the outlet survey and knowledge assessment. In addition, eight focus groups were conducted with caregivers of children under five and PPMV shop owners, managers, and employees to provide additional qualitative context to the survey data from the pilot.
- Conducted meetings with federal and state stakeholders to advocate for a federal and state partnership with national professional associations, including the Pharmacy Council of Nigeria (PCN) and the Nigeria Association of Patent and Proprietary Medicine Dealers (NAPPMED). NAPPMED and PCN agreed to

support the intervention. NAPPMED also participated in PPMV training sessions, including a TOT led by ESMPIN and an iCCM training also led by ESMPIN.

- Participated in advocacy visits with PPMVs in the intervention LGAs to officially inform them of the iCCM pilot and identify eligible PPMVs to participate in the pilot. As PCN was a close partner in the pilot and their support was needed for implementation, PPMVs were only eligible if registered with the PCN.
- Attended the Ebonyi State iCCM TOT led by ESMPIN. Of the 33 participants, 26 were selected as national iCCM facilitators. Trainees included ten ESMPIN canvassers, staff from the state MOH, Federal Teaching Hospital Abakaliki, FMOH, and directors of health departments of the intervention LGAs.
- Adapted the HNQIS—an existing management information system created by PSI to capture data in the field—to the needs of the implementation phase of the pilot. There were four modules included in the HNQIS—Assess, Improve, Monitor, and Plan. Two (Assess and Improve) of the four modules were used by the canvassers. The Assess module includes a checklist adapted from the Federal iCCM Sick Child Recording Form to assess the PPMV’s knowledge of skills learned during the iCCM training. According to the observations entered by the canvasser into the HNQIS, the Improve module created a monitoring platform that guided the canvasser on how to provide positive feedback to reinforce the skills that were taught during the PPMV iCCM training. Canvassers were equipped with tablets to capture data during every monitoring visit. All data collected via tablet was integrated into DHIS2. The objective of the Monitor module was to allow program managers to create charts and tables based on the information captured by canvassers, such as PPMV case load and skill assessment levels. The objective of the Plan module was to guide the canvasser on when the next visit to the PPMV should occur according to the canvasser’s assessment.
- Supported ESMPIN in PPMV registration and mapping. The GPS coordinates of the PPMV shops captured during the registration process were used for planning and management purposes.
- Initiated a cost analysis of the PPMV pilot. The purpose of this analysis was to capture the costs associated with training, monitoring, and mentoring PPMVs; commodity demand creation; and all relevant activities associated with providing iCCM interventions to PPMVs. As part of this analysis, a MalariaCare consultant traveled to Nigeria to evaluate SFH cost data collection practices and align reporting systems between headquarters, the SFH field office, and the intervention sites where field data is primarily collected.

PY4 accomplishments

- Finalized a report on baseline findings emerging from analysis of the data collected during the baseline evaluation. The report was shared with PMI, the FMOH, the Ebonyi State MOH, and the Federal Task Force.
- Continued expansion of the electronic management system. MalariaCare built an additional electronic tool for data collection during canvasser visits. This system took a holistic approach to improving the quality of iCCM by PPMVs by monitoring two key indicators that underpin high-quality service provision: 1) quality of PPMV performance in managing cases and 2) PPMVs’ caseload. This integrated system was composed of two tools, and data collected from these tools was integrated into the SFH DHIS2. The tools are:
 - HNQIS: The first two modules (Assess and Improve) were launched with the implementation of the pilot intervention in November 2015. They were used by canvassers in the field to assess PPMVs’ skills and knowledge in iCCM and to provide on-the-spot coaching to improve their malaria testing and fever case

management practices. The second two modules (Plan and Monitor) were finalized but not used in implementation of the intervention due to technical glitches in the system causing delays in finalization and due to a gap in funding from May to early July for canvasser and program manager salaries, which caused delays in the training on these modules. The funding gap resulted 1) in ESMPIN (via SFH) meeting their budget limit under their MalariaCare (via PATH) subagreement mid-pilot intervention and 2) additional time needed in order to amend the subagreement so funding could be provided. Therefore, the pilot was unable to test the impact of using these modules to make data-informed decisions at the project manager level.

- Case management monthly summary form: The form used in the management system was the electronic version of a national tool used for tracking case management output, originally developed by the Nigerian MOH for CHWs. The form tracked the quantity and the composition of fever, diarrhea, and pneumonia cases recorded at the provider level. During the initial PPMV training in PY3, PPMVs were trained on filling in the form on a daily basis. During each canvasser visit, data were collected from the paper form that the PPMV uses. Although the case management data were collected on paper forms by the canvassers during supervision visits, data were entered by the pilot intervention program managers into the electronic configuration of the aggregated form in DHIS2; this was developed by MalariaCare.

Although not all tools were used to their full capacity during the pilot intervention, MalariaCare configured a number of dashboards in DHIS2 to display the data collected. This tracked progress on quality and caseload, so program managers could plan project activities accordingly (Figure 70).

Figure 70. DHIS2 dashboard to track quality of integrated community case management of proprietary patent medicine vendors, Nigeria



- In October 2015, conducted an end-user training for nine canvassers. The three-day training introduced canvassers to HNQIS and also focused on improving mentoring skills. Canvassers learned how to use both the Assess and Improve modules, with a practical field session at local PPMV shops. Canvassers reviewed best practices for mentoring and used the Assess module to refine feedback and mentoring skills.

- In August 2016, conducted a three-day training for data users of the monitoring system, which included a total of 13 participants from the PMI Nigeria Mission and SFH. Participants were trained on how to conduct data analysis on data collected through the monitoring system, through utilization of the Data for Decision-making manual, which was developed by MalariaCare. By the end of the training, participants were able to:
 - Understand data dimensions and where they originated.
 - Create charts, graphs, pivot tables, and event reports for data analysis using specific indicators.
 - Interpret and explain custom dashboards.
 - Understand the different types of visualizations used for data analysis.
 - Understand how data outputs could be used to make decisions.
- Created training materials to support the end-user and data-user training. A summary of these is outlined in Table 70.



Data users of the integrated monitoring system for PPMVs.
Photo credit: MalariaCare/Nigeria

Table 70. Summary of training tools created to support monitoring system, Nigeria

Tool	Audience	Purpose
HNQIS End-user Manual	End users (cavassers)	Outline how to use the HNQIS application and the sales and stock tracker form.
DHIS2 Data-capture End-user Manual	End users (cavassers)	Outline how to use the case management monthly summary form.
HQNIS Data-user Manual	Data users (program managers)	Outline how to navigate dashboards available in DHIS2 and to use these in analyzing available data.
Data for Decision-making Manual	Data users (program managers)	Outline how to critically interpret and apply the data generated by the monitoring system to improve quality of iCCM service provision by PPMVs.

Note: HNQIS=health network quality information system; DHIS2=district health information system; iCCM=integrated community case management; PPMV=proprietary patent medicine vendors.

- Conducted routine monitoring throughout the implementation phase of the pilot. A total of four monitoring visits were conducted by MalariaCare during the pilot implementation period. During each monitoring visit, the MalariaCare project coordinator accompanied the iCCM state manager and cavassers during supervision visits to PPMV shops enrolled in the pilot to observe PPMV progress in conducting proper case management of malaria, diarrhea, and pneumonia for children under five years of age. The monitoring visits were also an opportunity to understand the standard procedures used by cavassers to guide PPMVs throughout the implementation, as well as to identify any issues in the monitoring system operation.
- Submitted an abstract to ASTMH for the 2016 conference. The abstract was accepted in September 2016.

- Began preparation for the endline evaluation to assess the impact of the PPMV iCCM intervention. The quantitative and qualitative survey tools from the baseline were refined to ensure that outcomes from the iCCM intervention were appropriately captured.
- Recruited a local contractor to complete endline data collection activities. A request for proposals was drafted and released in mid-August 2016. Three organizations submitted proposals and were evaluated on the demonstrated experience required to accomplish the scope of work included in the request for proposals, competitiveness of the cost proposal, overall completeness, and responsiveness to request-for-proposal requirements. In September 2016, a survey company, Binomial Optimus Limited (BOL), was selected as the agency that best met or exceeded expectations in each evaluation category.
- Provided technical assistance in capturing iCCM pilot cost data for the cost analysis. A costing template was developed for the SFH finance team to guide the capture of cost data during implementation of the pilot intervention. In October 2015, a consultant traveled to Nigeria to observe the PPMV iCCM step-down training to understand the capture of cost data at the field level, and to provide recommendations to improve data capturing and reporting. The costs of the iCCM TOT and the iCCM step-down trainers were captured in PY4. Other costs associated with mentoring and monitoring of PPMV activities, distributions of commodities, and the operations of the supply chain were captured in PY5. Once all of the intervention data are collected, they will be analyzed to determine the cost-effectiveness of the pilot and presented as part of the final evaluation report.

PY5 accomplishments

- Presented a poster at ASTMH in November 2016 on pilot activities and the baseline findings.
- Finalized onboarding of the local contractor, BOL, to support endline evaluation data collection activities. As a portion of funding for the endline surveys sits on the ESMPIN budget as implemented by SFH, a tripartite contract was signed between PATH, BOL, and SFH.
- Led a federal and state advocacy visit in preparation of the endline evaluation. In September 2016, MalariaCare led an in-state visit with the FMOH to meet with local stakeholders of the iCCM project. A meeting was held with the Ebonyi State Commissioner of Health to discuss the upcoming iCCM endline evaluation. Advocacy meetings were also held with local NAPPMED leaders to inform the participating PPMVs of the endline evaluation.
- Completed the endline evaluation in December 2016. MalariaCare worked closely with BOL to conduct both a household and outlet survey as well as several focus group discussion in the two intervention LGAs—Ikwo and Onicha—and the two control LGAs—Abakaliki and Afikpo North.
- For the household survey, a total of 14,106 households were listed across 166 enumeration areas in all four LGAs. Of these, 3,303 household interviews were completed. For the outlet, a total of 436 PPMV outlets participated in the survey across the four LGAs. In addition, four focus groups discussions were held in each LGA (total 16). For further details on endline methods, refer to the MalariaCare Evaluation Report.
- Reviewed pilot implementation costing data. In December 2016 and January 2017, MalariaCare worked closely with the SFH field team to review pilot costing data received from SFH. MalariaCare reviewed records and met with SFH staff to fill in costing data gaps not captured in the initial data collection phase as

well as to better understand costs already collected. The data captured were used to calculate the total cost of the pilot along with funds incurred under each cost category. Findings were presented in the MalariaCare final report.

- Developed a MalariaCare final report that included an analysis of evaluation data—baseline, monitoring, and endline—recommendations based on these results, and details on MalariaCare support throughout the life of the pilot.
- Supported a dissemination meeting to share evaluation findings at the state level, in partnership with ESMPIN. A total of 65 participants attended the meeting. Participants include representatives from the Ebonyi MOH, community leaders, Maternal Child Survival Program, PPMVs who participated in the pilot, and caregivers from intervention LGAs. Both the PPMVs and caregivers shared pilot experiences with attendees.
- Attended the Institutionalizing Community Health Conference in South Africa. As a delegate, MalariaCare worked with other country delegates to develop country-specific action plans for addressing priority issues/challenges to guide country action and harmonizing donor support around those actions.



Participants from dissemination meeting with ESMPIN.

Photo credit: MalariaCare/Nigeria

Summary of evaluation results

The evaluation of the iCCM PPMV pilot sought to determine whether, in two LGAs in Ebonyi State, management of common childhood illnesses (malaria, diarrhea, and pneumonia) could be improved on a population basis without the use of subsidies for medications or introduction of new types of providers. The evaluation used monitoring data, PPMV performance, caseload data collected during the intervention, and baseline and endline surveys to assess the impact of the intervention. A costing analysis was also completed to provide information to inform potential scale-up.

Overall, the study found large increases in PPMV performance, as shown by the monitoring data, and PPMV knowledge, captured through outlet surveys at PPMV shops. While household survey results also demonstrated better performance among PPMV shops in proper diagnosis, treatment, and adherence to national guidelines for malaria among PPMVs in the intervention arm and among households that brought their child to a PPMV shop, performance at endline was still low and did not match the magnitude of the intervention effect seen in other data sources.

A review of monitoring data collected on PPMV performance during consecutive supportive supervision visits showed substantial improvement on key indicators over the course of the pilot, though these results were not corroborated with those of the household survey. These improvements included an increase in the ability of a PPMV to recognize a client that requires an RDT, from 9 to 76 percent; an increase in the identification of correct

diagnosis on all three illnesses, from 16 to 89 percent; and an increase in correct treatment and referral if signs are shown of severe illness for all three illnesses, from 16 to 88 percent. Additionally, the proportion of diagnosed malaria, diarrhea, and pneumonia cases treated with an ACT, oral rehydration salts and zinc, and amoxicillin, respectively, was more than 95 percent at last visit.

Results of the endline evaluation, which included an outlet survey, a household survey, and focus group discussions, demonstrated better knowledge and use of RDTs and knowledge on diagnosis, treatment, and adherence to government guidelines for all three conditions in intervention arms compared to control areas. In addition, results shows better performance in proper diagnosis, treatment, and adherence to national guidelines for malaria by PPMVs in intervention arms compared to control, although performance at endline was still low. In the intervention arm, 96 percent of PPMVs knew that malaria should be diagnosed with an RDT, and 80 percent knew that a respiratory counter should be used to quantify fast breathing for pneumonia, compared to 55 percent and 13 percent, respectively, in the control arm. Compared to the baseline and to the control arm at endline, those in the intervention arm at endline were more likely to have seen (34 versus 76 versus 100 percent) and used (21 versus 61 versus 99 percent) an RDT. Importantly, compared to baseline, those in the intervention arm during endline were 14 percentage points (86 to 100 percent) more likely to indicate that a positive RDT meant a client had malaria, and 8 percentage points (87 to 95 percent) more likely to indicate that a negative test meant that a client did not have malaria. Knowledge on correct and recommended treatment for all three illnesses increased from baseline to endline in the intervention arm from 65 to 98 percent for malaria, 6 to 90 percent for diarrhea, and 17 to 99 percent for pneumonia; the latter two were also significantly higher in the intervention arm compared to control arm.

The household survey supported the findings from the outlet survey that diagnosis and treatment of malaria had improved following the pilot, specifically for children brought to a PPMV shop when care was sought for fever. Of this group, 40 percent in the intervention arm at endline reported having received a blood test in the previous two weeks (compared with 12 percent at baseline and 16 percent in the control arm), and 25 percent of children in the intervention arm at endline received correct diagnosis and treatment for all three illnesses (compared with 10 percent in the intervention arm at baseline and 10 percent in the control arm at endline). While a 15 percentage point increase from the baseline, this result is underwhelming and not consistent with the results of the outlet survey and monitoring data. Also contrary to what the outlet and case management monitoring data showed, treatment of diarrhea and pneumonia was reported in the household survey as being very low, with little to no difference from the baseline or control arm. The household survey results, which contradicted PPMV knowledge and data collected during monitoring, may reflect poor recall by the caregivers, low population coverage of the intervention, or a combination of both.

In addition to the primary findings, PPMV shops in the intervention areas had fewer stock-outs, which was expected given that commodities were provided to trained PPMVs as part of the pilot. Focus group discussions with caregivers indicated that the intervention built trust in PPMVs within the community. In addition to the role of practical factors such as proximity, time, cost, and PPMV shops being staffed by members of the community, caregivers recognized the importance of PPMV staff being trained and supervised, and caregivers indicated that they were now more comfortable going to a PPMV. The PPMVs' willingness, as reported in PPMV focus group discussions, to be supervised by public health workers at nearby referral centers provides an opportunity to incorporate these shops into the public health QA system.

The costing analysis is meant to provide additional information into a decision about whether to scale the pilot and to budget for that expansion, providing insight on the cost per intervention delivered. The analysis demonstrates that the cost per uncomplicated illness (malaria, diarrhea, pneumonia) treated is US\$16, while the cost per illness examined is US\$13. Integration of disease management among this provider group is most cost-effective, and it would be expected that identifying opportunities to integrate the expanded pilot into already existing systems, such as an existing QA system, could potentially lower costs further. Donors and the Government of Nigeria could use this analysis as well as the results of the evaluation and other pertinent considerations to prioritize public health action.

Challenges in identifying a population impact

Discrepancies between the monitoring and outlet data and household data in the proper case management of pneumonia and diarrhea could be the result of the relatively low coverage of the pilot intervention and/or caregiver recall. As PCN has regulatory oversight of PPMVs and was a partner in the intervention, only those PPMVs licensed with PCN could participate in the pilot. This greatly limited the number of PPMVs eligible for the pilot. Unfortunately, it was not until the endline evaluation when MalariaCare obtained the list of PPMVs registered with NAPPMED that the lack of coverage was made apparent. In reviewing all available records of PPMVs obtained throughout the pilot, coverage of the intervention was limited to an estimated 29 percent of PPMVs in the intervention LGAs. A sub-analysis conducted based on household distance from a PPMV shop found that households within one kilometer of trained PPMVs had a slightly greater proportion of fever cases, as well as cases for all three illnesses (fever, diarrhea, and pneumonia) which were appropriately diagnosed and treated. However, those closer to trained PPMVs were not more likely to be diagnosed and treated for diarrhea and pneumonia any more appropriately than those farther away. The sub-analysis showed some promise in the appropriate case management of fever, but it did not provide any different results in case management of pneumonia or diarrhea than presented in the overall household analysis. Caregiver recall may also have hindered the ability to identify a population impact in management of diarrhea and pneumonia as the household survey relied on caregiver recall of their child's symptoms, diagnosis, and treatment in the previous two weeks, and many caregivers could not remember the treatment they received for their children.

Discussion of evaluation results

While the relatively low coverage of the pilot intervention hindered the evaluation's ability to demonstrate population-level results, the pilot nonetheless seems to demonstrate that when PPMVs are trained, supervised, and supplied, it can improve the quality of case management and increase the percentage of sick children that receive proper diagnosis and treatment for malaria, diarrhea, and pneumonia per government guidelines. In order to sustain these gains, it is likely that expanded training and a routine QA system of supervision and provision of commodities would be necessary.

Ideally, a system that trains, supervises, and supplies PPMV shops could be implemented in coordination with similar public-sector interventions to increase the likelihood of quality care regardless of where a caretaker chooses to take a child. PPMVs, in focus group discussions, voiced a willingness to participate in supportive supervision activities connected to public health referral facilities. The community also verbalized an awareness and understanding of the importance of training and supervision in providing quality case management. Such an

integrated system could work to build confidence and demand for facilities in the public and private sectors, both of which will have to improve to realize population-wide improvements in mortality. Caregivers expressed very practical reasons for preferring PPMV shops that included proximity, hours, cost, and attentive staff. It would be expected that the population will continue to use PPMV shops, particularly during off hours when public-sector facilities are closed, so improving both these private as well as public facilities would be a step toward providing the population with 24-hour access to quality case management.

Challenges

Challenge	Solution/recommendations
Technical issues with the HNQIS.	Throughout the life of the pilot, there were several technical glitches that caused interruptions or issues in data collection. In working closely with ESMPIN, MalariaCare was able to identify and address these either through in-person or remote support.
Delays in baseline evaluation analysis due to poor-quality data and late deliverables by the local survey company.	MalariaCare found in that playing a larger role in survey implementation during endline, as compared to baseline, helped in improving data quality and efficiency of operations. MalariaCare led data collection in-country and data analysis with the survey contractor limited to supporting data collection, survey operations, and recruitment of enumerators and survey participants.
There was a gap in funding (May–early July) for canvassers’ and pilot intervention program managers’ salaries, as the SFH budget limit, under their MalariaCare (via PATH) subagreement, was met at mid-pilot intervention. Several elements of the monitoring systems, including HNQIS modules Monitoring and Plan, and the electronic version of the case management summary form were not finalized until May due to technical glitches in the testing phase. Because the funding issue was not resolved until early July, there was no time to roll out these additional tools for implementation prior to the end of the pilot period (July 30, 2016).	MalariaCare was able to allocate additional funding to SFH through a subagreement cost extension; however, it did take some time to process the updated budget and the amendment for execution of the extension. Although these tools could not be implemented during the intervention, MalariaCare did provide an overview of their function to ESMPIN program managers and PMI representatives as part of the data-user training. Also, during the time of the funding gap, canvassers did continue to perform supervision visits, though the number and frequency of these visits did decrease, as funding was not guaranteed to canvassers.

Additional recommendations

Based on the project’s involvement in multiple aspects of the M&E of the Nigeria PPMV iCCM pilot intervention, MalariaCare would make the following recommendations:

- Advocate with PCN for greater inclusion of PPMV shops. Population-level impact cannot be achieved if interventions are restricted to PCN-registered PPMV shops, as these make up only a small proportion of the total PPMV shops within a given LGA. Given that PCN has regulatory oversight for proprietary and patent medicine practice in Nigeria and licenses patent medicine vendors, it will be important to advocate with PCN for greater inclusion of PPMV shops in any intervention. One option would be for future implementers to act

as a liaison between the PPMV shops and PCN to help PPMV shops become registered and licensed as a part of the intervention.

- Continue to train PPMVs to improve case management capacity of private-sector providers. The Government of Nigeria could continue to train PPMVs as the evaluation demonstrated increased knowledge of childhood case management following training and supervision.
- Create a certificate program and advertise PPMV training status. As demonstrated through the caregiver and PPMV focus group discussions, community members are aware when a PPMV shop receives training and supervision or support from government entities. Some community members specifically requested that trained PPMVs be provided with a sign to indicate that they had been trained. Based on the results of the iCCM training, the Government of Nigeria could create a certification program, providing certificates and appropriate signage to PPMVs who meet a set of criteria during the iCCM training and follow-up supervision visits. Providing prominent signage to certified PPMV shops would inform community members which shops have been verified to provide high-quality services, and in turn influence treatment seeking by clients. This would also provide PPMV shops with an incentive to enroll, continue to participate in the program, and provide quality care if performance during supervision visits is related to ongoing certification and certification is seen as a being a business advantage.
- Strengthen/build supervision structures using existing local resources. Given the high costs of operating an NGO-led intervention that uses full-time staff as canvassers, the Government of Nigeria could consider alternate supervision structures to achieve scale. It could, for example, use referral hospital staff to conduct supervision visits and link PPMVs to referral facilities. During this intervention, SFH took several steps in order to map and link PPMV shops to referral health facilities that had adequate staffing and capacity to act as referral locations. In the PPMV focus group discussions, PPMVs reported being open to mentoring from health care workers, as long as health workers were supportive rather than punitive. Other options for supervision could include activating members of the National Youth Service Corps to act as supervisors or strengthening other existing supervision structures, such as through PCN, National Agency for Food and Drug Administration and Control (NAFDAC), or NAPPMED.
- Lower costs by targeting PPMVs with higher loads and poorer performance. In order to reduce the costs of ongoing supervision, data from supervision visits, collected through mobile applications like the HNQIS, could be used by program managers to focus on PPMV shops with higher caseloads and poorer performance as assessed through on-site observations.
- Modify existing iCCM training materials to include a strengthened behavior change communication component. The Government of Nigeria could modify the existing iCCM training to include content that not only equips PPMVs with the techniques/skills to diagnose and treat common childhood illnesses, but also includes a strong behavior change component to help educate and persuade caregivers to adhere to government guidelines for diagnosis and treatment. This could include role-playing of PPMVs negotiating diagnosis and treatment with reluctant caregivers, which could help increase a caregiver's trust in negative RDT results and in the recommended treatment, as well as help PPMVs to internalize these messages themselves.

- Strengthen connection between quality commodity suppliers and PPMV shops. By the time of the endline evaluation, four months after the end of the intervention, stock levels for key iCCM commodities had fallen. As noted in the focus group discussions, PPMVs often struggle to get access to quality assured treatment, and the majority end up purchasing their supplies either in an open drug market or from a larger PPMV shop. At the same time, private manufacturers often do not find it cost-effective to work with PPMV shops due to the small quantities they purchase on a regular basis. Liaisons between manufacturers, wholesalers, and organized regional networks of PPMVs could facilitate the creation of economies of scale and improve market conditions. Also, future implementers could test innovative models such as helping NAPPMED state or local chapters to develop a purchasing and warehousing system to improve routine stocking of key commodities.

Senegal

Introduction

In June 2017 (PY5), MalariaCare assessed the capacity of two parasitology laboratories of UCAD and the Ministry of Health and Prevention's (MOHP's) Parasitology Control Section (*Section de Lutte Anti-Parasitaire*, or SLAP) laboratory in Thiès to adequately perform national reference parasitology activities. The two UCAD laboratories are part of the Faculty of Medicine, Pharmacy and Odontology—one located in the Department of Medicine on the main UCAD Fann campus and the other located within the Department of Pharmacy in the university-affiliated teaching Hospital Aristide Le Dantec. Both laboratories have for many years provided parasitology research, monitoring, and technical assistance to the NMCP. The SLAP facility supports monitoring, research, and training in both entomology and parasitology and is associated with an adjacent health facility where practical sessions can be conducted alongside classroom learning. In addition, both UCAD laboratories carry out some research and training activities at the SLAP facility. The MOHP and the NMCP, supported by PMI, plan to use the three sites in a coordinated fashion to support national parasitology reference services—including routine malaria monitoring and research. MalariaCare contracted Amref Health Africa to perform the laboratory assessment to assist in determining gaps in both technical and organizational capacity. The findings from the assessment will serve as a key component toward implementing these plans. Findings were validated and disseminated through several meetings in December 2017.



Key accomplishments

MalariaCare supported the following activities in Senegal:

- Conducted laboratory assessments of UCAD's two parasitology laboratories and SLAP to evaluate 1) whether organizational structure was in accordance with WHO standards, 2) the human capacity of laboratory staff to conduct parasitology activities and report quality data, 3) the capacity of each laboratory to support training activities, and 4) the availability of functional technical equipment and information systems in each

laboratory. MalariaCare also assessed the technical collaboration between the UCAD laboratories and SLAP in the area of parasite monitoring and their functional relationship with the NMCP and other national and international institutions involved in parasitology activities. Assessment included interviews with key stakeholders at the three laboratories as well as the NMCP and the PMI Mission.

- Validated report findings with three participating labs and the NMCP. Following finalization of the first draft of the laboratory assessment report, MalariaCare (via Amref) met with the laboratories, the PMI Mission, and the NMCP to share the results of the assessment, discuss and prioritize recommendations, validate the report, and prepare for a larger dissemination meeting with other implementing partners and government officials.
- Per a recommendation emerging from the assessment, shared assessment findings with public and private stakeholders and defined next steps. More than 20 stakeholders attended the meeting in December 2017, including the NMCP; MOHP/Division of Planning, Research and Statistics; MOHP/Directorate of Laboratories; the Development Research Institute (*L'Institut de Recherche pour le Développement*); the CDC laboratory in Senegal; the three assessed laboratories; and USAID/PMI. The discussion addressed ways to find solutions to the problems identified and raised the need to share resources across different stakeholders in the fight against malaria. At the end of the discussion, all stakeholders endorsed the recommendations of the report and identified next steps (listed below).

Summary of laboratory assessment recommendations

Specific recommendations for short-, medium- and long-term interventions were made based on results of the assessment, with the rehabilitation of SLAP to support training in malaria diagnosis being identified as a priority. The following actions were suggested to address the gaps presented in the report:

Short-term recommendations

- Rehabilitate SLAP to support training in malaria diagnosis.
- Provide equipment and materials to UCAD laboratories to support national malaria research priorities.
- Hold a partners' meeting with all stakeholders (public and private).

Medium-term recommendations

- Maintain and expand the national ECAMM course with regular courses and establish a national database to assess and monitor the competence of laboratory technicians.
- Establish a national PT scheme for malaria microscopy in collaboration with the Directorate of Laboratories in the MOHP.
- Form a National Task Force for Malaria Parasitology involving all institutions (public and private) to reinforce collaboration and coordination of training, QA, and research in the country.
- Reactivate the NMCP technical committees (research, case management and training, community based interventions, and M&E).
- Ensure optimal use of laboratories based on their respective core expertise.

- Divide the country into malaria laboratory operational zones, with responsibility for ongoing therapeutic surveillance and molecular research delegated by zone to laboratories in the laboratory network.
- Draft strategic development plans for each laboratory.

Long-term recommendations

- Build the capacity of two additional regional laboratories—using the SLAP model—to provide malaria microscopy training and decentralized research functionality that would work in coordination with the UCAD laboratories to support ongoing surveillance activities.
- Plan a national laboratory competency mapping exercise on malaria parasitology, including private institutions.

Next steps

At the final stakeholder dissemination meeting, participants identified a number of steps to move the recommendations forward:

- MalariaCare finalized and shared the French version of the evaluation report with the MOHP and other stakeholders.
- The NMCP will establish a technical committee with representatives from the three assessed laboratories to develop an action plan that addresses the problems identified in the evaluation report.
- The NMCP will organize an advocacy meeting with the Government of Senegal to advocate for financial support to implement recommendations shared in the report.
- UCAD to support further administration of the WHO Francophone ECAMM course and work on integrating it as an accredited academic course at UCAD.
- The NMCP will revitalize the diagnostic committees at the national level. The revitalized research committee will be tasked with conducting a comprehensive assessment of diagnostic laboratory capacity—including private-sector facilities—across the country.
- The NMCP will enhance and maintain program leadership in providing guidance and coordination of actions related to diagnostics.
- The NMCP will involve other private laboratories (Development Research Institute, *Institut Pasteur de Dakar*) in capacity-building efforts.

Challenges and recommendations

Challenge	Solution/recommendations
MalariaCare was unable to procure equipment for SLAP as originally planned due to scheduling delays in the implementation of the assessment and the completion of the report. The project was unable to identify, on short	Given close-out of the project, MalariaCare shared vendor information with PMI so that the equipment can be procured through another mechanism.

notice, vendors that had items in stock for immediate procurement.

Tanzania

Introduction

MalariaCare began work in Tanzania in October 2014 (PY3) and continued to implement activities through September 29, 2017 (PY5). Over the three years, MalariaCare worked with the NMCP to implement a case management QA strategy at the regional and district (called council) level in eight high-burden regions in the country: Geita, Mara, Mwanza, Shinyanga, and Simiyu in the Lake Zone, and Dar es Salaam, Morogoro, and Pwani in the Eastern Zone. In addition, the project provided technical assistance to the Zanzibar Malaria Elimination Program (ZAMEP) to support implementation of its malaria diagnostic QA strategy.



Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Updated the National Malaria Microscopy QA manual to ensure that it aligns with the updated *WHO Malaria Microscopy Quality Assurance Manual, V2, 2015*, by supporting two technical workshops and providing technical input (PY4). The NMCP continued under other funding to develop and finalize training materials based on the manual, which is now being used by the NMCP to conduct microscopy training nationwide.
- Trained 62 laboratory technicians from the eight focus regions, 27 of whom were regional and district supervisors, over two sessions, to improve their malaria microscopy skills in PY3 and PY4. Over five days, these regional- and council-level microscopists were trained on malaria epidemiology and the biology of the malaria vector and parasite, preparation of high-quality thick and thin blood films, and microscopy reading skills including parasite detection, species identification, and parasite counting. In planning the first training session, it was anticipated that these participants, who were identified by the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) with assistance from MalariaCare, had received recent microscopy refresher training. However, it was later discovered that participants had not received any microscopy refresher training for at least two years (and some reported none since entering the workforce). The same training deficiencies were noted in the second session held in PY4. Consequently, at pre-test

microscopy skills were lower than expected and, at 52 percent, the average score on parasite detection was lower than seen in each of the other MalariaCare-supported countries. Improvement was seen in mean post-test scores for parasite detection and species identification (Table 71); however, only 1 of the 62 technicians trained met the Level A or B standard for all three competency areas. When removing species identification, 15 technicians met the standard for both parasite density and parasite counting (24 percent). Continued refresher training for microscopists is needed to bring practical performance up to WHO standards. The NMCP is currently working to address these deficiencies through the rollout of diagnostic refresher training under the support of Global Fund, using the national microscopy QA manual.

Table 71. Malaria diagnostic refresher training microscopy practical pre- and post-test results, Tanzania (n=62)

Competency area	Mean pre-test score (median [range])	Mean post-test score (median [range])	Percentage point change in mean score
Parasite detection	52% (47% [0%–94%])	78% (78% [48%–100%])	26
Species identification	18% (18% [0%–73%])	39% (40% [10%–90%])	21
Parasite counting	32% (25% [0%–100%])	32% (33% [0%–60%])	0

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Worked with the NMCP and other stakeholders, including PMI, to simplify RDT job aids and finalize the national RDT testing accuracy quality control (called RDT TA QC) training package in PY3. This training includes kit storage and proper testing procedures, common technical errors, and use of test results in clinical decision-making.
- Developed a cadre of 250 regional- and council-level RDT QA trainers in PY3, through eight regional TOTs. Between PY3 and PY5, these trainers then cascaded the training to 2,696 health care workers from the public sector, faith-based organizations (FBOs), and parastatal health facilities in the target regions—at least 2 staff from each facility. In addition, MalariaCare supported the NMCP to roll out the same RDT QA package in Tanga and Tabora regions, training 79 regional trainers who trained 1,272 health care workers from public health facilities to properly conduct an RDT. In sum, 4,297 individuals received capacity-building in RDT QA over the life of the project. Scores on the knowledge pre- and post-tests improved from an average of 49 percent at pre-test to 75 percent at post-test (Table 72). OTSS supervisors performed slightly better than clinicians.



Participants in a practical session during rapid diagnostic test (RDT) quality assurance training.
Photo credit: MalariaCare Tanzania

Table 72. Rapid diagnostic test quality assurance training pre- and post-test results, Tanzania (n=4,297)

Trainees	Mean pre-test score (median [range])	Mean post-test score (median [range])	Percentage point change in mean score
Supervisors (n=329)	51% (53% [0%–93%])	77% (80% [27%–100%])	26
Health care workers (n=3,968)	44% (47% [0%–99%])	72% (74% [20%–100%])	28
Total (n=4,297)	49% (52% [0%–99%])	75% (76% [20%–100%])	26

- Collaborated with the NMCP to train 124 medical doctors, assistant medical officers, clinical officers, assistant clinical officers, and nurses in malaria case management over four sessions during PY3 and PY4. Participants, who were selected by RHMTs to attend the training because they had not been included in earlier NMCP training, were provided with technical updates on malaria testing procedures, the use of ACTs to treat uncomplicated malaria, treatment of severe malaria, management of malaria in special situations such as in pregnant women and newborns, monitoring of malaria activities and malaria recording and reporting tools. The training also included topics related to management of malaria commodities and malaria surveillance/M&E. This was included in the training at the request of the MOHCDGEC in order to orient clinicians to the proper use of new registers that were recently rolled out. Training evaluation indicated improvement in knowledge: the average post-test score was 80 percent (median 82 percent; range 50 to 97 percent), a 21 percentage point increase from the pre-test average of 59 percent (median 60 percent; range 14 to 84 percent) (Table 73).

Table 73. Clinical pre- and post-test results, Tanzania (n=124)

Trainees	Mean pre-test score (median [range])	Mean post-test score (median [range])	Percentage point change in mean score
Clinicians (n=124)	59% (60% [14%–84%])	80% (82% [50%–97%])	21

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in adherence to their diagnostic test result, MalariaCare conducted the following activities:

- Printed and distributed copies of malaria case management algorithms that were developed jointly by the NMCP, WHO, and Clinton Health Access Initiative. In PY4, MalariaCare supported distribution of 5,000 copies of these algorithms to outpatient and inpatient departments in public health facilities in the project’s eight focus regions. In PY5, MalariaCare translated the algorithm into Swahili and distributed 16,460 copies to outpatient departments and antenatal clinics in lower-level health facilities nationwide.
- Built a cadre of 264 regional- and council-level OTSS supervisors in ten regional sessions. While RHMTs and council health management teams received an abridged supervisor training early in the project in preparation for the RDT QA training rollout, MalariaCare conducted a pilot supervisor training in PY3, full supervisor training in PY4 for all supervisors, and two additional sessions in PY5 to train new and replacement supervisors. Over the course of five days, supervisors were trained on mentoring and communication skills and oriented to the tablet-based checklist. The course featured role-playing and simulations to reinforce skills being learned, and one day was spent on field visits to nearby health facilities to

allow supervisors to practice conducting observations and providing feedback to health facility staff in real time.

- Conducted more than 2,500 supervision visits to 1,486 health facilities in the eight target regions over six rounds of OTSS. In accordance with the national RDT QA training manual, each facility received at least one OTSS visit, following completion of the RDT QA training cycle. The EDS, which was piloted in Mwanza in late PY3, greatly improved the ability to identify poor-performing facilities and target them for future visits. MalariaCare then limited subsequent rounds to only five health facilities per council: the council reference hospital plus four of the lowest-performing facilities. In later OTSS rounds, many council health management teams leveraged government and other donor funding to increase the number of health facilities visited, increasing the average to ten poor-performing facilities per council. During the last OTSS round, at the request of PMI and the NMCP, MalariaCare expanded its support beyond the public sector to include facilities managed by parastatal organizations, FBO, and other NGOs.



Supervisor reviewing the case management algorithms with a clinician during an OTSS visit.

Photo credit: MalariaCare Tanzania

- Conducted a performance evaluation for a sample of clinical and laboratory supervisors to assess the quality of supervision during the final OTSS round. Of the 164 active supervisors, MalariaCare technical staff used a standardized supervisor evaluation checklist to evaluate 45 clinical supervisors (51 percent of the 89 clinical supervisors) and 54 laboratory supervisors (72 percent of the 75 laboratory supervisors) on pre-OTSS preparation, adherence to SOPs on conducting observations, completeness of the OTSS checklist, and the ability to facilitate the development and dissemination of an action plan with the facility. On average, clinical supervisors and laboratory supervisors performed 91 percent and 93 percent of the checklist items correctly, respectively.
- The evaluation found that nearly all supervisors, 95 percent or greater, completed each of the following steps: greeted the health worker, properly collected adherence data, indicated the correct reason for not completing each observation, identified areas of improvement that were within their ability to address through mentoring, and worked with staff to resolve the problem. However, similar to other countries where the supervisor evaluation was conducted, supervisors in both cadres were less likely to review data from the previous OTSS visit—with 71 percent of clinical supervisors performing this step correctly and 79 percent of laboratory supervisors. Other areas of weakness included lack of reviewing action plans from the previous OTSS visit (clinical supervisors 81 percent; laboratory supervisors 85 percent), working with staff to develop SMART action plans (clinical supervisors 74 percent), and providing feedback and improvements to the health worker (laboratory supervisors 83 percent). These findings were discussed with OTSS supervisors during the final LLWs, where remediation plans were developed.

- Supported the National Institute of Medical Research (NIMR) and its partners to conduct a two-year therapeutic efficacy study on the clinical effectiveness of artemisinin-lumefantrine in treatment of uncomplicated malaria at eight sentinel sites. In the first year, 344 patients, six months to ten years of age and diagnosed with uncomplicated malaria, were enrolled as part of the country's ongoing antimalarial surveillance program. After PCR correction, only one patient had late clinical failure with a recrudescence infection, yielding an adequate clinical and parasitological response of more than 99 percent in the study population. The molecular analysis did not find any mutations associated with artemisinin resistance nor were there findings consistent with lumefantrine resistance. MalariaCare continued to support implementation of the second year of the study through June 2017, after which the USAID-funded Boresha Afya project took over providing funding for the study. Under MalariaCare support in the second year, patient enrollment for the study was initiated at all four sites; however, one site closed early due to a lack of eligible patients. Patient follow-up and data analysis will be completed under Boresha Afya support.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Prior to initiating implementation of regular case management activities later in the year, MalariaCare conducted a rapid health facility assessment in PY3 in each region to map the current system for malaria case management, evaluate the supervisory capacity of RHMTs, determine existing health facility capacity, and prioritize health facilities for support activities. In general, the quality of record-keeping was found to be poor, and performance in microscopy and clinical evaluations varied by region. In contrast, competence in RDT preparation and reading was fairly good across all regions. It was noted during these assessments that most RHMTs and council health management teams were very receptive to receiving feedback on the assessment findings and open to discussing how identified problems and weaknesses could be addressed.
- Met with RHMTs annually to review the year's approved work plan and planned the timing of implementation together with regional leadership. These annual meetings improved regional commitment, resulting in the RHMTs taking the lead in planning and implementing activities, allowing MalariaCare to provide technical support.
- Provided electronic data use training to a core group of seven NMCP staff members—DHIS2 analysts, information technology staff, and information and communication technologies advisors—which focused on using OTSS data from within the EDS DHIS2 platform. It included training on building graphs and tables and using data to evaluate individual health facility performance.
- Following the national-level training, MalariaCare conducted intensive training for 35 RHMT staff on using the EDS DHIS2 dashboards for OTSS data review. Participants included the RMFP, regional clinician, regional laboratory technician, regional pharmacist, and regional M&E/HMIS officer in each region. The two-day course occurred immediately prior to the PY4 LLW in each region. The M&E/HMIS officers were trained to make their own graphs in the system, while other participants were trained on using the dashboards

to interpret existing graphs that update with each round of supervision. By the end of the training, all trained supervisors were able to generate their regional data and orient council health management teams to understand graphs presenting council-specific data.

- Conducted 16 regional LLWs in PY4 and PY5. These two-day workshops brought together RHMTs and council health management teams, whose members serve as OTSS supervisors, to meet and discuss OTSS data and develop action plans addressing systemic problems. The first day of the LLWs was spent reviewing OTSS data in the dashboards and preparing presentations on the progress made in each council. The second day consisted of presenting and discussing results, sharing experiences, and developing action plans to improve common issues. During the PY5 LLWs, each regional and council data presentation also included a report of progress on action plans developed at the last LLW in addition to the OTSS data. Some examples of key actions taken using the data are:
 - In Geita region, supervisors found that five of the six labs visited were using Field stain to prepare microscopy slides, which was against national guidelines. In response, they worked with district teams to transition to use of Giemsa stain. By the fourth OTSS visit, five of the six labs were using Giemsa stain.
 - In Mwanza region, only 40 percent of facilities visited had RDTs in stock at the first OTSS visit, and only 60 percent of malaria cases were confirmed by a diagnostic test. With this information, regional authorities trained health facility staff on the use of reporting forms to correctly report RDT stocks, helped to redistribute stock within the districts, and mentored health workers on the importance of testing prior to treatment. Following these efforts, the percentage of facilities with RDTs in stock steadily rose, and by the fourth OTSS visit, 88 percent of facilities had RDTs in stock and 98 percent of malaria cases were confirmed with a diagnostic test.
- Provided technical assistance to ZAMEP in PY4 by participating in two rounds of routine malaria microscopy QA and supervision visits to facilities with laboratories performing malaria microscopy services, including public and FBO facilities. Supervision teams used five malaria diagnostics QA supervision checklists developed by ZAMEP for site visits: evaluation of general QA processes, observation of microscopy performance, rechecking of saved microscopy slides, rechecking of used RDT cassettes, and review of equipment maintenance.
- While supporting these supervision visits, MalariaCare found that ZAMEP administers a comprehensive diagnostics supervision system that covers all 34 laboratories performing microscopy. They have appointed a technician to make monthly visits to check the status of microscopes, and 30 facilities (88 percent) had functional microscopes during the first supervision visit in which MalariaCare participated. In addition, ZAMEP administers an EQA program that includes a collection of all malaria-positive and selected malaria-negative slides for rechecking at the reference laboratory. It also runs a PT scheme where negative/positive *P*.

“Before MalariaCare came to our region, I was hiding myself when I was asked to present malaria data from my region during meetings, but after I worked with [the] MalariaCare team, I learned a lot. I can now analyze data, develop presentations, and use data for planning. I am now comfortable to present at any meeting. I can now present malaria data to RHMT members and lead discussions. I have learned this during LLWs. I can now confidently stand up and present at any meeting.”

-Regional Focal Point

falciparum–infected slide panels are brought to health facilities by supervisors for assessment of microscopist competency.

- Participated in a meeting of ZAMEP’s malaria diagnostic technical working group, which is made up of members from the ZAMEP diagnostic and case management units, PMI, MalariaCare, and Jhpiego. At this meeting, the working group discussed current and upcoming activities, reviewed the Zanzibar malaria diagnosis and treatment guidelines, and discussed areas where the guidelines required updating.
- In PY5, to support ZAMEP to reinforce and strengthen malaria microscopy capacity on Zanzibar, MalariaCare procured 22 PT panels, each set made up of 31 slides. These panels, to be used as part of the ongoing PT scheme, include malaria-negative, *P. falciparum* of varying density, *P. ovale*, *P. malariae*, and mixed infection samples. The slides were developed by NIMR and validated by six WHO L1 microscopists. Copies of three additional donor samples containing *P. falciparum* gametocytes were also purchased and added to the panels—completing the 22 sets (plus some replacement slides in case of breakage, for a total of 766 slides). MalariaCare subsequently supported a diagnostics expert to travel to Zanzibar to review the slide sets and train ten ZAMEP staff on PT panel management using a slide bank database and manual/SOPs provided by the project. Following the Zanzibar close-out meeting, as part of its capacity-building efforts, MalariaCare also supported three staff from ZAMEP to visit the slide bank at the National Laboratory Quality Improvement and Training Center and slide archives at Ifakara Health Institute and Health Research Laboratory to better understand how slide banks are managed.
- Transitioned the case management QA system and implementation of the OTSS approach to the NMCP and partner organizations by supporting the development of the NMCP’s Malaria Service Delivery Quality Improvement (MSDQI) package and transitioning MalariaCare’s EDS to become the electronic platform that supports the MSDQI. In order to facilitate the nationwide rollout of government-led supervision visits, the NMCP requested technical input from MalariaCare and other partners in the development of a harmonized, national supervision tool that includes checklist modules for the following focus areas: outpatient care, inpatient care, antenatal clinic, RDT use, microscopy and laboratory environment, pharmacy and supply chain, data quality, and RHMT supervision of council health management teams. MalariaCare checklist modules—outpatient, RDT, and microscopy—were used as models for development of the MSDQI tools. After development, MalariaCare programmed all MSDQI content into the EDS DHIS2 platform to create the new MSDQI electronic tool. In preparation for the transition of the system to the NMCP, MalariaCare provided systems administration training to key NMCP and Boresha Afya staff who will be responsible for administering the MSDQI system. This included adding health facilities to the database, making simple updates to the checklist modules, and adding new users for data entry and analysis. MalariaCare also supported Boresha Afya during their first end-user training, where 48 supervisors and three Boresha Afya staff were trained.

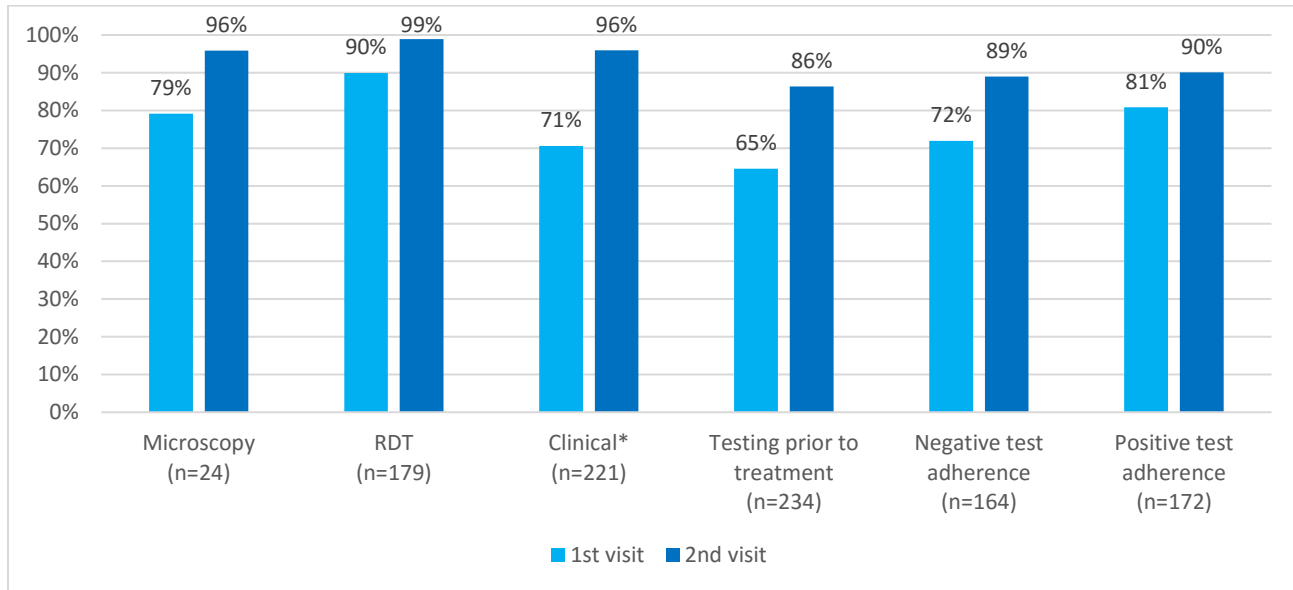
Progress made on key MalariaCare indicators

Trend analysis

Since the start of MalariaCare’s work in Tanzania, MalariaCare has visited 1,486 unique facilities at least once. These facilities represent 20 percent of the 7,480 health facilities in mainland Tanzania.

Of the 1,486 facilities ever visited, 866 (58 percent) were visited once, 330 facilities (22 percent) had two visits, 192 facilities (13 percent) had three visits, and 98 facilities (7 percent) had at least four visits. Of those facilities visited twice, facilities showed improvement in all six indicators between first and second visit (Figure 71).

Figure 71. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus second visit, Tanzania



Note: For clinical and testing prior to treatment, the percentage of facilities with scores at both first and second visits was above 67%; for RDT, 54 percent; for negative test adherence, 50 percent; for positive test adherence, 54 percent. For microscopy, 25% of the 96 facilities with microscopy had a score at both visits.

*Compares scores for first and second visits conducted after May 2016 when the revised clinical checklist was implemented.

For microscopy, improvements in performance from 79 percent to 96 percent were largely due to improvements in the following two minimum standard steps:

- Spreading the thick film into a 1–2 cm diameter circle and reading the print placed under the slide (13 percentage point increase).
- Agreement between the technician and supervisor on slide positivity (10 percentage point increase).

For RDTs, there were only slight improvements in the minimum standard steps, as average performance for these steps was at or above 90 percent at both time points. RDT performance improvements were due to workers adhering better to:

- Checking the expiry date (17 percentage point increase).
- Cleaning the puncture site with alcohol and allowing it to air-dry (14 percentage point increase).
- Labeling the cassette (11 percentage point increase).

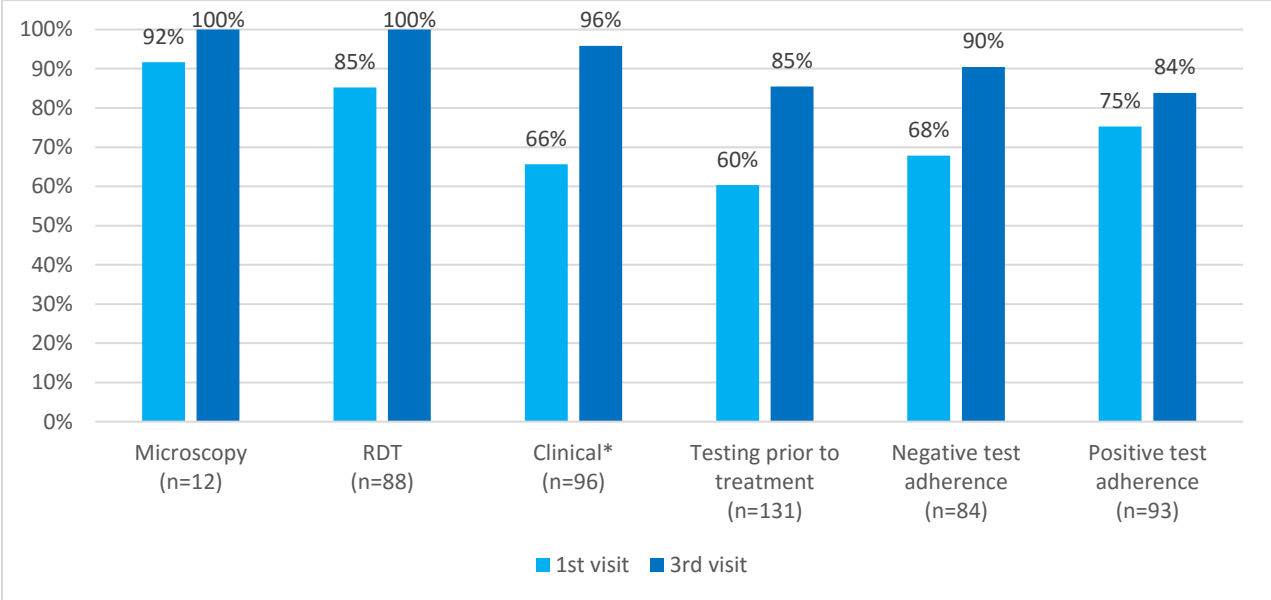
Clinical management had the greatest improvement across the six indicators, with an increase from 71 percent to 96 percent of facilities meeting the target by the second visit. This improved performance between first and second visit was due to improved performance in:

- The minimum standard step of checking for at least one sign of severe malaria (21 percentage point increase).
- Checking for altered consciousness (33 percentage point increase).
- Conducting an abdominal exam or checking for abdominal stiffness (32 percentage point increase).
- Conducting skin exam and checking for rash or dehydration (30 percentage point increase).

Improvements on both testing prior to treatment (from 65 percent to 86 percent) and positive test adherence (from 81 percent to 90 percent) may be partially attributed to improved stock levels of RDTs and ACTs, respectively. Of those facilities with adherence scores and data on stock levels, the proportion of facilities reporting a significant stock-out of RDTs decreased from 42 percent to 27 percent; and the proportion of facilities reporting a significant stock-out of ACTs decreased from 19 percent to 4 percent.

Of the 192 facilities visited three times, improvements were seen for all six core indicators, with at least 80 percent of facilities meeting or exceeding the target by the third visit (Figure 72). Trends were similar to facilities with two visits. The largest improvement was seen in clinical management, where scores increased by 30 percentage points between the two time periods. This improvement in clinical scores, like those facilities with two visits, can be largely attributed to improved performance in checking for at least one sign of severe malaria (16 percentage point increase). For microscopy, the greatest improvement was seen in spreading thick film into a 1–2 cm diameter circle and reading the print placed under the slide (17 percentage point increase), and for RDTs, the greatest improvement was waiting the correct amount of time when results were negative (14 percentage point increase).

Figure 72. Proportion of health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus third visit, Tanzania



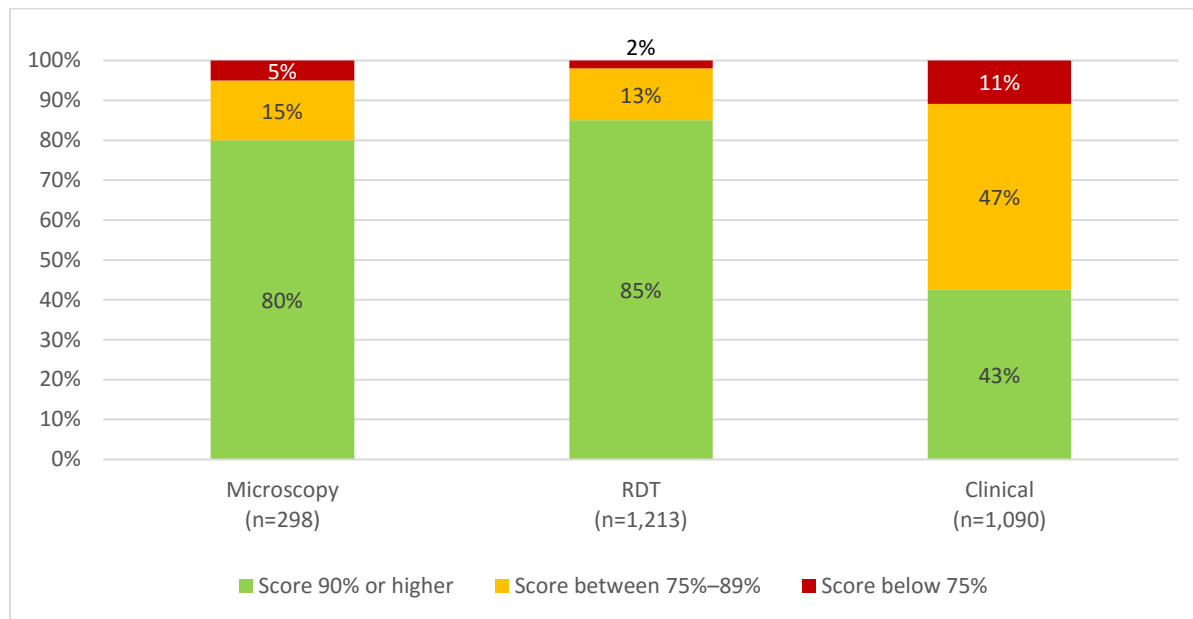
Note: For testing prior to treatment, the percentage of facilities with scores at both first and third visits was 69 percent. For remaining indicators, the percentage of facilities with scores at both first and third visits were 50 percent or below: microscopy, 15 percent of the 79 microscopy facilities; RDT, 46 percent; clinical, 50 percent; negative test adherence, 44 percent; positive test adherence, 49 percent.

*Compares second and third visits only, as revised clinical scores were not available during the first visit.

Most recent visit

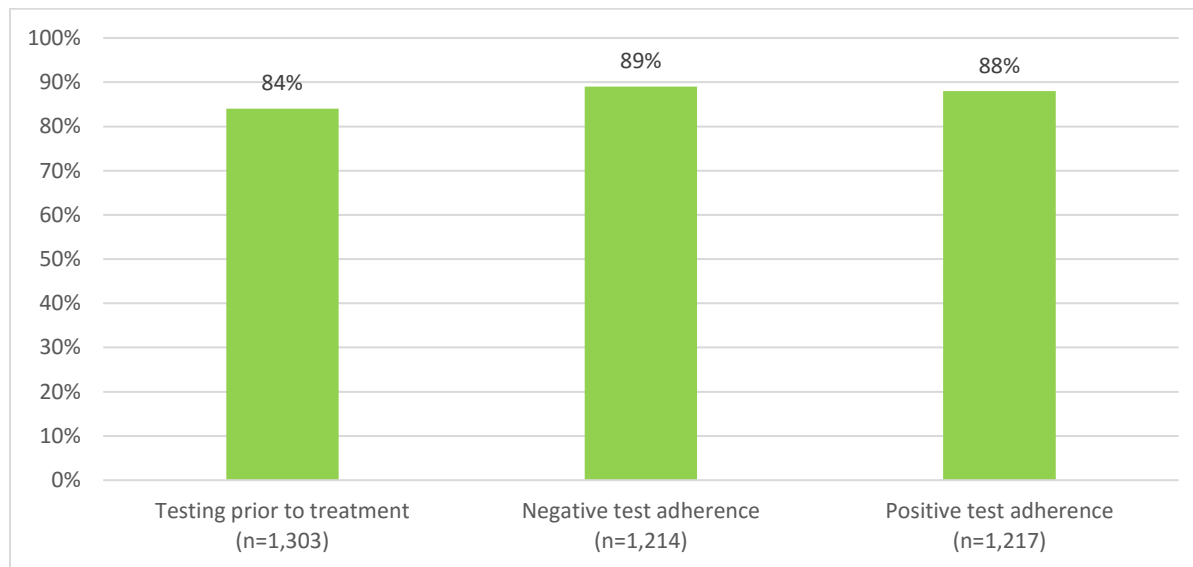
The proportion of facilities meeting the minimum standards at the most recent visit for all facilities was similar to last visits in the trend analyses, as shown in Figure 73 and Figure 74 below. More than 90 percent of facilities met the minimum standard (scoring at least 75 percent) for microscopy and RDT, while 89 percent met this target for clinical management. While the proportion of facilities meeting the overall target of 90 percent or higher was at least 80 percent for microscopy and RDT, only 43 percent met this target for clinical.

Figure 73. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Tanzania



Note: For RDT and clinical indicators, scores were available for at least 73 percent of facilities visited. For microscopy, 65 percent of the 456 facilities that perform microscopy had scores available.

Figure 74. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Tanzania



Note: Scores were available for 82 percent or greater of facilities visited.

Challenges

Challenges	Solution/recommendations
<p>The high number of health facilities in project supported regions makes OTSS visits to all facilities difficult and expensive.</p>	<p>Use OTSS data to target supportive supervision to high-volume and lowest-performing facilities in order to concentrate resources where they have the most impact.</p>
<p>Low use of the supervision data by RMFPs due to:</p> <ul style="list-style-type: none"> • Participant and facilitator feedback indicated that the time for this training was too short—a simplified 2-day training instead of the full 3 days, combined with an LLW. Reportedly, it did not give participants enough time to practice their skills in creating data visualizations. • Poor internet connectivity, which restricts RMFPs' ability to access the DHIS2. • Trained staff forget how to use the system between OTSS visits, which are done only once every 3–6 months. 	<ul style="list-style-type: none"> • Data-user training should provide time for practice. • Create job aids with step-by-step instructions and screenshots on how to update their specific dashboards.
<p>General low knowledge and skill level in laboratory and clinical supervisor candidates. Initial refresher training showed improvement, but it did not result in achieving adequate knowledge and skill levels.</p>	<p>Monitor supervisor performance during OTSS visits and LLWs in order to provide feedback by technical staff. Carry out refresher training on malaria diagnostics, clinical care, and supervision skills, as needed based on observed performance.</p>
<p>Planned technical assistance to support ZAMEP activities for PY5 delayed due to funding issues on ZAMEP's end.</p>	<p>Ongoing discussion with ZAMEP and the PMI Mission resulted in revision of the planned technical assistance, with a focus on supporting ZAMEP to lay the groundwork for implementing a PT program.</p>

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Tanzania, the following recommendations may be considered:

- Continue to support the NMCP to develop and roll out national policies and guidelines for MSDQI.
- Continue implementing OTSS to improve performance on key case management indicators.
- Make use of the MSDQI's electronic database for quick data analysis and generation of reports for sharing and decision-making. To support this, develop standardized MSDQI dashboards based on the new MSDQI key indicators and conduct data-user training to familiarize existing users with the MSDQI content and new users with both the content and platform.
- MalariaCare dropped a proposed activity to scale up EDS data-user training to the council level due to time constraints and uncertainty about the value of the resource allocation due to the perceived low level of DHIS2 skills at that level. Following two years of using the EDS dashboards (with RHMT support) during

preparations for LLWs, council health management teams may now be familiar enough with the system for a data-user training at the council level to be productive, provided strong support from the RHMTs is available and that regular use of the dashboards is emphasized and monitored.

On Zanzibar, MalariaCare proposes the following recommendations, which were shared during the two malaria microscopy QA supervision feedback meetings that were attended by project diagnostic staff:

- Support ZAMEP to implement its malaria case management QA program and use the MSDQI electronic platform.
- Support maintenance of malaria PT slide sets for capacity-building and EQA to improve the quality of malaria microscopy.
- Improve the health facilities' supervision PT approach by having the collected malaria slides reviewed on-site by supervisors during OTSS visits in order to provide teaching moments, and expand the panels carried by supervisors to include low-density infections so that laboratory staff can practice parasite counting—a key areas of competency in the elimination setting.
- Include a clinical component to supervision to improve overall case management of malaria in each facility and add microscopy IQA measures for improving the quality of slide development and reading skills.
- It was observed that primary health care unit facilities do not use a standardized laboratory register and the data collected varies. It is recommended that ZAMEP standardize information collected in registers by distributing the standard register used at district hospitals to all health facilities with laboratories.
- Review the MalariaCare OTSS checklist and incorporate any useful pieces into the existing Zanzibar supervision checklists.

Transition and sustainability

- Conducted transition planning meeting with each RHMT early in PY5, to review programmatic accomplishments and support RHMTs and council health management teams to develop transition plans in support of a continuation of malaria case management QA activities. All regions and councils agreed to incorporate OTSS (using MSDQI) and LLWs into their Comprehensive Council Health Plans, which pool Health Basket Fund, Global Fund, and other donor funding for use at the council level. Increasingly, Health Basket Fund funds are also being set aside at the council and regional levels to support localized capacity-building for health care workers, such as RDT QA, clinical update, and microscopy refresher training.
- In June 2017, a national-level transition/close-out meeting was held for mainland activities. MalariaCare, RMFPs, and representatives from PMI, NMCP, NIMR, RHMTs, council health management teams, and other implementing partners participated in the meeting. Presentations and discussion focused on project experiences and outcomes, challenges encountered during implementation, lessons learned and best practices, project data, and how activities would be continued following project close-out through other partners. At the national level, the NMCP and USAID Boresha Afya project will implement the MSDQI, the NMCP's expanded malaria service QA approach based on MalariaCare's OTSS and EDS, which will include the rollout of supervision visits nationwide.

- In July 2017, MalariaCare conducted a close-out meeting with PMI and ZAMEP presenting the technical assistance provided to ZAMEP by the project. At this meeting, it was determined that the remaining activities in MalariaCare’s work plan (one international trip to support microscopy QA supervision, one domestic trip to participate in the supervision feedback meeting, and two domestic trips to support development of malaria case management training materials) would not occur before the end of PY5. It was agreed that MalariaCare would instead provide additional support to the development of the PT program through the purchase of additional slides and sponsor a trip for ZAMEP staff to observe the management of slide banks on the mainland. ZAMEP is now fully equipped with the knowledge and materials needed to implement a malaria microscopy PT program to improve and assure the quality of microscopy services on Zanzibar.

Zambia

Introduction

MalariaCare began work in Zambia in March 2013 (PY1) and continued to implement activities through September 29, 2017 (PY5). For the first three years of the project, MalariaCare worked closely with the national malaria elimination program (NMEP) across all ten provinces in Zambia to strengthen malaria case management and expand the country’s network of highly trained OTSS supervisors and trainers. In PY3,



MalariaCare initiated sub-district OTSS and, by the end of the project, provided support to 169 lower-level health facilities. Starting in PY4, MalariaCare focused its efforts to support the Central, Copperbelt, North-Western, and Western provinces while also providing support for a new bilateral project called the Program for Advancement of Malaria Outcomes (PAMO) to take up activities in Luapula, Northern, Muchinga, and Eastern provinces.

Key accomplishments

Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent.

In support of strengthening capacity in accurate diagnostic testing, MalariaCare conducted the following activities:

- Strengthened the technical capacity of 33 laboratory supervisors through MDRT training in PY1, PY4, and PY5. The first MDRT in PY1 included district supervisors across the ten provinces MalariaCare supported, and all 18 participants achieved the equivalence of WHO L2 target or higher. The PY4 and PY5 MDRT included provincial and sub-district supervisors in the Central, Copperbelt, North-Western, and Western provinces as part of MalariaCare’s focused efforts. All but one laboratory supervisor trained in PY4 was also trained in PY5, and five laboratory supervisors were trained in all three years; however, none of the

supervisors met the WHO L2 target in PY5. Table 74 summarizes the results of the 32 participants with scores.

Table 74. Malaria diagnostic refresher training pre- and post-test results, PY5, Zambia (n=32)

Competency area	Pre-test score	Post-test score	Percentage point change in mean score
	Mean (median [range])	Mean (median [range])	
Parasite detection	79% (85% [36%–100%])	82% (83% [52%–100%])	3
Species identification	35% (33% [0%–67%])	47% (44% [9%–85%])	12
Parasite counting	33% (30% [0%–100%])	46% (29% [0%–100%])	13

- Developed an outline for the national malaria microscopy accreditation program in PY2 to accredit basic- and advanced-level microscopist skills as a core group of national/provincial-level microscopy trainers, OTSS supervisors, reference-level microscopists, and health facility practicing microscopists. MalariaCare supported the NMEP to pilot the Zambia Competency Assessment on Malaria Microscopy in PY2 with 21 participants; however, none passed all three components: general knowledge, slide preparation, and slide reading. While the knowledge test and slide preparation steps were new, it is not clear why participants did not pass the slide reading component, which was modelled on the MDRT that most of these participants had taken during PY1. Given these initial results, MalariaCare decided to use future microscopy resources on refresher training and on-site supervision.
- Supported the NMEP’s chief parasitologist to prepare for, attend, and pass the WHO ECAMM course in PY4. He attained L1 accreditation—considered international expert level—with a certification valid through 2019.
- Worked with Intellectual Ventures and Amref Health Africa to pilot a virtual malaria microscopy e-learning course for 34 provincial- and district-level OTSS laboratory supervisors. The pilot was conducted in Zambia and in 18 other countries (4 of which were supported by MalariaCare) to test the use of online microscopy training as a continuing education tool for microscopy supervisors and trainers. The approximately 40-hour course included didactic learning modules and practical virtual microscope slide reading components. A total of 154 participants returned learning surveys—8 from Zambia—and 97 percent of participants rated the course as “good” or “excellent.” Using the survey information, the course is being further refined for more generalized distribution in 2018.
- Printed and distributed 200 copies of the updated 2013 national malaria laboratory training manual to approximately 22 health facilities per province throughout the country in PY1.

Objective 2: Increased percentage of patients suspected to have malaria or a febrile illness who receive a diagnostic test for malaria.

In support of increasing the number of febrile patients who received a diagnostic test for malaria, MalariaCare conducted the following activities:

- Assured the quality of RDT use at the health facility level by conducting RDT QA training for 82 OTSS supervisors to perform on-site RDT mentoring, which was carried out during each OTSS visit by laboratory supervisors. In PY2, MalariaCare trained four laboratory technicians and two clinicians to be OTSS supervisors as part of the project’s expansion of OTSS activities into the newly established Muchinga Province. In PY3, in order to expand RDT QA training to the sub-district level, MalariaCare conducted a five-day joint laboratory and clinical supervisor training on RDT QA mentoring. Of the 82 participants, the 67 individuals who had scores available improved from a baseline mean of 27 percent (median 17 percent; range 0 percent to 83 percent) to an end-course score of 96 percent (median 100 percent; range 67 to 100 percent).



Practicing skills during PY3 RDT QA training in North-Western Province.

Photo credit: Timothy Nzangwa

- Worked with the Zambia Integrated Systems Strengthening Program (ZISSP) in PY2 to coordinate RDT QA activities in 27 ZISSP-supported districts and health facilities to scale up quality RDT use.

Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illness—consistent with the result of the diagnostic test.

In support of increasing the number of patients treated appropriately in accordance with their diagnostic test result, MalariaCare conducted the following activities:

- Conducted CCMRT in PY4 and PY5 for 33 supervisors, hospital clinicians, and district and provincial health offices. The training focused on the clinical management of uncomplicated and severe malaria, complications, and appropriate differential diagnoses of other febrile conditions. Average scores from both training sessions improved from a baseline of 71 percent (median 71 percent; range 58 to 86 percent) to 86 percent (median 85 percent; range 76 to 95 percent) at course end.
- Conducted more than 1,800 OTSS visits during 14 rounds of OTSS over the course of the project. More than 1,400 visits were conducted through provincial OTSS to 309 high-volume health facilities with microscopy over eight rounds. Starting in PY3, MalariaCare began sub-district OTSS, targeting lower-level health facilities without laboratories and by the end of the project, 459 sub-district visits were conducted to 169 of these facilities.
- Performed a number of training activities in PY5 in coordination with PAMO in order to transfer MalariaCare experience and technology to PAMO and the NMEP. Activities included clinical case management and OTSS supervisor training for 34 PAMO OTSS supervisors, training project staff and supervisors on field use of the EDS-based clinical and diagnostics checklists, and training to project and NMEP staff on how to manage and use the data collected with EDS and stored in a DHIS2-compatible database.
- Supported the NMEP to implement an artemisinin therapeutic efficacy study—using the WHO protocol to perform country-level surveillance. The study assessed the therapeutic efficacy of artemether lumefantrine (current first line), artesunate amodiaquine, and dihydroartemisinin piperaquine for the treatment of

uncomplicated *P. falciparum* malaria. Data collection began in PY4 across three sites: Katete (Eastern Province), Mansa (Luapula Province), and Gwembe (Southern Province). The analysis was completed in PY5 and showed high efficacy and an adequate safety profile. Table 75 shows the results—with 100 percent PCR-corrected efficacy for each of the three drug combinations.

Table 75. Summary of therapeutic efficacy study results, Zambia

Study drug arm	Total enrolled per protocol	No. lost to follow-up	Pre-PCR corrected efficacy	No. reinfections	PCR corrected cases	PCR corrected efficacy
Dihydroartemisinin Piperaquine	91	1	87%	12	78	100%
Artemether Lumefantrine	92	4	86%	12	76	100%
Artesunate Amodiaquine	97	7	98%	2	88	100%
Total	280	12	90% (mean)	26	242	100% (mean)

- Conducted project performance evaluation of OTSS supervisors. Of the 85 active supervisors, MalariaCare assessed 24 out of 43 clinical supervisors (56 percent) and 27 out of 42 laboratory supervisors (64 percent). The evaluations were conducted by MalariaCare technical staff and focused on pre-OTSS preparation, adherence to SOPs on conducting observations, completeness of the OTSS checklist, and the ability to facilitate the development of an action plan with the facility. Both groups of supervisors performed well, with average clinical supervisor scores of 89 percent and laboratory supervisor scores of 92 percent. All evaluated supervisors were found to provide an appropriate explanation for their suggested changes to address a gap, properly collected registry data to assess adherence, indicated the correct reason for not completing each observation, identified areas of improvement that were within their scope of mentorship, and worked with the appropriate staff to resolve the problem. The survey found the following problem areas: supervisors across both cadres performed poorly on reviewing data from the previous OTSS visit (54 percent of clinical supervisors and 52 percent of laboratory supervisors did this), providing feedback only after all observations were complete (clinical supervisors 71 percent); determining the status of the problems identified during the previous visit and discussing them with staff (clinical supervisors 50 percent; laboratory supervisors 67 percent); and working with staff to develop SMART actions (clinical supervisors 89 percent). These findings were discussed during the final LLW with OTSS supervisors.

Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.

In support of strengthening laboratory systems at the national level, MalariaCare conducted the following activities:

- Supported three LLWs over the project period, in PY1, PY2, and PY5. LLWs included provincial OTSS supervisors and clinical care experts to share information from the latest OTSS visits and create action plans to address specific challenges. Key problems identified in early LLWs included the lack of a unified malaria laboratory register, which made collection of routine testing data difficult during OTSS visits, and inappropriate treatment with an antimalarial of febrile patients with negative malaria tests. As a result, MalariaCare worked to standardize laboratory registers in PY2 and advocated for OTSS to be focused on

underperforming health facilities. In PY5, MalariaCare included PAMO and the Malaria Control and Elimination Partnership in Africa in the final LLW to involve provincial supervisors and representatives across the eight MalariaCare- and PAMO-supported provinces. This LLW served to identify challenges and gaps in the provision of quality malaria case management and as a capacity-building opportunity for implementing partners. Participants identified opportunities for OTSS at the provincial level and the different roles of the community, facility, province/district, and NMEP in sustaining OTSS. Challenges in implementing OTSS mentioned during the PY5 LLW included facility and supervisor turnover, lack of necessary equipment, and poor management of commodities.



Participants from PY5 final LLW in Lusaka, Zambia.

Photo credit: MalariaCare, Zambia

- Supported a number of improvements and changes to the OTSS program in Zambia over the project period. Starting in PY2, MalariaCare reviewed and revised the laboratory OTSS checklist to strengthen the mentoring component. The checklist was further revised in PY3 to include a more comprehensive clinical observations section. These changes were in response to inconsistencies in implementing OTSS during the first two years of the project. During that period, data quality was poor due to incomplete checklists filled out by supervisors, leading to inconsistent findings. In addition, facility selection was done by the supervisors by round, without coordination and apparent consideration for achieving a consistent supervision approach over time for a cohort of facilities based on needs. Consequently, the project was unable to compare performance of a health facility over time. Beginning in PY4, these problems were largely resolved with the introduction of the revised checklist in the EDS tablet-based format and tighter coordination with the NMCP on health facility selection for OTSS. Data completeness improved dramatically and MalariaCare was able to measure trends on key indicators at the same health facilities over time. The performance of OTSS health facilities is described in more detail under the “Performance on key MalariaCare indicators” section.
- Another significant change in PY4 was a narrowing of geographic focus for OTSS. The project moved from a high-level/high-volume facility focus in all ten provinces to working in only four high prevalence provinces—Central, Copperbelt, North-Western, and Western—but deepened the intervention from provincial to sub-district level. This was feasible because of the case management support that was initiated that year by PAMO, which took over operations in the four north and eastern provinces. The final round of provincial and sub-district OTSS in PY5 prioritized facilities with low clinical competency, using data from the EDS.

- Conducted seven EDS end-user training sessions from PY3 through PY5 to ensure that 187 supervisors were able to use the tablet-based checklist during OTSS visits to mentor health facility staff and to prepare the NMEP and its partners to use the EDS platform for continued OTSS. In coordination with the NMEP, MalariaCare also supported EDS data-user training at national and provincial levels in PY4, targeting 26 participants, including NMEP staff and OTSS supervisors. The goal of the data-user training was to facilitate the accessibility and use of data for local decision-making following each OTSS round. Participants were first oriented on the content of the OTSS checklist and MalariaCare’s global scoring system for health facility competencies, and then they learned how to retrieve, analyze, and produce graphical results of actual data within the EDS database.
- Supported the NMEP in PY2 to standardize malaria laboratory registers across OTSS-supported health facilities. These registers included laboratory serial numbers to help streamline monthly reporting and disaggregated data by sex and age. Other features included more detailed patient information, test results, staff who completed the test, and expiry dates for RDTs, if applicable.
- Conducted a microscope inventory survey in PY3 during the year’s two rounds of OTSS. MalariaCare conducted the survey in order to develop a plan for repairing and/or replacing nonfunctional microscopes for the NMEP. Results of the survey found a total of 193 microscopes—of which 51 (26.4 percent) were non-functional—and that 37 out of 61 health facilities (61.3 percent) possessed a sufficient number of microscopes to meet their microscopy diagnostic needs. The survey also found that 61.3 percent of health facilities had the ability to provide necessary maintenance.
- Worked with the NMEP to develop a NAMS protocol for Zambia in PY2. Following final institutional review board approval in early PY4, MalariaCare and the NMEP conducted NAMS training to nine laboratory technicians from three sample collection sites: Katete (Eastern Province), Kalabo (Western Province), and Samfya (Luapula Province). QA visits to each site were conducted by two WHO L1 microscopists to confirm species identification and parasite quantification for donors. Per WHO protocol for national slide set development, each donor sample was further characterized through expert reading by six WHO L1 microscopists, and infecting species were confirmed via PCR molecular characterization.
- The current Zambia NAMS has 44 validated donors, 10 uninfected and 34 *P. falciparum*-infected, with low, medium, and high parasite density categories. MalariaCare also provided the NMEP with a NAMS management (Microsoft Access) database that allows for easy tracking and management of slides within the NAMS storage unit in Zambia for use in trainings and PT schemes.
- Supported the NMEP to develop the Malaria Quality Assurance Diagnostic Manual. MalariaCare organized a two-day meeting in PY5 with the laboratory technical writing team to plan for and draft the manual. The manual is currently undergoing final revisions by the NMEP.

Progress made on key MalariaCare indicators

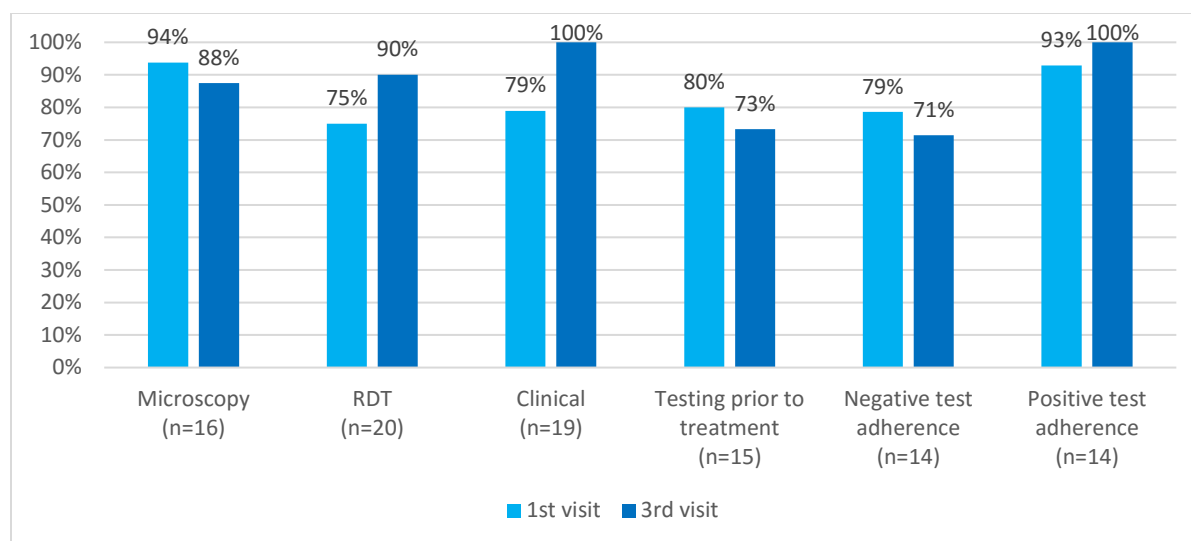
Trend analysis

In PY4, MalariaCare completed revision of the OTSS checklist and through the end of the project, conducted three rounds of provincial OTSS. A total of 43 high-level facilities were visited with the revised checklist; in the

final round, visits targeted 20 facilities that were the poorest performers in clinical performance. Figure 75 summarizes trends in performance on MalariaCare’s six key indicators, comparing the first and final (third) visit using the revised checklist for the 20 facilities visited in all three rounds.

Facilities showed improvement on three of the six core indicators. The greatest improvement was for clinical case management, which increased from 79 percent for the first visit to all facilities meeting the target.

Figure 75. Proportion of provincial health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus third visit with revised checklist, Zambia



Note: All scores were available for at least 70 percent of provincial OTSS facilities visited three times with the revised checklist.

Between the first and third visits, the proportion of facilities meeting the minimum performance target for microscopy decreased from 94 percent to 88 percent. Performance on all five minimum standard steps decreased, with the largest decline in average facility performance seen in:

- Using a standard 10 percent Giemsa solution (100 percent to 92 percent).
- Immersing the thick film slide in the 10 percent Giemsa stain for 10–15 minutes (100 percent to 92 percent).

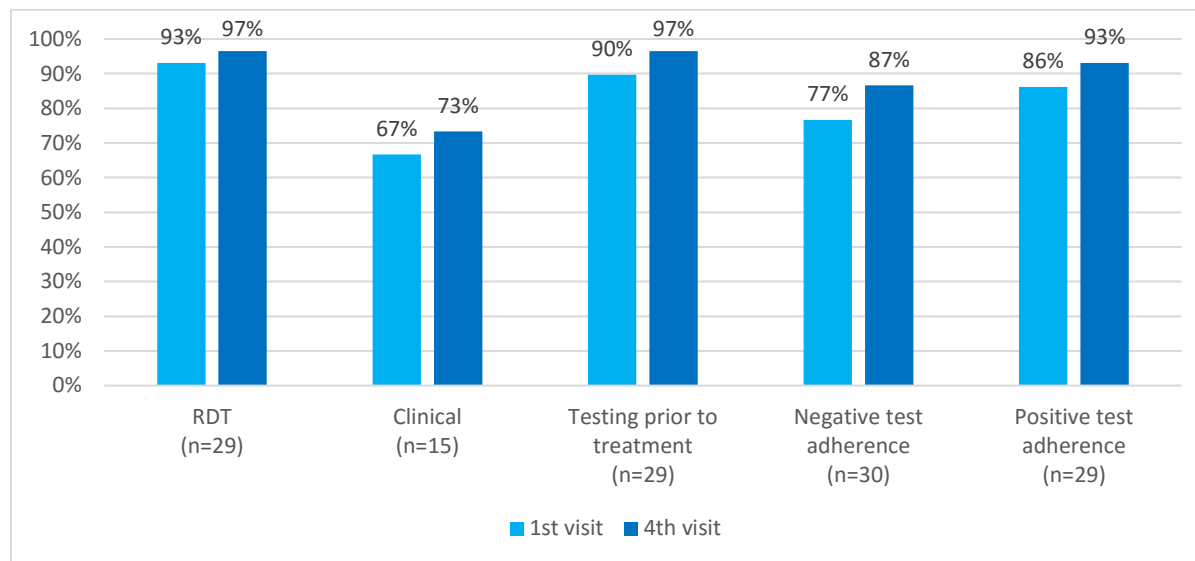
The declines in performance can likely be attributed to reduced microscopy practice for lab staff in favor of using RDTs.

For RDTs, the proportion of facilities meeting the minimum performance target increased from 75 percent to 90 percent. Average performance on the minimum standard steps remained at 100 percent or increased between the first and third rounds, with the greatest improvement seen in recording the results correctly in the register (12 percentage point increase).

While all facilities with scores met the overall performance target for positive test adherence by the third visit, performance declined for both testing prior to treatment and negative test adherence. Since the third visit for these facilities occurred during the peak season for malaria (February–March), clinicians may have been less likely to test patients, less likely to record the test result due to higher patient loads, and/or less likely to believe a negative test result.

Five rounds of sub-district OTSS visits were conducted (four with the new checklist) over the course of the project. Like provincial OTSS, the final round was scaled back to focus on the lowest-performing health facilities for clinical performance, and a total of 35 facilities were visited for all four rounds (see Figure 76).

Figure 76. Proportion of sub-district health facilities meeting minimum performance target (75%) for technical competencies and overall performance target (90%) for measures of adherence, first versus fourth visit with revised checklist, Zambia



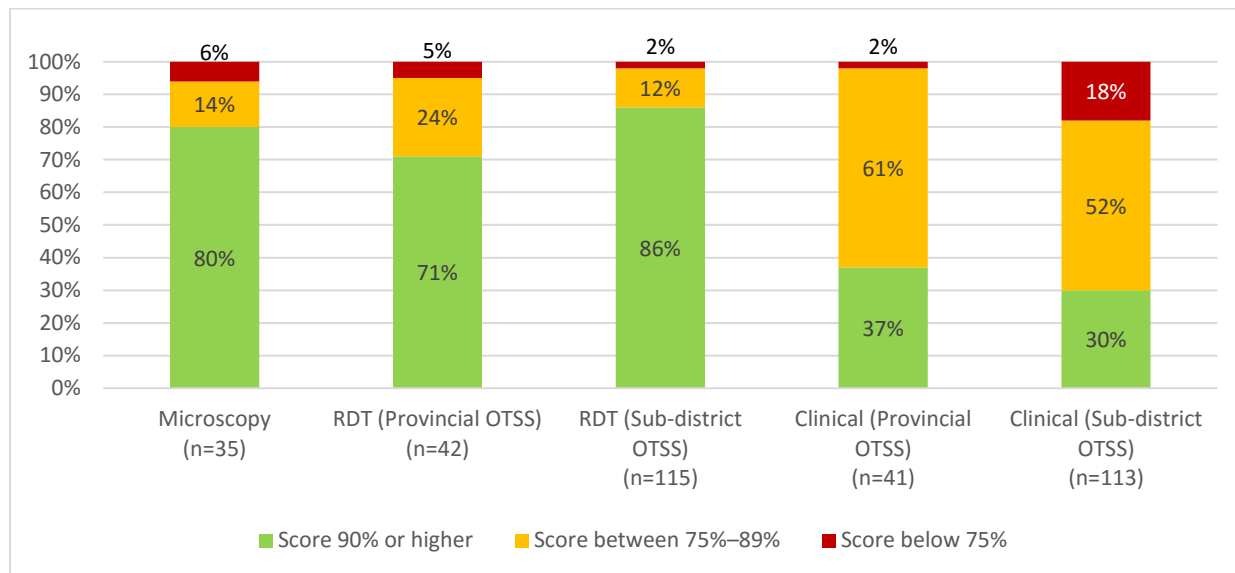
Note: Scores were available for more than 82 percent of sub-district OTSS health facilities visited four times.

Performance improved for all applicable five indicators (microscopy was not observed, as sub-district OTSS facilities were small health centers or health posts), with the greatest improvement seen in negative test adherence (10 percent increase). For RDTs, average facility performance on the minimum standard steps remained high at both time points, with the greatest improvement seen in waiting the correct amount of time per manufacturer’s instruction (increase from 78 to 93 percent). For clinical case management, although average facility performance on checking for at least one sign of severe malaria improved from 64 percent during the first visit to 69 percent during the fourth, performance on this minimum standard step was still significantly weaker than at provincial OTSS facilities. Like other countries, however, Figure 77 highlights that the majority of health facilities have yet to meet the overall target (score of 90 percent or higher) for clinical case management.

Most recent visit

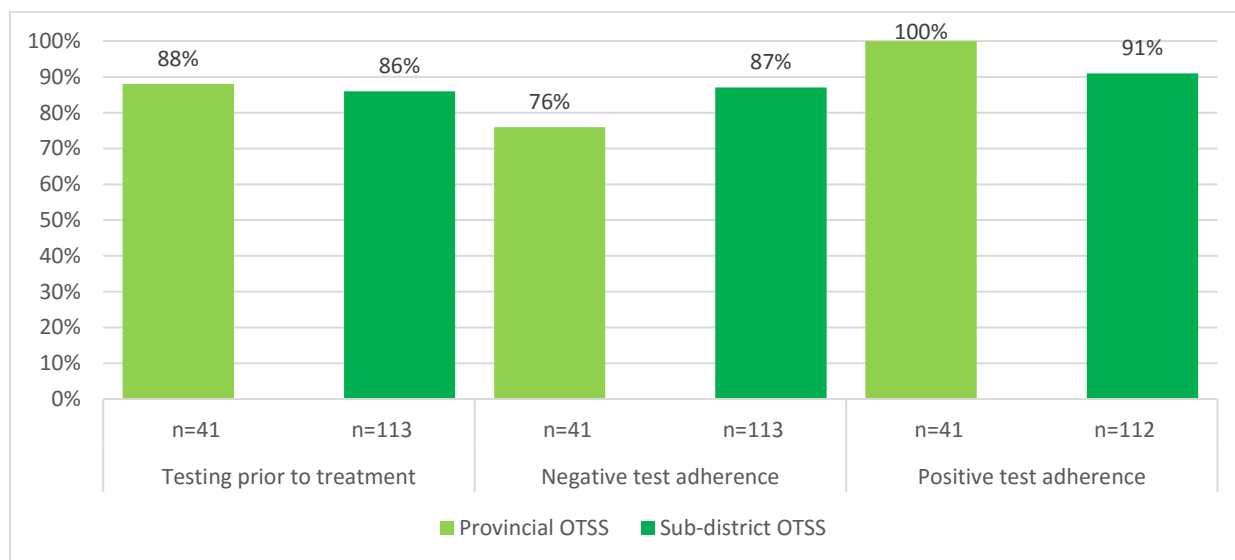
Figure 77 and Figure 78 provide an overview of the most recent status of technical performance (microscopy, RDTs, clinical performance) and adherence (testing prior to treatment, adherence to negative test results, adherence to positive test results) indicators, based on the most recent OTSS visit each health facility received since the revised checklist was introduced in PY4. This includes both the 43 health facilities visited over the last three rounds of provincial OTSS and the 116 health facilities visited over the last four rounds of sub-district OTSS conducted in PY4. The proportion of facilities meeting the minimum targets was similar to those facilities with trend data over three or four visits. However, as Figure 77 illustrates, the majority of health facilities have yet to meet the overall target (score of 90 percent or higher) for clinical case management: only 37 percent of provincial OTSS facilities and 30 percent of sub-district OTSS facilities met this target.

Figure 77. Proportion of health facilities meeting minimum (75%) and overall (90%) targets on technical performance indicators during the most recent OTSS visit, Zambia



Note: Scores were available for more than 81 percent of health facilities.

Figure 78. Proportion of health facilities meeting overall performance target (90%) on testing before treating and adherence to test results during the most recent OTSS visit, Zambia



Note: Scores were available for more than 95 percent of health facilities.

Challenges

Challenge	Solution/recommendations
Due to the data quality issues inherent in the use of paper checklists and later internet connectivity challenges, health managers found it difficult to timely analyze OTSS data and make programmatic decisions based on evidence from OTSS.	To address issues of missing data elements and slow input times, MalariaCare implemented EDS in Zambia in PY4. Although there were challenges with data uploads during the first rounds of OTSS using EDS, MalariaCare staff worked closely with supervisors, provincial medical offices, and EDS programmers to address upload issues. A new version of the EDS app was developed in PY5 to enable automatic uploading of data, and the EDS consultant continued to provide troubleshooting support with supervisors during OTSS rounds. The NMEP should put in place a mechanism to follow up with supervisors as soon as possible to get internet connectivity so their data can be uploaded. Although this mechanism would require some level of effort, the data will be of higher quality and can be analyzed much more quickly than if the country reverted back to data entry from paper checklists.
Shifts in the selection of OTSS supervisors and supported health facilities due to competing demands on NMEP made consistent follow-up and trend analysis difficult.	In PY4, MalariaCare’s diagnostic technical advisor met with NMEP and the provincial medical offices to update lists of OTSS supervisors and health facilities and review the process for engaging supervisors and selecting health facilities for OTSS. To more consistently follow the progress of health facilities, the NMEP should define national criteria for enrolling and graduating facilities in and out of the OTSS program depending on performance ratings.
Supervisors indicate high staff turnover within facilities, particularly among provincial hospital medical officers who are, therefore, unfamiliar with OTSS methodology. In addition, supervisors are often transferred to new facilities, making it more difficult to track continuous progress.	The NMEP should work with provincial and DHOs to build broad capacity within health facilities through systems like hospital malaria therapeutics committees, which include departmental heads, in order to sustain familiarity with OTSS methodology in light of staff attrition. The NMEP could also train clinical officers or nurses-in-charge as well as medical officers in OTSS supervision to address the issue of supervisor transfers.

Challenge	Solution/recommendations
<p>Development of the NAMS turned out to be a longer and more strenuous process than planned due to shifting technical and logistical priorities and unavailability of the staff. Also, only <i>P. falciparum</i> species were found at the selected sites and validated for inclusion within the NAMS.</p>	<p>In PY4, MalariaCare identified and hired a qualified diagnostics technical advisor to assist in the finalization of NAMS after the unfortunate illness and ultimate passing of MalariaCare’s diagnostics technical advisor (Timothy Nzangwa).</p> <p>MalariaCare worked to identify laboratories within Ghana and Ethiopia for the NMEP to exchange slides with in order to obtain the remaining species, but an exchange was not yet agreed upon by the end of the project period. MalariaCare recommends the NMEP find additional support to continue building the NAMS with other species. <i>P. vivax</i>, in particular, is a rare species in Zambia, and the NMEP should look for support to fund procurement of these slides from an established research center to ensure timely delivery and a cost-effective high-quality product.</p>
<p>Declining laboratory supervisors’ microscopy skills may eventually affect the quality of OTSS in the field.</p>	<p>MalariaCare used the piloting of the virtual microscopy e-learning course to boost competencies of supervisors. However, the NMEP should put in place a mechanism to regularly assess and refresh the skills of OTSS and other supervisors and use MDRT results to select provincial supervisors.</p>

Additional recommendations

In order to sustain and continue to build upon the gains made in the quality of care provided for malaria and other febrile illnesses in Zambia, the following recommendations may be considered:

- To address the declining microscopy proficiency among laboratory staff, continue regular refresher training to assess and strengthen microscopy skills and select OTSS laboratory supervisors based on tested proficiency and mentorship skill. The NMEP should assess the competencies of supervisors at least once a year and consider refresher training for those whose skills are found to decline. The NMEP should prioritize mentoring and supervision where microscopy is essential to continue, such as referral facilities with inpatient wards. The NMEP could also consider enrolling these supervisors in an external periodic skills assessment scheme and training scheme such as PT panel testing and virtual microscopy, and then select the best performers to sponsor for ECAMM certification or recertification.
- Rising human resource costs and competing priorities of supervisors may reduce the ability to regularly conduct OTSS at all health facilities. The NMEP should develop guidelines for provincial and/or DHOs to select health facilities based on results from HMIS and OTSS performance data (e.g., through use of the EDS dashboard). Low-performing facilities may require quarterly visits, while high performers could “graduate” to a visit every 6–12 months if performance is maintained over time, possibly in combination with other, less resource-intensive QA interventions or integrated supervision approaches. The NMEP should also build the capacity of provincial and district health authorities to understand, analyze, and use data from the OTSS checklist to aid in prioritization.

- The NMEP should include training institutions during malaria training to ensure that clinicians and nurses who manage health facilities and health posts receive the most current clinical and treatment guidelines. Collaboration with training institutions will help ensure new graduates enter the workforce with knowledge and skills that meet current guidelines. Regulatory bodies should also be involved when updating curricula to ensure that content in the curricula matches the tests schemes.

Transition and sustainability

- MalariaCare held a national-level close-out meeting on August 14, 2017, to share and discuss the project approach, project achievements, key products, and how activities will continue following project close-out. A total of 27 participants attended the meeting, including representatives from the NMEP, PMI, MOH, implementing partners, provincial health directors, OTSS provincial supervisors, and other stakeholders. As a result of the meeting, provincial health directors committed to ensuring OTSS activities are included within the Medium Term Expenditure Framework work plans.
- The NMEP has adopted MalariaCare’s QA approach and will continue to support OTSS across provincial and district health facilities. MalariaCare worked with the NMEP when establishing a standardized curriculum for OTSS supervisor training, received approval from the NMEP on the OTSS checklist, and involved the NMEP as part of the national team during OTSS visits and LLWs. The NMEP will also oversee training sessions and LLWs, supervisory activities, and provincial and DHO work planning. Dates for OTSS visits are decided through a consultative process with the NMEP, provincial and DHOs, and the supervisors, as schedules need to be coordinated with other MOH programs to avoid overlapping. Provincial and district QA officers will ensure QA components are included in annual work plans at both levels, while OTSS supervisors are responsible for the implementation of supervisory visits.
- With the technical assistance MalariaCare provided to PAMO in the last months of the project, PAMO is positioned to continue to provide technical and implementation support to the NMEP to implement OTSS in the Luapula, Northern, Muchinga, and Eastern provinces. Before the end of the project, MalariaCare provided an orientation on the EDS data use training materials to PAMO’s M&E advisor. PAMO will support OTSS/EDS data use training for OTSS provincial and district supervisors, which will include key supervisory staff involved in malaria diagnosis and treatment.
- The NMEP and PAMO received administrative training in running the EDS tool for the country, and NMEP has been designated as the main EDS administrator. The server is shared with other MalariaCare countries, until Zambia is comfortable to branch off. Data hosting ceased to be funded by MalariaCare on December 31, 2017. At the time of writing of this report, another implementing partner has agreed to fund the server in the short-term.

Appendix B: Performance Monitoring Plans

Burma performance monitoring plan

Indicators		Periods with Targets									Periods without Targets*		Actual totals over all periods	
		PY3		PY4				PY5			PY5	Ext.		
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Total	Q4		Ext.
		Apr - Jun 2015	July - Sep 2015	Oct-Dec 2015	Jan-Mar 2016	Apr-Jun 2016	Jul-Sep 2016	Oct-Dec 2016	Jan-Mar 2017	Apr-Jun 2017	Total	Jul-Sep 2017	Oct-Nov 2017	
# tested with rapid diagnostic test	%	37%	16%	78%	88%	57%	100%	106%	74%	120%	95%	N/A	N/A	N/A
	Actual/Target	3675 / 9840	4604 / 29520	8952 / 11520	10091 / 11520	15336 / 26880	26887 / 26880	19951 / 18900	13971 / 18900	22721 / 18900	126188 / 133500	33739	23201	183128
Total # of people with confirmed malaria treated according to national guidelines ⁺	%	4%	2%	7%	3%	1%	3%	28%	30%	17%	7%	N/A	N/A	N/A
	Actual/Target	48 / 1279	67 / 3838	78 / 1152	33 / 1152	29 / 2688	76 / 2688	106 / 378	114 / 378	64 / 378	615 / 8814	115	27	757
# of people with confirmed <i>Pf</i> treated with ACT (plus PQ) according to national guidelines	%	3%	2%	7%	4%	1%	2%	33%	33%	13%	7%	N/A	N/A	N/A
	Actual/Target	18 / 640	33 / 1918	39 / 576	24 / 576	8 / 1344	26 / 1344	63 / 189	63 / 189	25 / 189	299 / 4407	44	7	350
# of people with confirmed <i>Pv</i> treated with CQ (plus PQ) according to national guidelines	%	5%	2%	7%	2%	2%	4%	23%	27%	21%	7%	N/A	N/A	N/A
	Actual/Target	30 / 640	34 / 1918	39 / 576	9 / 576	21 / 1344	50 / 1344	43 / 189	51 / 189	39 / 189	316 / 4407	71	20	407

Note: *Pf*=*Plasmodium falciparum*; ACT=artemisinin-based combination therapy ; PQ=primaquine; *Pv*=*Plasmodium vivax*; CQ=chloroquine;

*As the Burma project was expected to close in June 2017, no targets were set for the period from July to November 2017. For these months we provide the total number of individuals tested or treated for each indicator.

⁺ For the total # of people with confirmed malaria treated according to national guidelines, the target is the expected number of cases. Thus, the reported percentage is the percentage of cases treated out of the expected number of cases treated, rather than the percentage of total confirmed cases each quarter that were correctly treated. For the percentage of confirmed cases correctly treated, please see the narrative.

Burundi performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other febrile illnesses											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Country has supervisory structure for laboratory diagnosis of malaria											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. In Burundi, MalariaCare's diagnostic supervision tools adhere to global standards. During PY5, we worked with the NMCP and partners to adapt the diagnostic supervision tools for use during mobile team visits.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	70%	100%	9	9	100%	100%	<p>Target reached.</p> <p>Mobile clinic teams were planned to consist of four nurses and one laboratory technician. However, due to non-availability of lab staff, the majority of mobile clinic team members were nurses. Of the 9 lab staff observed conducting RDTs during the mobile clinic visits, all 9 (100%) received a score of 90% or greater.</p> <p>Across MalariaCare countries conducting OTSS, roughly 70% of HCWs assessed were reaching 90% or higher on the RDT observation checklist at the time of target setting. Since we did not have a baseline for Burundi, we conservatively set the target at 70%. However, all HCWs scored 100% on the RDT checklist. The unusually high scores may be a result of inadequate supervisor skills due to the short supervisors' orientation as was requested by the NMCP during the emergency response, and supervisors not closely assessing each item on the checklist.</p>
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	<p>Target not applicable.</p> <p>As part of the emergency response initiated by the Burundi MOH, MalariaCare supported mobile clinics which do not conduct microscopy. Thus, this indicator is no longer relevant to our programming.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	70%	100%	107	107	100%	100%	<p>Target reached.</p> <p>Mobile clinic teams were planned to consist of four nurses and one laboratory technician. However, due to non-availability of lab staff, the majority of mobile clinic team members were nurses. Of the 107 clinical staff observed conducting RDTs during the mobile clinic visits, all 107 (100%) received a score of 90% or greater.</p> <p>Across MalariaCare countries conducting OTSS, roughly 70% of HCWs assessed were reaching 90% or higher on the RDT observation checklist at the time of target setting. Lacking a baseline for performance in Burundi, we conservatively set the target of 70%. However, all health workers scored 100% on the RDT checklist. The unusually high scores may be a result of inadequate supervisor skills due to the short supervisors' orientation as was requested by the NMCP during the emergency response, and supervisors not closely assessing each item on the checklist.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	<p>Target not applicable.</p> <p>This indicator is made of three components: RDT bench aids and SOPs, RDT stock, and having at least one person trained in RDT use. SOPs and bench aids were not distributed to mobile clinics as part of the emergency response. As this item is required to calculate this indicator, we are not reporting on this indicator.</p> <p>For the other indicators, of the 40 mobile clinics:</p> <ul style="list-style-type: none"> – All (100%) had at least one person trained in RDTs, through the mobile clinic team orientation, – 29 (73%) had no stock-outs of RDTs during the 6-week mobile clinic period. <p>The majority of stock- outs occurred during the first few weeks of implementation, and MalariaCare notified the MOH in order to resolve stock out issues.</p>
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.2	MDRT Activity Report	50%	80%	24	30			<p>Target reached.</p> <p>Of the 30 supervisors tested during MDRT, 30 (100%) scored at Level A or B (>=80%) for parasite detection; and 24 (80%) scored at Level A or B for parasite quantitation (>=40%).</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.1	Mobile Clinic Supervisor Orientation Activity Report	85%						Indicator not assessed. Due to MOH's request for an orientation focused on supervisor responsibilities and use of the supervision tools, the orientation did not include a refresher training for supervisors on the use of RDTs.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	Add 2.1	Activity Reports	95%	100%	40	40			Target reached. Of the 40 mobile clinics visited, all 40 (100%) reported on whether staff were trained in RDTs. Of these 40 mobile clinics, all 40 (100%) had at least 1 provider formally trained in RDTs. Before the mobile clinics were deployed, MalariaCare trained 197 clinicians during three two-day orientation sessions on clinical management, RDT use, and the use of supervision checklists for implementation of mobile clinic activities.
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	N/A	Activity Reports	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. As part of the emergency response, MalariaCare supported mobile clinics which do not conduct microscopy. Thus, this indicator is no longer relevant to our programming and we are not reporting against it. Also, as part of the reprogramming, MalariaCare did not conduct any microscopy training.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	1.1, 1.2	MDRT Activity Report	95%	100%	46	46			Target reached. In PY5, MalariaCare planned to train 99 providers, with 2 drawn from each of the 46 district hospitals, plus participants from the NMCP, INSP and Department of Pharmacy, Medicines, and Laboratory. Of these, 97 (97% of 99) were trained and at least 1 staff person from each district hospital was trained.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	3.1	Activity Reports	95%	96%	95	99			Target reached. In PY5 MalariaCare planned to train 99 clinical providers. Of these, 95 (96%) were trained.
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	1.1, 1.2	MDRT Activity Report	95%	98%	97	99			Target reached. MalariaCare, per the PY5 work plan, planned to train 99 laboratory staff in RDT QA during the MDRT and 97 (98% of target) attended the training.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.1, 1.2	MDRT Activity Report	95%	98%	97	99			Target reached. MalariaCare, per the work plan, planned to train 99 laboratory staff during MDRT and 97 (98% of target) attended the training.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	Add 1.2	Mobile Clinic Supervisor Orientation Activity Report	95%	117%	33	28			<p>Target reached.</p> <p>According to the addendum to the PY5 work plan, MalariaCare planned to train a total of 43 mobile clinic supervisors—28 clinicians and 15 laboratory technicians (10 from the NMCP, 3 from provincial health offices, 10 from health districts and 20 from district hospitals). We trained 43 mobile clinic supervisors (100% as per the WP).</p> <p>We trained more clinicians (33) and fewer lab staff (10) than anticipated. The teams were constructed so that each team had one lab technician and four clinicians, so that each team had the requisite clinical and laboratory skills.</p>
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	3.2	Mobile Clinic Supervisor Orientation Activity Report	95%	67%	10	15			<p>Target not reached.</p> <p>According to the work plan, MalariaCare planned to train a total of 43 mobile clinic supervisors—28 clinicians and 15 laboratory technicians (10 from the NMCP, 3 from provincial health offices, 10 from health districts and 20 from district hospitals). We trained 43 mobile clinic supervisors (100% of the intended number): 3 provincial medical officers, 10 district medical officers, 10 malaria focal persons, 10 clinicians from the CCMRT, and 10 laboratory technicians from the aMRDT.</p> <p>We trained more clinicians (33) and fewer lab staff (10) than anticipated. The teams were constructed so that each team had one lab technician and four clinicians, so that each team had the requisite clinical and laboratory skills.</p>

Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria

Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.

Intermediate Objectives

Providers demonstrate competence in detecting suspected malaria cases

Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases

Providers demonstrate competence in malaria treatment

Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness

Private facilities are linked with the public sector

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	4.1	NMCP	1/1	1/1	1	1			Target reached. The Government of Burundi updated its national guidelines for malaria case management based on the results of the therapeutic efficacy study. This update included guidelines for determining suspected malaria cases. MalariaCare was not asked to support this guideline revision.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	80%	93%	110	118			Target reached. Of the 118 providers observed during the mobile clinic visits, 110 (93%) asked about history of fever and checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	85%	100%	118	118			Target reached. Of the 118 providers observed during the mobile clinic visits, supervisors agreed with 118 (100%) of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools adhere to global standards for determining possible malaria cases. During PY5, we worked with the NMCP and partners to adapt the clinical supervision tools in support of the emergency response.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	1.3, 4.1	NMCP	1/1	1/1	1	1			Target reached. The Government of Burundi’s national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare’s clinical supervision tools adhere to global standards to malaria treatment standards. During PY5, we worked with the NMCP and partners to adapt the clinical supervision tools in support of the emergency response.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	<p>Target not applicable.</p> <p>This indicator is made of four components: case management guidelines, ACT stock, paracetamol stock, and having at least one person trained in malaria case management. Malaria case management guidelines were not distributed to mobile clinics as part of the emergency response. As this is required to calculate this indicator, we are not reporting on this indicator.</p> <p>For the remaining components, for all targeted mobile clinics:</p> <ul style="list-style-type: none"> – All (100%) had at least one person trained in malaria case management through the mobile clinic team orientation. – 30 (75%) had no stock-outs of first-line antimalarials during the six-week mobile clinic period. Of the ten mobile clinics that reported a stock-out, all had at least one type of age-group formulation during any one week; therefore, a high proportion of patients were still able to be treated as one formulation was always available. – 40 (100%) had no stock-outs of paracetamol during the six-week mobile clinic period. <p>The majority of stock- outs of first-line antimalarials occurred during the first few weeks of implementation, and MalariaCare notified the MOH in order to resolve stock out issues.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. Register reviews were not included in the checklist as part of the emergency response, so we are no longer reporting on this indicator. MalariaCare worked with the NMCP to develop a tool for reporting on key case management quality of care indicators.
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. Register reviews were not included in the checklist as part of the emergency response, so we are no longer reporting on this indicator. MalariaCare worked with the NMCP to develop a tool for reporting on key case management quality of care indicators.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	3.3	Activity Reports	80%	46%	17	37	81%	79%	Target not reached. Of the 37 clinical training participants selected to be supervisors, 17 (46%) obtained a post-test score of 80% or greater. Although the target was not met, mean and median scores were very close to the 80% target and 8 of the supervisors scored 79%. Only 1 selected supervisor scored below 75%.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.3	Mobile Clinic Supervision Checklist Data	90%	100%	40	40			Target reached. MalariaCare conducted 2 rounds of supervision to all 40 mobile clinics.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	3.1	Activity Reports	95%	97%	96	99			Target reached. MalariaCare, per the work plan, planned to train 99 clinicians in malaria treatment during the CCMRT, and 96 (97% of target) attended the training.
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	90%	100%	117	117			Target reached. Of the 117 staff at the health facilities visited during OTSS, all 117 (100%) received feedback from supervisors.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	3.2	Mobile Clinic Supervisor Orientation Activity Reports	95%	117%	33	28			<p>Target reached.</p> <p>According to the work plan we planned to train for a total of 43 mobile clinic supervisors—28 clinicians and 15 laboratory technicians (10 from the NMCP, 3 from provincial health offices, 10 from health districts, and 20 from district hospitals). We trained 43 mobile clinic supervisors (100% of the intended number): 3 provincial medical officers, 10 district medical officers, 10 malaria focal persons, 10 clinicians from the CCMRT, and 10 laboratory technicians from the aMRDT.</p> <p>We trained more clinicians (33) and fewer lab staff (10) than anticipated. The teams were constructed so that each team had one lab technician and four clinicians, so that each team had the requisite clinical and laboratory skills.</p>

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards for laboratory system analysis. During PY5, we worked with the NMCP and partners to adapt the diagnostic supervision tools for use during mobile team visits, specifically for observation of RDTs.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A			Target not applicable. As part of the emergency response, MalariaCare supported mobile clinics which did not conduct microscopy. Thus, this indicator is no longer relevant to our programming and is not reported against.
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics.	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. As part of the emergency response, MalariaCare supported mobile clinics which did not conduct microscopy. Thus, this indicator is no longer relevant to our programming and is not reported against.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. As part of the emergency response, MalariaCare supported mobile clinics which did not conduct microscopy. Thus, this indicator is no longer relevant to our programming and is not reported against.
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.3	Mobile Clinic Supervision Checklist Data	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. As part of the emergency response, MalariaCare supported mobile clinics which did not conduct microscopy. Thus, this indicator is no longer relevant to our programming and is not reported against.

Democratic Republic of the Congo performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In DRC, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.2	OTSS checklist data	80%	89%	65	73	98%	100%	Target reached. Of the 73 lab staff observed conducting RDTs during OTSS, 65 (89%) received a score of 90% or greater.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.2	OTSS Checklist Data	70%	79%	53	67	94%	100%	Target reached. Of the 67 lab staff observed conducting microscopy during OTSS, 53 (79%) received a score of 90% or greater.
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.2	OTSS Checklist Data	60%	67%	4	6	92%	94%	Target reached. Of the 6 clinical staff observed conducting RDTs during OTSS, 4 (67%) received a score of 90% or greater.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2	OTSS Checklist Data	50%	54%	21	39			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of the 39 facilities with sufficient data: – 69% had no stock-outs of RDTs of 7 days or more over the previous 3 months – 85% had RDT bench aids and/or SOPs – 82% had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers. Note: Must score at least Level A or B on parasite detection (>=80%) and parasite quantitation (>=40%).	1.1	MDRT Activity Report	65%	29%	2	7			Target not reached. Of the 7 supervisors tested during MDRT, 6 (86%) scored at Level A or B (>=80%) for parasite detection; and 3 (43%) scored at a Level A or B for parasite quantitation (>=40%). The target was based on the most recent MDRT results available at the time of work plan submission, indicating that lab supervisors for the new provinces tended to have lower proficiency than older ones. We recommend that future malaria microscopy refresher training continue in all provinces to both raise and maintain technical skills.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.1, 3.1	MDRT and CCMRT Activity Reports	95%						Indicator not assessed. No formal test of RDT competence was administered during supervisor training.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.2	OTSS Checklist Data	95%	82%	32	39			Target not reached. Of the 39 facilities visited for OTSS and with data on the indicator, 32 (82%) had at least 1 provider formally trained in RDTs. Targets were developed based on performance in the previous project year. The lower proportion as compared with PY4 may be related to new facilities being added to the OTSS program in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities.	3.2	OTSS Checklist Data	50%	50%	20	40			Target reached. Of the 40 facilities visited during OTSS and with data on the indicator, 20 (50%) had at least 1 provider formally trained in microscopy.
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MDRT in the last two years/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. This indicator applies to health facility staff, rather than supervisors. MDRTs were only conducted with those intended to be supervisors and master trainers, and no MDRTs were conducted for general laboratory staff.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	3.1	CCMRT Activity Report	95%	97%	58	60			Target reached. Per the PY5 work plan, MalariaCare planned to train 60 newly-qualified clinicians in RDTs; of these, 58 (97%) were trained.
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MDRTs for PY5 were conducted for supervisors and master trainers, rather than lab technicians generally.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.1	MDRT Activity Report	95%						Indicator not assessed. MDRTs for PY5 were conducted for supervisors and master trainers, rather than lab technicians generally.
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	3.1	CCMRT Activity Report	90%	100%	10	10			Target reached. MalariaCare, per the PY5 work plan, planned to train 10 clinical supervisors in supervision of RDTs during the CCMRT training, and 10 (100% of target) attended the training.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No supervisor training was planned for PY5. All OTSS supervisors were trained in supervision skills prior to PY5 (although a selected number of lab supervisors attended the MDRT in PY5).
Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria											
Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.											
Intermediate Objectives											
Providers demonstrate competence in detecting suspected malaria cases											
Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases											
Private facilities are linked with the public sector											
Intermediate Outcomes											
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	4.4	PNLP	1/1	1/1	1	1			Target reached. The national case management guidelines were finalized in 2017 with technical assistance from MalariaCare. They include guidelines for determining suspected malaria cases and adhere to global standards.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.2	OTSS Checklist Data	98%	100%	63	63			Target reached. Of the 63 providers observed during OTSS, all asked about history of fever or checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.2	OTSS Checklist Data	98%	92%	58	63			<p>Target not reached. Of the 63 providers observed during OTSS, supervisors agreed with 58 (92%) of them on whether to order a malaria test for a febrile patient.</p> <p>Targets were set based on the prior year's performance, indicating that competence was at a slightly lower rate for the new facilities visited this year. This shortfall was shared with PNLP and other stakeholders during MalariaCare's close-out meeting.</p>
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	3.2	PNLP	1/1	1/1	1	1			<p>Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In DRC, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.</p>

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	4.4	PNLP	1/1	1/1	1	1			Target reached. The national case management guidelines were finalized in 2017 with technical assistance from MalariaCare. They include guidelines for malaria treatment and adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In DRC, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2	OTSS Checklist Data	50%	62%	23	37			<p>Target reached. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of the 37 facilities visited for OTSS with data:</p> <ul style="list-style-type: none"> – 78% had the most recent malaria case management guidelines – 73% had at least 1 staff formally trained in malaria case management in the previous 2 years – 62% had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months – 92% had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months.
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.2	OTSS Checklist Data	70%	87%	317	366			<p>Target reached. Of the 366 records of positive test results reviewed by OTSS supervisors, 317 (87%) were found to have a corresponding ACT prescription recorded, in accordance with global standards.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.2	OTSS Checklist Data	70%	78%	283	362			Target reached. Of the 362 records of negative test results reviewed by OTSS supervisors, a corresponding ACT prescription was not found for 283 results, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	3.1	CCMRT Activity Report	90%	30%	3	10	Mbuji-Mayi: 75% Lubumbashi: 57%	Mbuji-Mayi: 76% Lubumbashi: 68%	Target not reached. Of the 10 clinical participants at the CCMRT training, 3 (30%) obtained a post-test score of 80% or greater. Of the six clinical supervisors at the training in Mbuji-Mayi, one received a score of 83%. At the training in Lubumbashi, which used an abbreviated 25 question test that removed 11 questions on pharmacovigilance as per the government facilitator's preference, two of the four clinical supervisors received a score of 80%. Therefore we present these means and medians separately for these two groups. Despite the reduced test, the means were lower in the Lubumbashi training. As also seen in the OTSS data, when compared to other countries, DRC is lagging behind other countries in the clinical aspects of malaria case management, likely due to the recent roll-out of the updated malaria diagnosis and treatment guidelines.

Outputs											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.2	OTSS Checklist Data	95%	67%	33	49			Target not reached. MalariaCare, per the PY5 work plan, planned to visit 49 facilities with outpatient departments in each round of OTSS; only 33 (67%) actually received 2 visits. This was mostly due to organizational restrictions on programmatic travel to the provinces of Kasai Central, Kasai Oriental, Lomami, and Sankuru due to security issues.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	3.1	CCMRT Activity Report	95%	113%	34	30			Target reached. Per the PY5 work plan, MalariaCare planned to train 30 newly-qualified clinicians in malaria treatment; 34 (113%) were actually trained.
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.2	OTSS Checklist Data	95%	98%	60	61			Target reached. Of the 61 clinical providers observed during OTSS, 60 (98%) received feedback from supervisors.
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No training on supervision skills was planned for PY5.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	N/A	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In DRC, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

Outputs

36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.2	OTSS Checklist Data	50%	58%	22	38			Target reached. Of the 38 facilities visited during OTSS with data for this question, 22 (58%) had updated Ministry of Health (MOH) guidelines on microscopy.
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.2	OTSS Checklist Data	85%	81%	30	37	92%	100%	Target not reached. Data for this indicator was available for 37 of the 41 facilities visited for OTSS that perform microscopy. Of these 37 facilities, 30 (81%) scored 90% or greater on slide rechecking. Targets were set based on performance during the previous project year. Of the 7 facilities that did not meet the standard, 4 of them were newly-added facilities for PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.2	OTSS Checklist Data	3%	3%	1	35			Target reached. In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of 8 malaria microscopy supplies that would impede malaria microscopy lasting more than 7 days in the previous 3 months; a microscopy bench aid or standard operating procedures present in the lab; and at least one lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed were pH paper/meter (only 3% of facilities reported having this) and having a lab staff formally trained in malaria microscopy (51%).
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.2	OTSS Checklist Data	95%	68%	34	50			Target not reached. Of the 50 facilities enrolled in PY5, 34 (68%) received 2 laboratory visits, and 41 received 1 visit. This was mostly due to organizational restrictions on programmatic travel to the provinces of Kasai Central, Kasai Oriental, Lomami, and Sankuru due to security issues.

Ghana performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: Scale up and improve access to and availability of quality malaria diagnostic services, with a focus on the lower health facility level.											
Objective 2: Scale up and improve access to and availability of high-quality malaria treatment, with a focus on the lower health facility level.											
Objective 3: Improve the accuracy, reliability, and availability of health information management systems.											
Objective 4: Strengthen technical management ability at the regional level for implementing programs and activities.											
Objective 1: Scale up and improve access to and availability of quality malaria diagnostic services, with a focus on the lower health facility level.											
Description: Scale up and improve access to and availability of quality malaria diagnostic services, with a focus on the lower health facility level. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Country has supervisor structure for laboratory case management of malaria											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Country has national malaria diagnostics supervision tools whose indicators adhere to global standards.	The National Malaria Control Program (NMCP) has national diagnostic tools whose indicators adhere to global standards	2.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Ghana, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	2.3	EDS data from OTSS	95%	75%	1112	1485	93%	96%	Target not reached. Of the 1,485 clinical staff observed conducting RDTs during OTSS, 1,112 (75%) received a score of 90% or greater. Targets were set based on performance during the most recently available results at the time of work plan submission. The relative decline in scores may be due to budgetary constraints that required supervisors to prioritize visiting the poorest performing facilities during the last round of OTSS.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	2.3	EDS data from OTSS	45%	64%	623	969			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of the 969 targeted facilities: –86% had no stock-outs of RDTs of 7 days or more over the previous 3 months –71% had RDT bench aids and/or SOP –89% had at least 1 person trained in RDTs in the previous 2 years Targets were set based on performance during the most recently available results at the time of work plan submission. Improvements were seen for all 3 conditions.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	2.1	OTSS Supervisor Training Records	95%						Indicator not assessed. Supervisor training on malaria diagnostics was not conducted in PY5, because most of the supervisors had already been trained on the revised malaria case management guidelines and RDT use. Instead, priority was given to practical training on the updated EDS.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	2.3	EDS data from OTSS	85%	89%	884	990			Target reached. Of the 1,181 facilities that conduct RDTs visited during OTSS, 990 (84%) reported on whether staff were trained in RDTs. Of the 990 facilities with data, 884 (89%) had at least 1 provider formally trained in RDTs. Targets were based on performance during the previous year. The improvement (may be due to MalariaCare's training of new health workers, but we do not have enough data to confirm this.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	1.1	MDRT activity report	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare, per the work plans, proposed to train 0 lab workers in PY4 and 150 in PY5 during MDRTs; 164 (109%) were trained. Participants were selected based on health facility need rather than targeting a specific number of health facilities.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	2.1	OTSS Supervisor Training Records	95%	99%	494	500			Target reached. Per the PY5 work plan, MalariaCare planned to train 500 newly-qualified clinicians in RDTs; of these, 494 were trained.
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No training involving RDT QA for lab technicians was planned for PY5.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.1	MDRT activity report	95%	109%	164	150			Target reached. MalariaCare, per the PY5 work plan, proposed to train 150 lab workers during MDRTs; 164 (109%) were actually trained.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	2.2	OTSS Supervisor Training Records	95%						Indicator not assessed. Supervisor training on malaria diagnostics was not conducted in PY5, because most of the supervisors had already been trained on the revised malaria case management guidelines and RDT use. Instead, priority was given to practical training on the updated EDS.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No supervision training for lab supervisors was planned for PY5.
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, Giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not implement laboratory OTSS in PY5.
Objective 2: Scale up and improve access to and availability of high-quality malaria treatment, with a focus on the lower health facility level.											
Description: Scale up and improve access to and availability of high-quality malaria treatment, with a focus on the lower health facility level. These activities relate to addressing health care provider performance in the use of diagnostic tools and case management after appropriate training. Emphasis is on supervision and use of performance monitoring tools.											
Intermediate Objectives											
Providers demonstrate competence in detecting suspected malaria cases											
Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases											
Providers demonstrate competence in malaria treatment											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Private facilities are linked with the public sector											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	2.3	NMCP	1/1	1/1	1	1			Target reached. The Government of Ghana's national guidelines for malaria case management, which includes guidelines for determining suspected malaria cases, adhere to global standards.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	2.3	EDS data from OTSS	90%	99%	1307	1319			Target reached. Of the 1,319 providers observed during OTSS, 1,307 (99%) asked about history of fever or checked the patient's temperature.
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	2.3	EDS data from OTSS	90%	85%	1115	1319			Target not reached. Of the 1,319 providers observed during OTSS, supervisors agreed with 1,115 (85%) of them on whether to order a malaria test for a febrile patient. Targets were set based on performance during the most recently available results at the time of work plan submission). The failure to meet this target may be due to budgetary constraints that required supervisors to visit the poorest performing facilities.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	2.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In Ghana, this tool is endorsed by the national government and used by the government and partners as the national supervision tool for malaria.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	N/A	1/1	1/1	1	1			Target reached. The Government of Ghana's national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	2.3	NMCP	1/1	1/1	1/1	1			Target reached. MalariaCare's clinical supervision tools, which include supervision of malaria treatment, adhere to global standards. In Ghana, this tool is endorsed by the national government and used by the government and partners as the national supervision tool for malaria.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	2.3	EDS data from OTSS	65%	72%	694	965			<p>Target reached.</p> <p>Data for this indicator was available for 965 (82%) of the 1,181 facilities visited for OTSS. Facilities must meet all conditions below to achieve the standard for quality malaria treatment. Of the 965 facilities with data:</p> <ul style="list-style-type: none"> - 82% had the most recent malaria case management guidelines - 91% had at least one staff formally trained in malaria case management in the previous two years - 93% had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous three months - 87% had no stock-outs of paracetamol lasting more than 7 days in the previous three months <p>Compared to facilities visited in the previous year, a higher proportion of facilities reported having a trained health worker and the case management guidelines. MalariaCare may have contributed to the increase through training new providers.</p>
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	2.3	EDS data from OTSS	99%	98%	5427	5524			<p>Target not reached.</p> <p>Of the 5,524 records of positive test results reviewed by OTSS supervisors, 5,427 (98%) had an ACT prescription documented, in accordance with global standards.</p> <p>Targets were set based on performance during the most recently available results at the time of work plan submission. The failure to achieve the target may be due to budgetary constraints that required supervisors to visit the poorest performing facilities.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	2.3	EDS data from OTSS	90%	91%	4913	5375			Target reached. Of the 5,375 records of negative test results reviewed by OTSS supervisors, 4,913 (91%) did not have an associated ACT prescription found in the pharmacy or clinical registers, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	2.2	OTSS Supervisor Training: Clinical	65%						Indicator not assessed. Supervisor training on malaria diagnostics was not conducted in PY5, because most of the supervisors had already been trained on the revised malaria case management guidelines and RDT use. Instead, priority was given to practical training on the updated EDS.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. Per the PY5 work plan, only one round of clinical/M&E OTSS was planned for PY5.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	2.1, 2.5	Clinical Training (non-supervisor) Records	95%	110%	748	680			Target reached. Per the PY5 work plan, 100 new clinicians per region (500 total) and 180 new medical school lecturers were expected to be trained; of these, 492 new clinicians and 256 lecturers attended the trainings.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	2.3	EDS data from OTSS	95%	100%	1226	1232			Target reached. Of the 1,232 clinical providers observed during OTSS, 1,226 received feedback from supervisors (almost 100%).
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	2.2	OTSS Supervisor Training Records	95%						Indicator not assessed. Supervisor training on malaria diagnostics was not conducted in PY5, because most of the supervisors had already been trained on the revised malaria case management guidelines and RDT use. Instead, priority was given to practical training on the updated EDS.

Objective 3: Improve the accuracy, reliability, and availability of health information management systems.

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
G1*	Proportion of targeted records persons competent in malaria data management at the time of most recent supervisory visit	Number of people in charge of facility records at OTSS-supported health facilities who score 90% or above on supervisory checklists measuring data management capability/ Total number of in-charges who received a supervisory visit during the reporting period.	3.3	EDS data from OTSS	75%	82%	738	898			<p>Target reached.</p> <p>Of the 1,181 health facilities visited for OTSS, 898 (76%) had sufficient data to calculate whether staff in charge of data management were competent. Targets were based on performance during the previous year. The biggest increases in the individual competencies included in the score were the in-charges' ability to distinguish between old and new cases, and the total number of malaria cases prescribed ACTs.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
G2*	Proportion of facilities whose data reported in DHIMS2 fall within the allowable deviation range of +/- 10%	Number of facilities in which the numbers of malaria cases suspected, tested, tested positive, and number put on ACTs recorded in DHIMS2 falls within the allowable deviation (10%) when compared to the register/ Total number of facilities for which malaria cases suspected, tested, tested positive and number put on ACTs were verified during OTSS.	3.3	EDS data from OTSS	60%	61%	555	909			Target reached. Of the 1,181 facilities visited for OTSS, 909 (77%) had sufficient data to calculate a data accuracy score. Of these 909 facilities, 555 (61%) had all 4 malaria indicator numbers recorded in DHIMS2 match the register totals within 10%.
Outputs											
G3*	Proportion of targeted service providers (re)trained in M&E and/or data management practices	Number of M&E staff at health facilities who received feedback from M&E supervisors during OTSS visits/Total number of targeted M&E staff at health facilities visited during OTSS	3.3	EDS data from OTSS	95%	92%	801	869			Target not reached. Of the 869 health facilities where a data management gap was identified, 801 (92%) received feedback from supervisors.

Objective 4: Strengthen technical management ability at the regional level for implementing programs and activities.

Description: Strengthen technical management ability at the regional level for implementing programs and activities. These activities relate to addressing the health systems management issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as program management, use of data for decision-making, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Regional and district directors use DHIMS2 and OTSS data to guide programmatic decision making

Regional and district health management teams demonstrate good governance and accountability practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
G4*	Percentage of targeted districts developing an action plan based on information from LLWs	Number of districts with documented action plans / Total number of districts represented at the LLW	4.3	Activity Reports from LLWs	95%	N/A	N/A	112			Indicator not assessed. No action plans were developed for the final LLW of the project due to lacking of means to follow up on those. Actions plans from the previous LLW were reviewed instead.
Outputs											
G5*	Percentage of RHMT joint work planning sessions with MalariaCare participation	Number of RHMT joint work planning sessions that MalariaCare staff participate in / Total number of RHMT joint work planning sessions within MalariaCare's area of intervention	4.1	Activity Reports	100%	100%	5	5			Target reached. MalariaCare participated in 5 out of 5 RHMT joint work planning sessions.
G6*	Percentage of targeted DHMT members attending LLWs	Number of LLW participants who are members of DHMTs/ Total targeted DHMT participants	4.3	Activity Reports from LLWs	95%	100%	112	112			Target reached. 108 district and 5 Kumasi sub-metro DHMTs were invited to the LLWs; of these 113 invitees, 112 attended.

*this is an indicator specific to Ghana.

Kenya performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: Improve the accuracy of diagnostic testing for malaria to greater than 90 percent											
Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria											
Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test											
Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases											
Objective 1: Improve the accuracy of diagnostic testing for malaria to greater than 90 percent											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Country has supervisory structure for laboratory diagnosis of malaria											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Kenya, this tool is endorsed by the government as the national supervision tool.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	70%	90%	325	362	96%	100%	Target reached. Of the 362 lab staff observed conducting RDTs during OTSS, 325 (90%) received a score of 90% or greater. Of all 1,008 health workers observed conducting RDTs during OTSS, 874 (87%) received a score of 90% or greater. We set the PY5 target to be a 9% increase from 61% to 70% based on the results of the first round of OTSS. After 2 to 4 OTSS visits per facility across the three phases scores have dramatically increased.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	70%	72%	246	344	93%	99%	Target reached. Of the 344 lab staff observed conducting malaria microscopy during OTSS, 246 (72%) received a score of 90% or greater. Lab workers performed more poorly on slide preparation and slide staining than on reading. Providers most frequently missed the following steps: filtering stain prior to use (34%) and labelling the slide with the date and patient's name and/or number (17%).
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	70%	85%	549	646	96%	100%	Target reached. Of the 646 clinical staff observed conducting RDTs during OTSS, 549 (85%) received a score of 90% or greater. Of all 1,008 health workers observed conducting RDTs during OTSS, 874 (87%) received a score of 90% or greater.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	40%	48%	428	898			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of the 898 facilities receiving a supervisory visit: - 702 (78%) had no stock-outs of RDTs of 7 days or more over the previous 3 months; - 631 (70%) had RDT bench aids and/or SOPs; and - 722 (80%) had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.1	MDRT Activity Report	40%	0%	0	20			Target not reached. Of the 20 supervisors tested during MDRT, 16 (80%) scored at Level A or B (>=80%) for parasite detection; and 1 (5%) scored at a Level A or B for parasite counting (>=40%). Parasite counting continues to be a challenge for supervisors to conduct accurately. The majority of the participants had never taken a malaria microscopy course before (outside pre-service training) and participants were starting from a basic level, which explains the poor results on this indicator.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.1	MDRT Activity Report	80%	100%	20	20			Target reached. Of the 20 supervisors tested during aMDRT, 20 (100%) scored 90% or greater on the RDT knowledge test.

Outputs											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	2.1	OTSS Data From EDS	90%	80%	748	934			<p>Target not reached.</p> <p>Of the 934 facilities visited during OTSS, all 934 (100%) reported on whether staff were trained in RDTs, with 748 (80%) reporting having at least 1 provider formally trained. During PY5, MalariaCare trained a total of 176 staff in RDT use. However, most of the training occurred after the last round of OTSS. Per the PY5 work plan, an additional round of OTSS was planned to occur after the RDT training, but this did not happen due to the health worker strikes. Thus, the OTSS data does not reflect the effects of the most recent training on the proportion of health facilities with a provider trained.</p>
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	3.4	OTSS Data From EDS	67%	46%	186	405			<p>Target not reached.</p> <p>Of the 445 facilities visited during OTSS that conduct microscopy, 405 (91%) reported on whether staff were trained in microscopy. Of the 405 facilities with data, 186 (46%) had at least 1 provider formally trained in microscopy.</p> <p>In PY5, MalariaCare trained 160 health facility laboratory staff in microscopy. Despite the high number trained, the percentage of facilities with one or more providers trained in microscopy was still well below the target. Upon further analysis, 133 (61%) of the 219 that did not have a provider trained appeared to be dispensaries. Priority for the training was given to staff from higher-level facilities who had not participated in a malaria microscopy training during the last 2-3 years. In the future, microscopy capacity should be strengthened among lower-level facilities if current policy remains in effect that microscopy should continue to be performed at this level.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	1.2	MDRT Activity Report	95%	92%	255	277			Target not reached. In PY4 and PY5, MalariaCare planned to train 277 providers in malaria microscopy. Of these, 255 (92%) were trained. The final aMDRT for county malaria reference lab (MRL) staff was not held due to the health workers strike and internal issues related to financial approvals.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	2.1	RDT QA Activity Report	95%	147%	176	120			Target reached. Per the PY5 work plan, MalariaCare planned to train 120 health providers from 120 facilities in malaria RDTs. When calling participants for training, MalariaCare requests those that most often conduct RDTs at facilities to attend, and thus it is difficult to set specific targets for clinicians and laboratory personnel. In total, 176 providers (147%) were trained, including 56 health workers in Siaya County who were originally planned to be trained in PY4, but were unable due to scheduling issues. Excluding those, 120 out of 120 were trained, reaching the 95% target.
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	2.1	RDT QA Activity Report	95%	147%	176	120			Target reached. Per the PY5 work plan, MalariaCare planned to train 120 total health providers from 120 facilities in malaria RDTs. When calling participants for training MalariaCare requests those that most often conduct RDTs at facilities to attend, and thus it is difficult to set specific targets for clinicians and laboratory personnel. Of the planned 120 total health providers 176 (147%) were trained.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.2	MDRT Activity Report	95%	73%	60	82			Target not reached. MalariaCare, per the PY5 work plan, planned to train 82 laboratory staff during MDRT; 60 (73% of target) attended the training. The final aMDRT for county MRLs was not conducted due to delays with the health workers strike and internal issues related to financial approvals.
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	3.1	CCMRT Activity Report	100%	100%	10	10			Target reached. In the work plan, MalariaCare estimated that 22 clinicians would need to be trained due to poor performance or attrition. However, only 10 clinical supervisors required replacement during PY5. Thus, MalariaCare trained 100% of the required clinical supervisors in malaria diagnostics.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	1.1	MDRT Activity Report	100%	100%	20	20			Target reached. In the work plan, MalariaCare estimated that 22 lab supervisors would need to be trained due to poor performance or attrition. However only 20 lab supervisors required replacement during PY5. Thus, MalariaCare trained 100% of the required laboratory supervisors in malaria diagnostics.

Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria

Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.

Intermediate Objectives

Providers demonstrate competence in detecting suspected malaria cases

Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases

Providers demonstrate competence in malaria treatment

Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness

Private facilities are linked with the public sector

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Kenya's national guidelines for malaria case management, which includes guidelines for determining suspected malaria cases, adhere to global standards.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.4	OTSS Data From EDS	95%	99%	1313	1323			Target reached. Of the 1323 providers observed during OTSS, 1313 (99%) asked about history of fever or checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.4	OTSS Data From EDS	95%	98%	1297	1323			Target reached. Of the 1323 providers observed during OTSS, supervisors agreed with 1297 (98%) of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In Kenya, this tool is endorsed by the government as the national supervision tool.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Kenya's national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment .	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include supervision of malaria treatment, adhere to global standards. In Kenya, this tool is endorsed by the government as the national supervision tool.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	40%	28%	265	930			<p>Target not reached.</p> <p>Data for this indicator was available for 930 (99%) of the 933 facilities visited for OTSS. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of the 930 facilities with data:</p> <ul style="list-style-type: none"> - 547 (59%) had the most recent malaria case management guidelines - 773 (83%) had at least 1 staff formally trained in malaria case management in the previous 2 years - 535 (58%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months - 669 (72%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months. <p>Targets were developed based on performance in the previous project year, indicating that meeting the standards for quality treatment of malaria has not significantly improved. Although MalariaCare activities, per the Kenya work plan, have a limited role in improving this indicator, this information was shared with the national malaria program for future action. During LLWs these stock issues were also discussed and action plans were developed to work on resolving them.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.4	OTSS Data From EDS	95%	97%	5758	5951			Target reached. Of the 5951 records of positive test results reviewed by OTSS supervisors, 5758 (97%) were found to have a corresponding ACT prescription recorded, in accordance with global standards.
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.4	OTSS Data From EDS	90%	94%	5462	5807			Target reached. Of the 5807 records of negative test results reviewed by OTSS supervisors, a corresponding ACT prescription was not found for 5462 (94%) results, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	3.1	CCMRT Activity Report	75%	100%	10	10			Target reached. Of the 10 clinical participants at the supervisor training, 10 (100%) obtained a post-test score of 80% or greater.

Outputs											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.4	OTSS Data From EDS	50%	85%	795	933			<p>Target reached.</p> <p>MalariaCare, per the PY5 work plan, planned to do 1 round of OTSS to all facilities, with an additional 2 rounds of joint supervision in PY5 to 50%, or 466 of the 933 targeted facilities. However, during the year the strategy was changed to maximize the number of facilities that received a minimum of three visits. All Phase 2 and Phase 3 facilities were targeted to receive two visits in PY5, so that they would receive a total of three and two visits, respectively, before the end of the program. Phase 1 facilities were targeted to receive one visit, so that they would receive a total of three visits before the end of the program, with the lowest performing 50% of facilities receiving an additional fourth visit. A third OTSS round in PY5 was not conducted due to delays resulting from the health worker strike. With this revised plan, the targeted number of facilities to receive two visits became 785 (84%) of the 933 facilities. In total, 795 (85% of the 933) were visited twice.</p>
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	N/A	N/A	N/A	N/A	N/A	N/A			<p>Target not applicable.</p> <p>MalariaCare did not plan to conduct case management training with providers (other than supervisors) in PY5.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.4	OTSS Data From EDS	95%	83%	1716	2075			Target not reached. Of the 2,075 staff observed during OTSS, 1,716 (83%) received feedback from supervisors.
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	3.2	Supervisor Training Activity Report	100%	100%	10	10			Target reached. In the work plan, MalariaCare estimated that 22 clinicians would need to be trained due to poor performance or attrition. However, only 10 clinical supervisors required replacement during PY5. Thus, MalariaCare trained 100% of the required clinical supervisors in supervision.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Service providers are able to provide high quality case management services for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

QA/QC strategies are robust and evidence-based

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Kenya, this tool is endorsed by the government as the national supervision tool.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.4	OTSS Data From EDS	95%	49%	197	402			Target not reached. Data for this indicator was available for 402 of the 445 facilities (90%) visited for OTSS that conduct microscopy. Of these 402 facilities, 197 (49%) had updated MOH guidelines on microscopy. While MalariaCare planned to finalize, print and disseminate 750 copies of the national QA guidelines for parasitological diagnosis of malaria in the second half of PY5, MalariaCare was unable to continue support due to suspension of USG support to the national level.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.4	OTSS Data From EDS	50%	90%	307	343	95%	100%	Target reached. Data for this indicator was available for 343 of the 445 facilities (77%) visited for OTSS that perform microscopy. Of these 343 facilities, 307 (90%) scored 90% or greater on slide rechecking.
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, Giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.4	OTSS Data From EDS	15%	7%	26	388			Target not reached. Data for this indicator was available for 388 of the 445 facilities (87%) visited for OTSS that perform microscopy. In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of eight malaria microscopy supplies that would impede malaria microscopy lasting more than 7 days in the previous 3 months; a microscopy bench aid or standard operating procedures present in the lab; and at least one lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed were no stock-outs of buffer solution and tabs (only 23% of facilities reported having this) and at least one lab staff formally trained in microscopy in the previous 2 years (47%). Targets were developed based on performance in the previous project year, indicating that the proportion of facilities with all required materials to confirm malaria diagnosis has not significantly improved. Although MalariaCare activities, per the PY5 work plan, have a limited role in improving this indicator, we are sharing this information with the NMCP for further action.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.4	OTSS Data From EDS	50%	92%	411	445			<p>Target reached.</p> <p>MalariaCare, per the PY5 work plan, planned to do three rounds of supervision in PY5 - one round of OTSS to all facilities, with an additional two rounds to 50% of facilities. However, during the year the strategy was changed to maximize the number of facilities that received a minimum of three visits. All Phase 2 and Phase 3 facilities were targeted to receive two visits in PY5, so that they would receive a total of three and two visits, respectively, before the end of the program. Phase 1 facilities were targeted to receive one visit, so that they would receive a total of three visits before the end of the program, with the lowest performing 50% of facilities receiving an additional fourth visit. A third OTSS round in PY5 was not held due to delays resulting from the health worker strike. Thus, the number of facilities targeted to receive 2 visits became 387 (87%) of the 445 facilities that do microscopy. In total, 411 (92%) of the 445 received 2 visits in PY5.</p>

Malawi performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	N/A	NMCP, ONSE	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Malawi, this tool is endorsed by the national government as the national supervision tool. These tools are now being used by the NMCP and the ONSE project during their implementation OTSS.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	75%	84%	87	103	96%	100%	Target reached. Of the 103 lab staff observed conducting RDTs during OTSS, 87 (84%) received a score of 90% or greater. Providers most frequently missed the following steps: checking expiry date (21%) and labeling the cassette (12%).

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	50%	65%	125	192	92%	97%	Target reached. Of the 192 lab staff observed conducting malaria microscopy during OTSS, 125 (65%) received a score of 90% or greater. Lab workers performed more poorly on slide preparation than on staining or reading slides. Providers most frequently missed the following steps, which are both part of slide preparation: cleaning the slide (27%) and air-drying thick film slide before staining (23%).
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	70%	68%	23	34	92%	92%	Target not reached. Of the 34 clinical staff observed conducting RDTs during OTSS, 23 (68%) received a score of 90% or greater. Providers most frequently missed the following steps: checking the expiry date (41%) and labeling the cassette (41%). The number of observations in indicators 2 and 4 are relatively low because the majority of the RDT observations were done with other workers who are not clinicians who more often conduct RDTs, namely attendants (225, 39%), HSAs (103, 18%), and groundskeepers (62, 11%). Of the 581 observations of unique facility personnel who conducted RDTs, 77% met the 90% target, with a mean of 94% and a median of 96%.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2, 3.3	Team Supervision Reports	50%	51%	206	402			<p>Target reached.</p> <p>Facilities must meet all of the conditions below to achieve the standard for quality diagnosis.</p> <p>Of these 402 facilities:</p> <ul style="list-style-type: none"> – 340 (90%) had no stock-outs of RDTs of 7 days or more over the previous 3 months; – 310 (77%) had RDT bench aids and/or SOPs, and – 304 (76%) had at least 1 person trained in RDTs in the previous 3 years.
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers. Note: Must score at least Level A or B on parasite detection (>=80%) and parasite quantification (>=40%)	N/A	N/A	N/A	N/A	N/A	N/A			<p>Target not applicable.</p> <p>MalariaCare did not conduct any MDRT training for supervisors in PY5.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not conduct any RDT supervisor training in PY5.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.2, 3.3	OTSS Data From EDS	75%	76%	307	405			Target reached. Of the 406 facilities visited during OTSS that conduct RDTs, 405 (99%) reported on whether staff were trained in RDTs. Of the 405 facilities with data, 307 (76%) had at least 1 provider formally trained in RDTs.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	1.1, 1.2	OTSS Data From EDS	85%	54%	62	115			<p>Target not reached.</p> <p>Of the 118 facilities visited during OTSS that conduct microscopy, 115 (97%) reported on whether staff were trained in microscopy. Of these 115 facilities, 62 (54%) had at least one provider formally trained in microscopy. According to the PY5 work plan, MalariaCare planned to train 20 staff across 20 facilities in conducting microscopy and 20 were trained. Of these facilities, 17 were visited during OTSS. In September 2016, 8 of these 17 facilities had at least 1 person trained in microscopy. The lab assistant training occurred in October to November 2016. By December 2016, 15 of the 17 facilities had at least 1 person trained in microscopy. While this training helped to increase microscopy capacity in-country, the numbers trained were not sufficient to reach the target. This may be due in part to turnover among lab staff. Additional training would need to be conducted to address the low numbers of facilities with staff trained in malaria microscopy.</p>
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MDRT in the last two years/Total number of targeted facilities.	1.1, 1.2	MDRT Activity Reports	95%	103%	60	58			<p>Target reached.</p> <p>In PY4 and PY5 MalariaCare planned to train 58 providers from 58 facilities in malaria microscopy. Of these 60 (103%) were trained.</p>
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	N/A	N/A	N/A	N/A	N/A	N/A			<p>Target not applicable.</p> <p>No RDT QA training planned in PY5.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No RDT QA training planned in PY5.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.1, 1.2	MDRT Activity Reports	95%	50%	20	20			Target reached. MalariaCare, per the PY5 work plan, planned to train 20 laboratory staff; 20 (100% of target) attended the training.
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No OTSS supervisor training in PY5.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No OTSS supervisor training in PY5.

Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria

Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.

Intermediate Objectives

Providers demonstrate competence in detecting suspected malaria cases

Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases

Private facilities are linked with the public sector

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Malawi's national guidelines for malaria case management, which include guidelines for determining suspected malaria cases, adhere to global standards.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	85%	97%	517	534			Target reached. Of the 534 providers observed during OTSS, 517 (97%) asked about history of fever or checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.2, 3.3	OTSS Data From EDS	95%	98%	522	534			Target reached. Of the 534 providers observed during OTSS, supervisors agreed with 522 (98%) of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In Malawi, this tool is endorsed by the national government as the national supervision tool. These tools are now being used by the NMCP and the ONSE project during their implementation of OTSS.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl.QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Malawi's national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include supervision of malaria treatment, adhere to global standards. In Malawi, this tool is endorsed by the national government as the national supervision tool. These tools are now being used by the NMCP and the ONSE project during their implementation of OTSS.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	30%	40%	162	404			<p>Target reached.</p> <p>Data for this indicator was available for 404 (98%) of the 406 facilities visited for OTSS. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of the 404 facilities with data:</p> <ul style="list-style-type: none"> -291 (72%) had the most recent malaria case management guidelines -317 (78%) had at least 1 staff formally trained in malaria case management in the previous 2 years -369 (91%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months -276 (68%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months.
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	90%	94%	2286	2442			<p>Target reached.</p> <p>Of the 2,442 records of positive test results reviewed by OTSS supervisors, 2,286 (94%) were found to have a corresponding ACT prescription recorded, in accordance with global standards.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.2, 3.3	OTSS Data From EDS	95%	98%	2396	2451			Target reached. Of the 2,451 records of negative test results reviewed by OTSS supervisors, a corresponding ACT prescription was not found for 2,396 (98%) results, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No OTSS supervisor training in PY5.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.2, 3.3	OTSS Data From EDS	95%	96%	388	406			Target reached. MalariaCare, per the PY5 work plan, planned to visit 260 joint and 146 facilities without labs in both rounds of OTSS, which makes the target 406. As the PMP was not updated with the final version of the work plan, the denominator for this target was adjusted from 146 to 406 to match the work plan. We still expected 95% of the facilities to receive 2 clinical supervisory visits this year.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No case management training in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	95%	99%	525	529			Target reached. Of the 529 clinical providers observed during OTSS, 525 (99%) received feedback from supervisors.
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No OTSS supervisor training in PY5.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Malawi, this tool is endorsed by the national government as the national supervision tool. These tools are now being used by the NMCP and the ONSE project during their implementation of OTSS.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.2	OTSS Data From EDS	35%	42%	48	115			Target reached. Data for this indicator was available for 115 of the 118 facilities (97%) visited for OTSS that conduct microscopy. Of these 115 facilities, 48 (42%) had updated MOH guidelines on microscopy.
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	80%	93%	85	91	96%	100%	Target reached. Data for this indicator was available for 91 of the 118 facilities (77%) visited for OTSS that perform microscopy. Of these 91 facilities, 85 (93%) scored 90% or greater on slide rechecking.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, Giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.2	OTSS Data From EDS	15%	1%	1	115			<p>Target not reached.</p> <p>Data for this indicator was available for 115 of the 118 facilities (97%) visited for OTSS that perform microscopy. In order to meet this indicator, facilities must have: a functional microscope; no stock-outs lasting more than 7 days in the previous 3 months for 6 malaria microscopy supplies that would impede malaria microscopy; a microscopy bench aid or standard operating procedures present in the lab; and at least 1 lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed were having pH paper/meter (only 4% of facilities reported having this in stock) and having at least 1 lab staff formally trained in microscopy (only 54% of facilities reported having at least 1 lab staff trained).</p>
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.3	OTSS Data From EDS	95%	98%	255	260			<p>Target reached.</p> <p>MalariaCare, per the PY5 work plan, planned to visit 260 facilities twice for joint OTSS. As the PMP was not updated with the final version of the work plan, a target was not set for this indicator. However, we expected 95% of the joint OTSS facilities to receive 2 supervisory visits this year. Of the 260 planned facilities, 255 (98%) were visited twice for joint OTSS.</p>

Mali performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	3.1, 3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mali, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. Because almost all RDT observations conducted during OTSS were of health facility staff located in the outpatient department, results for laboratory workers are not reported. See indicator 4 for results for clinical staff.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	75%	82%	37	45	95%	97%	Target reached. Of the 45 lab staff observed conducting malaria microscopy during OTSS, 37 (82%) received a score of 90% or greater.
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.1, 3.2	OTSS Data From EDS	60%	72%	206	288	92%	96%	Target reached. Of the 288 clinical staff observed conducting RDTs during OTSS, 206 (72%) received a score of 90% or greater.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.1, 3.2	OTSS Data From EDS	65%	76%	110	144			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Results were available for 143 out of 144 facilities visited during PY5. Of these 143 facilities: – 128 (90%) had no stock-outs of RDTs of 7 days or more over the previous 3 months – 129 (90%) had RDT bench aids and/or SOPs – 133 (93%) had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers. Note: Must score at least Level A or B on parasite detection (>=80%) and parasite quantitation (>=40%)	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No MDRT for supervisors was planned for PY5.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	1.4	RDT QA Activity Report	100%	86%	42	49	89%	95%	Target not reached. Of the 49 supervisors tested during either the RDT QA TOT or the RDT QA for district supervisors, 42 (75%) scored 90% or greater on the RDT knowledge test. Commonly missed questions included proper disposal of waste, checking the expiration date, and wearing gloves. These steps were reviewed with supervisors prior to the end of the RDT QA training.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.1, 3.2	OTSS Data From EDS	95%	93%	134	144			Target not reached. Of the 143 facilities visited during OTSS that conduct RDTs, all 143 (100%) facilities reported on whether staff were trained in RDTs. 133 facilities of these 143 (93%) had at least 1 provider that received formal training on RDTs. However, all CSRefs received RDT QA training in PY5 via training of OTSS supervisors, who then went on to train providers on-site in RDTs during OTSS visits at all but one CSCom.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	3.1	OTSS Data From EDS	50%	85%	28	33			Target reached. Of the 35 facilities visited during OTSS that conduct microscopy, 33 (97%) reported on whether staff were trained in microscopy. Of these facilities, 28 (85%) reported having at least 1 staff formally trained in microscopy. The improvement is at least partially attributable to the MDRT trainings conducted in both PY4 and PY5.
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	1.2	MDRT Training Report	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare, per the work plans, proposed to train 20 lab workers in PY4 and 40 in PY5 during MDRTs; all 60 were trained. Participants were selected based on health facility need and supervisor turnover rather than targeting a specific number of health facilities.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	1.5	RDT TOT and RDT QA Activity Reports	95%	172%	31	18			Target reached. Due to the health workers strike affecting implementation timelines, MalariaCare revised the programmatic approach to this activity in order to ensure it could be implemented before the close of the project. Formal RDT QA training was not conducted at CSComs as originally proposed in the work plan. Instead, an RDT TOT was followed by a RDT QA training of OTSS supervisors so that training could be conducted on-site. Under the revised approach, MalariaCare aimed to train 2 clinicians as master trainers and a minimum of 1 clinical supervisor per district for 16 districts. Ultimately, 9 clinician master trainers and 22 supervisors were trained.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	1.5	RDT TOT and RDT QA Activity Reports	95%	106%	19	18			Target reached. Due to the health workers strike affecting implementation timelines, MalariaCare revised the programmatic approach to this activity in order to ensure it could be implemented before the close of the project. Formal RDT QA training was not conducted at CSComs as originally proposed in the work plan. Instead, an RDT TOT was followed by a RDT QA training of OTSS supervisors so that training could be conducted on-site. Under the revised approach, MalariaCare aimed to train 2 laboratory technician as master trainers and a minimum of 1 lab supervisor per district for 16 districts. Ultimately, 9 clinician master trainers and 22 supervisors were trained.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.2	MDRT Activity Report	95%	100%	40	40			Target reached. MalariaCare, per the PY5 work plan, planned to train 40 laboratory staff during MDRT; all attended the training.
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	2.2	Supervisor Training Activity Report	90%	170%	17	10			Target reached. MalariaCare, per the PY5 work plan, planned to train 10 clinical supervisors in supervision of RDTs during the supervisor training; 17 (170% of target) attended the training.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	2.2	Supervisor Training Activity Report	90%	20%	2	10			Target not reached. MalariaCare, per the PY5 work plan, planned to train 10 laboratory supervisors in supervision of RDTs during the supervisor training; 2 (20% of target) attended the training. It was determined that more clinical supervisors needed to be trained due to more frequent turnover than lab supervisors, rather than training an equal distribution of lab and clinical supervisors as specified in the work plan.
Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria											
Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.											
Intermediate Objectives											
Providers demonstrate competence in detecting suspected malaria cases											
Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases											
Private facilities are linked with the public sector											
Intermediate Outcomes											
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	PNLP	1/1	1/1	1	1			Target reached. The Government of Mali's national guidelines for malaria case management, which includes guidelines for determining suspected malaria cases, adhere to global standards.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.1, 3.2	OTSS Data From EDS	98%	99%	261	262			Target reached. Of the 262 providers observed during OTSS, 261 (99%) asked about history of fever or checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.1, 3.2	OTSS Data From EDS	98%	100%	262	262			Target reached. Of the 262 providers observed during OTSS, supervisors agreed with all of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	3.1, 3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In Mali, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Service providers demonstrate competence in malaria treatment

Facilities are able to provide high quality case management services for malaria and other febrile illness

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	PNLP	1/1	1/1	1	1			Target reached. The Government of Mali’s national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	3.1, 3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare’s clinical supervision tools, which include supervision of malaria treatment, adhere to global standards. In Mali, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.1, 3.2, 4.1	OTSS Data From EDS	85%	84%	121	144			<p>Target not reached. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of these 144 facilities:</p> <ul style="list-style-type: none"> – 128 (89%) had the most recent malaria case management guidelines – 132 (92%) had at least 1 staff formally trained in malaria case management in the past 2 years – 142 (99%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months – 143 (99%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months <p>Although progress was made from the previous year (75% met the standard), the lack of guidelines at certain facilities seem to be the main restricting factor in reaching this year’s target. The need to more widely disseminate the guidelines was an action point discussed by regional directorates during the regional close-out meetings.</p>
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.1, 3.2	OTSS Data From EDS	90%	90%	840	936			<p>Target reached. Of the 936 records of positive test results reviewed by OTSS supervisors, 840 (90%) were prescribed ACTs.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.1, 3.2	OTSS Data From EDS	90%	96%	893	929			Target reached. Of the 929 records of negative test results reviewed by OTSS supervisors, 893 (96%) were not prescribed ACTs in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	2.2	Supervisor Training Activity Report	90%	100%	1	1	85%	85%	Target reached. One CCMRT participant went on to participate in the supervisor training; this supervisor obtained a score of 85%.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.1, 3.2	OTSS Data From EDS	95%	99%	143	144			Target reached. MalariaCare, per the PY5 work plan, planned to visit 144 facilities during 2 rounds of OTSS. Of these 144 facilities, 143 facilities were visited twice; 1 facility was not visited in Round 4 due to insecurity issues.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	2.2	CCMRT Activity Report	95%	100%	80	80			Target reached. MalariaCare, per the PY5 work plan, planned to train 80 clinicians in malaria treatment during the CCMRT over the course of 4 sessions. All 80 clinicians attended the training.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.1, 3.2	OTSS Data From EDS	95%	91%	236	259			Target not reached. Of the 259 clinical providers observed during OTSS, supervisors reporting providing immediate feedback to 236 (91%).
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	2.2	Activity/ Training Reports	95%	170%	17	10			Target reached. MalariaCare, per the PY5 work plan, planned to train 10 clinical supervisors in supervision of malaria treatment during the supervisor training, and 17 (170% of target) attended the training.
Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases											
Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.											
Intermediate Objectives											
Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses											
Private sector laboratories are integrated into national QA/QC and supervision strategies											
Reporting and monitoring information for malaria is integrated, complete and accurate											
Intermediate Outcomes											
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	3.1, 3.2	PNLP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mali, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

Outputs											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.1, 4.1	OTSS Data From EDS	95%	86%	30	35			Target not reached. Of the 35 facilities with functional labs, 30 (86%) had updated MOH guidelines on microscopy. MalariaCare distributed 15 copies of the national guidelines to CSComs with laboratories during OTSS Round 4.
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	65%	56%	18	32	87%	90%	Target not reached. Data for this indicator was available for 32 of the 35 facilities (91%) visited for OTSS that perform microscopy. Of these 32 facilities, 18 (61%) scored 90% or greater on slide rechecking. The target was set based on previous OTSS results, indicating that little improvement was seen in this area.
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.1	OTSS Data From EDS	3%	27%	8	30			Target reached. Data for this indicator was available for 30 of the 35 facilities (86%) visited for OTSS that perform microscopy. In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of 8 malaria microscopy supplies that would impede malaria microscopy lasting more than 7 days in the previous 3 months; a microscopy bench aid or standard operating procedures present in the lab; and at least 1 lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed was pH paper/meter (only 21% of facilities reported having this).

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.1	OTSS Data From EDS	95%	99%	143	144			Target reached. MalariaCare, per the PY5 work plan, planned to visit 144 facilities with a lab supervisor during 2 rounds of OTSS. Of these 144 facilities, 143 facilities were visited twice; 1 facility was not visited in Round 4 due to security concerns.

Mozambique performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	N/A	PNCM	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mozambique, this tool was endorsed by the national government as the national supervision tool. At the close of the project, this tool was provided to the PNCM to support future supervision visits and the PNCM and partners are seeking to harmonize this tool with additional tools from other implementing partners.
2*	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	70%	83%	5	6	85%	98%	Target reached. Of the 6 lab staff observed conducting RDTs during OTSS, 5 (83%) received a score of 90% or greater. The majority of those observed for RDTs were not lab staff, however, and most observed were clinical providers. Of all 141 health workers observed conducting RDTs during OTSS, 99 (70%) received a score of 90% or greater.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3*	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	85%	62%	40	65	91%	98%	Target not reached. Of the 65 lab staff observed conducting malaria microscopy during OTSS, 40 (62%) received a score of 90% or greater. Lab workers performed more poorly on slide preparation and slide staining than on slide reading. Providers most frequently missed the following steps: spreading thick film into 1-2cm diameter circle and reading the print placed under the slide (31%), and filtering stain prior to use (29%). These weaknesses were discussed during the provincial and national close-out meetings.
4*	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	70%	70%	94	135	90%	96%	Target reached. Of the 135 clinical staff observed conducting RDTs during OTSS, 94 (70%) received a score of 90% or greater. Of all 141 health workers observed conducting RDTs during OTSS, 99 (70%) received a score of 90% or greater.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	75%	80%	60	75			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of these 75 facilities: – 62 (83%) had no stock-outs of RDTs of 7 days or more over the previous 3 months; – 74 (99%) had RDT bench aids and/or SOP; and – 74 (99%) had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. There was no OTSS supervisor training in PY5.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. There was no OTSS supervisor training in PY5.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.1	OTSS Data From EDS	95%	99%	74	75			Target reached. Of the 76 facilities visited during OTSS that conduct RDTs, 75 (99%) reported on whether staff were trained in RDTs. 74 of these 75 facilities (99%) had at least 1 provider trained on RDTs.
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	3.1	OTSS Data From EDS	65%	92%	57	62			Target reached. Of the 62 facilities visited during OTSS that conduct microscopy, 62 (100%) reported on whether staff were trained in microscopy. Of the 62 that reported on microscopy training, 57 (92%) had at least 1 person trained in microscopy.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	1.1	MDRT Activity Report	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. MalariaCare only conducted microscopy training for national and provincial level staff during PY5. Because MDRTs for these two years were aimed at selection of participant to attend future ECAMM sessions, selection of participants was based on developing a core group of regional and national trainers rather than targeting certain facilities.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. There was no RDT QA training planned in PY5.
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. There was no RDT QA training planned in PY5.
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	1.1	MDRT Activity Report	95%	145%	16	11			Target reached. MalariaCare, per the PY5 work plan, planned to train 11 laboratory staff during MDRT; (145% of target) attended the training.
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. There was no OTSS supervisor training in PY5.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. There was no OTSS supervisor training in PY5.

Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria

Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.

Intermediate Objectives

Providers demonstrate competence in detecting suspected malaria cases

Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases

Private facilities are linked with the public sector

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	PNCM	1/1	1/1	1	1			Target reached. The Government of Mozambique's national guidelines for malaria case management, which includes guidelines for determining suspected malaria cases, adhere to global standards.
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.1	OTSS Data From EDS	95%	93%	152	163			Target not reached. Of the 163 providers observed during OTSS, 152 (93%) asked about history of fever or checked the patient's temperature.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.2	OTSS Data From EDS	90%	91%	146	161			Target reached. Of the 161 providers observed during OTSS, supervisors agreed with 146 (91%) of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	N/A	PNCM	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mozambique, this tool is endorsed by the national government as the national supervision tool. At the close of the project, this tool was provided to the PNCM to support future supervision visits and the PNCM and partners are seeking to harmonize this tool with additional tools from other implementing partners.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test											
Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.											
Intermediate Objectives											
Country has full national policies for malaria treatment											
Service providers demonstrate competence in malaria treatment											
Facilities are able to provide high quality case management services for malaria and other febrile illness											
Country has supervisory structures and implementation of supervision of malaria case management practices											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	PNCM	1/1	1/1	1	1			Target reached. The Government of Mozambique’s national guidelines for malaria case management adhere to global standards.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	N/A	PNCM	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mozambique, this tool is endorsed by the national government as the national supervision tool. At the close of the project, this tool was provided to the PNCM to support future supervision visits and the PNCM and partners are seeking to harmonize this tool with additional tools from other implementing partners.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	80%	87%	65	75			<p>Target reached.</p> <p>Data for this indicator was available for 75 (99%) of the 76 facilities visited for OTSS. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of the 70 facilities with data:</p> <ul style="list-style-type: none"> – 73 (97%) had the most recent malaria case management guidelines – 71 (95%) had at least 1 staff formally trained in malaria case management in the previous 2 years – 71 (95%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months – 73 (97%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months. <p>MalariaCare, per the Mozambique work plan, has a limited role in improving this indicator. This information was shared during the provincial and national close-out meetings for future action.</p>
27*	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.1	OTSS Data From EDS	97%	98%	616	627			<p>Target reached.</p> <p>Of the 627 records of positive test results reviewed by OTSS supervisors, 616 (98%) were found to have a corresponding ACT prescription recorded, in accordance with global standards.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28*	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.1	OTSS Data From EDS	95%	96%	595	622			Target reached. Of the 622 records of negative test results reviewed by OTSS supervisors, a corresponding ACT prescription was not found for 595 (96%) results, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. There was no OTSS supervisor training in PY5.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.1	OTSS Data From EDS	95%	107%	70	65			Target reached. MalariaCare, per the PY5 work plan, planned to visit 65 facilities in each round of OTSS. As the PMP did not match the narrative of the final work plan, the denominator for this target was adjusted from 88 to 65 to match the work plan narrative. The target remained at 95% of the facilities to receive two clinical supervisory visits this year. 70 (107%) of facilities were visited twice in the 2 OTSS rounds conducted during PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. There was no case management training in PY5.
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.1	OTSS Data From EDS	95%	97%	169	174			Target reached. Of the 174 clinical providers observed during OTSS, 169 (97%) received feedback from supervisors.
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. There was no OTSS supervisor training in PY5.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	N/A	PNCM	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Mozambique, this tool is endorsed by the national government as the national supervision tool. At the close of the project, this tool was provided to the PNCM to support future supervision visits and the PNCM and partners are seeking to harmonize this tool with additional tools from other implementing partners.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.1	OTSS Data From EDS	70%	98%	61	62			Target reached. Data for this indicator was available for 62 of the 62 facilities (100%) visited for OTSS that conduct microscopy. Of these 62 facilities, 61 (98%) had updated MOH guidelines on microscopy.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.1	OTSS Data From EDS	87%	84%	51	61	94%	100%	Target not reached. Data for this indicator was available for 61 of the 62 facilities (98%) visited for OTSS that perform microscopy. Of these 61 facilities, 51 (84%) scored 90% or greater on slide rechecking.
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.1	OTSS Data From EDS	5%	36%	21	59			Target reached. Data for this indicator was available for 59 of the 62 facilities (95%) visited for OTSS that perform microscopy. Of these 59 facilities, 21 (36%) met all required criteria. In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of six malaria microscopy supplies that would impede malaria microscopy lasting more than seven days in the previous three months; a microscopy bench aid or standard operating procedures present in the lab; and at least one lab staff formally trained in microscopy in the previous two years. Of these requirements, the most commonly missed was pH paper/meter (only 39% of facilities reported having this).

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.1	OTSS Data From EDS	95%	107%	70	65			<p>Target not reached.</p> <p>MalariaCare, per the PY5 work plan, planned to conduct two OTSS visits with lab supervisors in each round of OTSS. As the PMP did not match the narrative of the final work plan, the denominator for this target was adjusted from 88 to 65 to match the work plan narrative. The target remained at 95% of the facilities to receive two clinical supervisory visits this year.</p> <p>70 (107%) of facilities were visited twice in the 2 OTSS rounds conducted during PY5</p>

*In the last OTSS round in Cabo Delgado, Nampula and Tete, supervisors observed only those providers who had received previous OTSS mentorship, while in previous rounds any staff at the health facility were observed. This resulted in a dramatic increase in the proportion of facilities meeting the 75 percent minimum performance targets. As this data was not comparable to previous rounds, and does not reflect the full performance of the health facilities we did not include it in the PMP analysis or in the analysis of the OTS results included in the narrative.

Tanzania performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Country has supervisory structure for laboratory case management of malaria											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In PY5, MalariaCare worked closely with the NMCP to further revise the tool for use by the NMCP and all partners involved in supervision visits.
2	Percentage of targeted laboratory technicians demonstrating competence in RDTs.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	85%	94%	336	359	97%	100%	Target reached. Of the 359 lab staff observed conducting RDTs during OTSS, 336 (94%) received a score of 90% or greater. Of all 767 health workers observed conducting RDTs during OTSS, 701 (91%) received a score of 90% or greater.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technicians demonstrating competence in malaria microscopy.	Number of targeted laboratory technicians who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technicians who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	80%	84%	234	277	96%	99%	Target reached. Of the 277 lab staff observed conducting malaria microscopy during OTSS, 234 (84%) received a score of 90% or greater.
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	85%	89%	365	408	97%	100%	Target reached. Of the 408 clinical staff observed conducting RDTs during OTSS, 365 (89%) received a score of 90% or greater. Of all 767 health workers observed conducting RDTs during OTSS, 701 (91%) received a score of 90% or greater.
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	60%	74%	306	415			Target reached. Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of the 415 facilities that had all relevant data: –331 (80%) had no stock-outs of RDTs of 7 days or more over the previous 3 months; –403 (97%) had RDT bench aids and/or SOPs, and –396 (95%) had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not conduct any aMDRT supervisor training in PY5.
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not conduct any supervisor training that include RDT training in PY5.
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.2	OTSS Data From EDS	95%	96%	436	456			Target reached. Of the 470 facilities visited during OTSS that conduct RDTs, 456 (97%) reported on whether staff were trained in RDTs. 436 facilities of these 456 (96%) had at least 1 provider trained on RDTs. In PY5, MalariaCare trained 74 additional staff in conducting RDTs across 74 facilities in Dar and Pwani, areas where MalariaCare also conducts OTSS. The training in PY5, in addition to RDT QA training conducted in previous years, has led to a high coverage of facilities with at least one person trained in using RDTs.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	3.2	OTSS Data From EDS	25%	31%	61	200			Target reached. Of the 253 facilities visited during OTSS that conduct microscopy, 200 (79%) reported on whether staff were trained in microscopy. Targets were developed based on performance in the previous project year, indicating that the level of formal microscopy training has not significantly improved in OTSS facilities. MalariaCare activities, per the Tanzania work plan, had a limited role in improving this indicator.
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not conduct any MDRT training in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	2.1	RDT QA Activity Report	95%	53%	74	139			<p>Target not reached.</p> <p>As per the PY5 work plan, we planned to train 139 health workers, with the trainees split between lab, clinical, and lower level staff who routinely conduct RDTs at health facilities. Following work planning, we discovered that 49 of the facilities included in our target were actually for-profit facilities and should consequently not be included in the training. The updated target was set as the 90 remaining facilities. In PY5 we trained 74 health workers (53% of the original 139 target and 82% of the revised target of 90). We did not reach the target of 90 facilities due to human resource challenges at some health facilities. Some facilities had only two staff during the time when the training was scheduled. They could not close the facilities and leave patients unattended.</p> <p>Of the 74 trained health workers, 54 (73%) were lab staff, 19 (26%) were clinicians and 1 (1%) was another health worker.</p> <p>Note: Additional RDT QA training was conducted in Tabora and Tanga, outside of the MalariaCare zones. No specific targets were set for this activity as we were providing logistical and technical support to activities led and planned by the NMCP.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
12	Percentage of targeted laboratory technicians trained in RDTs.	Number of laboratory technicians trained in RDTs/Total number of targeted laboratory technicians.	2.1	RDT QA Activity Report	95%	53%	74	139			<p>Target not reached. As per the PY5 work plan, we planned to train 139 health workers, with the trainees split between lab, clinical, and lower level staff who routinely conduct RDTs at health facilities. Following work planning, we discovered that 49 of the facilities included in our target were actually for-profit facilities and could, therefore, not be included in the training. The updated target was set as the 90 remaining facilities. In PY5 we trained 74 health workers (53% of the original 139 target and 82% of the revised target of 90). We did not reach the target of 90 facilities due to human resource challenges at some health facilities. Some facilities had only one or two staff during the time when the training was scheduled so they could not close the facilities and leave patients unattended. Of the 74 trained health workers, 54 (73%) were lab staff, 19 (26%) were clinicians and 1 (1%) was another type of health worker.</p> <p>Note: Additional RDT QA training was conducted in Tabora and Tanga, outside of the MalariaCare zones. No specific targets were set for this activity as we were providing logistical and technical support to activities led and planned by the NMCP.</p>
14	Percentage of targeted laboratory technicians participating in MDRT.	Number of laboratory technicians participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technicians.	N/A	N/A	N/A	N/A	N/A	N/A			<p>Target not applicable. MalariaCare did not conduct any MDRT training in PY5.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	3.1	Supervisor Training Activity Report	95%	120%	18	15			Target reached. In PY5, MalariaCare planned to train 30 supervisors, roughly half of which would be clinical supervisors. MalariaCare trained a total of 40 supervisors, 18 of which were clinical supervisors.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	3.1	Supervisor Training Activity Report	95%	107%	16	15			Target reached. In PY5, MalariaCare planned to train 30 supervisors, roughly half of which would be laboratory supervisors. MalariaCare trained a total of 40 supervisors, 16 of which were laboratory supervisors. (The remaining 6 participants that were not clinicians or lab staff were district malaria focal persons who have a role in overseeing supervision.)
Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria											
Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.											
Intermediate Objectives											
Providers demonstrate competence in detecting suspected malaria cases											
Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases											
Providers demonstrate competence in malaria treatment											
Reference laboratories and facilities are able to provide high quality diagnostics for malaria and other febrile illness											
Private facilities are linked with the public sector											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Tanzania recently updated its national guidelines for malaria case management which includes guidelines for determining suspected malaria cases.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.2	OTSS Data From EDS	95%	99%	685	695			Target reached. Of the 695 providers observed during OTSS, 685 (99%) asked about history of fever or checked the patient's temperature.
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.2	OTSS Data From EDS	95%	99%	679	685			Target reached. Of the 685 providers observed during OTSS, supervisors agreed with 679 (99%) of them on whether to order a malaria test for a febrile patient.
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools adhere to global standards. In PY5, MalariaCare worked closely with the NMCP to further revise the tools for use by the NMCP and all partners involved in supervision visits.

Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test

Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.

Intermediate Objectives

Country has full national policies for malaria treatment

Health care providers demonstrate competence in malaria treatment

Country has supervisory structures and implementation of supervision of malaria case management practices

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	NMCP	1/1	1/1	1	1			Target reached. The Government of Tanzania recently updated its national guidelines for malaria case management which includes guidelines for determining suspected malaria cases.
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools adhere to global standards. In PY5, MalariaCare worked closely with the NMCP to further revise the tools for use by the NMCP and all partners involved in supervision visits.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	60%	61%	261	427			<p>Target reached.</p> <p>Data for this indicator was available for 427 (90%) of the 477 facilities visited for OTSS. Of the 427 with data 261 (61%) met all required conditions. Facilities must meet all conditions below to achieve the standard for quality malaria treatment.</p> <p>Of the 427 facilities with data:</p> <ul style="list-style-type: none"> – 377 (88%) had the most recent malaria case management guidelines – 341 (80%) had at least 1 staff formally trained in malaria case management in the previous 2 years – 414 (97%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months – 352 (82%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months.
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.2	OTSS Data From EDS	95%	91%	2793	3056			<p>Target not reached.</p> <p>Of the 3,056 records of positive test results reviewed by OTSS supervisors, 2,793 (91%) were found to have a corresponding ACT prescription recorded, in accordance with global standards.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.2	OTSS Data From EDS	95%	95%	2877	3022			Target reached. Of the 3,022 records of negative test results reviewed by OTSS supervisors, a corresponding ACT prescription was not found for 2,877 (95%) results, in accordance with global standards.
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Target not applicable. MalariaCare did not conduct any malaria case management supervisor training in PY5.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. As per the final work plan, only one round of OTSS was included. Thus this target should be N/A, as no facilities will receive two rounds of clinical supervision under MalariaCare.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare did not conduct any malaria case management trainings in PY5.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.2	OTSS Data From EDS	95%	98%	658	674			Target reached. Of the 674 clinical providers observed during OTSS, 658 (98%) received feedback from supervisors.
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	3.1	OTSS Data From EDS	95%	120%	18	15			Target reached. In PY5, MalariaCare planned to train 30 supervisors, roughly half of which would be clinical supervisors. MalariaCare trained a total of 40 supervisors, 18 of which were clinical supervisors.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Service providers are able to provide high quality case management services for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

QA/QC strategies are robust and evidence-based

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	N/A	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In PY5, MalariaCare worked closely with the NMCP to further revise the tool for use by the NMCP and all partners involved in supervision visits.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.2	OTSS Data From EDS	35%	52%	105	202			Target reached. Data for this indicator was available for 202 of the 253 facilities (80%) visited for OTSS that conduct microscopy. Of these 202 facilities, 105 (52%) had updated MOH guidelines on microscopy.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	80%	72%	122	170	89%	100%	<p>Target not reached.</p> <p>Data for this indicator was available for 170 of the 228 facilities (75%) visited for OTSS that perform microscopy. Of these 170 facilities, 122 (72%) scored 90% or greater on slide rechecking.</p> <p>These weaknesses were shared with NMCP and other stakeholders during LLWs/MalariaCare's close-out meeting.</p>
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, Giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.2	OTSS Data From EDS	30%	5%	10	196			<p>Target not reached.</p> <p>Data for this indicator was available for 196 of the 228 facilities (86%) visited for OTSS that perform microscopy.</p> <p>In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of 8 malaria microscopy supplies that would impede malaria microscopy lasting more than 7 days in the previous 3 months; a microscopy bench aid or standard operating procedures present in the lab; and at least 1 lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed were pH paper/meter (only 11% of facilities reported having this) and having at least one lab staff formally trained in microscopy in the previous two years (31%).</p> <p>Targets were developed based on performance in the previous project year, where performance on this indicator was 3%. Given that MalariaCare activities, per the PY5 work plan, have a limited role in improving this indicator, even 30% was an ambitious target. We are sharing this information with the NMCP for further action.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	3.2	OTSS Data From EDS	50%	N/A	N/A	N/A			Target not applicable. As per the final work plan, only one round of OTSS was included. Thus this target should be N/A, as no facilities will receive two rounds of clinical supervision under MalariaCare.

Zambia performance monitoring plan

GOAL: Contribute to PMI's overall goal 50% reduction in the burden of malaria in 70% of the at-risk population in PMI focus countries.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Objective 2: Increased percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test.											
Objective 3: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses-consistent with the diagnostic test.											
Objective 4: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases.											
Objective 1: The accuracy of diagnostic testing for malaria is improved to greater than 90%.											
Description: The accuracy of diagnostic testing for malaria is improved to greater than 90 percent. The activities described in this section relate to addressing the laboratory technician and health care provider competency related to providing quality diagnostic services.											
Intermediate Objectives											
Clear and disseminated laboratory guidelines, procurement policies, supervision structures											
Clear and functioning quality assurance procedures for regulation of diagnostics for malaria and other IDs											
Reporting on malaria indicators is complete and accurate											
Country has complete national guidelines for the diagnosis of malaria											
Providers demonstrate competence in RDTs and/or microscopy											
Intermediate Outcomes											
#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
1	Percentage of targeted countries with national malaria diagnostics supervision tools whose indicators adhere to global standards.	Number of targeted countries whose national malaria diagnostics supervision tools adhere to global standards/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Zambia, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
2	Percentage of targeted laboratory technologists demonstrating competence in RDTs.	Number of targeted laboratory technologists who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of lab staff who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	40%	87%	20	23	94%	96%	Target reached. Of the 23 lab staff observed conducting RDTs during provincial OTSS, 20 (87%) received a score of 90% or greater.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PYS Results					Comment
						%	Num.	Den.	Mean	Median	
3	Percentage of targeted laboratory technologists demonstrating competence in malaria microscopy.	Number of targeted laboratory technologists who score 90% or greater on supervisory checklist measuring slide preparation and parasite detection/Total number of laboratory technologists who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	90%	74%	39	53	91%	96%	<p>Target not reached. Of the 53 lab staff observed conducting malaria microscopy during OTSS, 39 (74%) received a score of 90% or greater.</p> <p>The target was set based on previous rounds' performance; however, for the most recent round, lab supervisors were selected based on their competence on parasite detection. This may have led to more rigorous grading during the observation.</p>
4	Percentage of targeted clinical providers that demonstrate competence in RDTs.	Number of targeted clinical providers who score 90% or greater on supervisory checklists measuring the preparation and reading of the malaria RDTs/Total number of clinical providers who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	40% provin. 70% sub-district	42% provin. 84% sub-district	11 provin. 174 sub-district	26 provin. 207 sub-district	83% provin. 95% sub-district	88% provin. 100% sub-district	<p>Target reached. Of the 233 clinical staff observed conducting RDTs during the OTSS rounds conducted this year, 185 (79%) received a score of 90% or greater.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
5	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality diagnosis of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists for diagnosis during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	60% provin. 30% sub-district	90% provin. 59% sub-district	18 provin. 64 sub-district	20 provin. 109 sub-district			<p>Target reached.</p> <p>Facilities must meet all of the conditions below to achieve the standard for quality diagnosis. Of these 129 facilities visited with data:</p> <ul style="list-style-type: none"> – 111 (86%) had no stock-outs of RDTs of 7 days or more over the previous 3 months; – 118 (91%) had RDT bench aids and/or SOPs, and – 104 (81%) had at least 1 person trained in RDTs in the previous 2 years.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PYS Results					Comment
						%	Num.	Den.	Mean	Median	
6	Percentage of supervisors demonstrating competence in malaria microscopy.	<p>Percentage of supervisors who score 90% or greater in slide preparation and parasite detection during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.</p> <p>Note: Must score at least Level A or B on parasite detection (>=80%) and parasite quantitation (>=40%)</p>	3.1, 3.4	MDRT Reports	45%	0%	0	20			<p>Target not reached. Of the 20 supervisors tested during MDRT, 5 (20%) scored at Level A or B (>=80%) for parasite detection; and none scored at Level A or B for parasite quantitation (>=40%).</p> <p>Because MDRT data was not available for the previous year, the target was based on available scores from similarly resourced countries (Malawi and Mozambique). Possible reasons for low scores are poor slide quality and poor facilitator to participant ratio (1:20).</p> <p>As a result of the poor results from this training, supervisors recommended for supervision had to have obtained at least Level A or B on parasite detection. In addition, 19 out of 20 supervisors were registered to participate in the virtual microscopy course to strengthen their skills, although Amref received course results from 8 participants due to issues with sending results as reported.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PYS Results					Comment
						%	Num.	Den.	Mean	Median	
7	Percentage of supervisors demonstrating competence in RDTs.	Percentage of supervisors who score 90% or greater in preparation and reading of RDTs during the training of trainers post-test/Total number of supervisors who completed a post-test during a training of trainers.	3.1, 3.4	Supervisor Training Activity Reports	95%	43%	10	23	80%	80%	Target not reached. Of the 23 supervisors tested during the supervisor training, 10 (43%) scored 90% or greater on the RDT knowledge. These results may have been the result of a low facilitator to participant ratio (1:23).
Outputs											
8	Percentage of targeted facilities with at least one provider trained in RDTs.	Number of targeted facilities with one or more providers trained in RDT/Total number of targeted facilities.	3.2, 3.3	OTSS Data From EDS	75% provin. 65% sub-district	90% provin. 78% sub-district	18 provin. 87 sub-district	20 provin. 111 sub-district			Target reached. Of the 131 facilities visited during OTSS, 131 (100%) reported on whether staff were trained in RDTs. Of the 131 facilities with data, 105 (80%) had at least 1 provider formally trained in RDTs.
9	Percentage of targeted facilities with at least one provider trained in malaria microscopy.	Number of target facilities with one or more providers trained in malaria microscopy/Total number of targeted facilities	3.2	OTSS Data From EDS	20%	75%	15	20			Target reached. Of the 20 facilities visited during provincial OTSS that conduct microscopy, all reported on whether staff were trained in microscopy. Of these facilities, 15 (75%) had at least 1 provider who was formally trained in malaria microscopy.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
10	Percentage of targeted facilities with at least one provider who received MDRT in the last two years.	Number of targeted facilities with one or more providers who received MRDT in the last two years/Total number of targeted facilities.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. MalariaCare, per the work plans, proposed to train 24 lab workers in PY4 and 20 in PY5 during MDRTs. Of these, 35 (79%) were trained. Because MDRTs for these two years were aimed at OTSS supervisors, selection of participants was based on regional supervisor need rather than targeting certain facilities.
11	Percentage of targeted clinical providers trained in RDTs.	Number of clinical providers trained in RDTs/Total number of targeted clinical providers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No training involving RDT QA for clinical providers, other than supervisors, was planned for PY5.
12	Percentage of targeted laboratory technologists trained in RDTs.	Number of laboratory technologists trained in RDTs/Total number of targeted laboratory technologists.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No training involving RDT QA for laboratory workers, other than supervisors, was planned for PY5.
14	Percentage of targeted laboratory technologists participating in MDRT.	Number of laboratory technologists participating in malaria diagnostics refresher trainings/Total number of targeted laboratory technologists.	3.1	Activity/ Training Reports	95%	83%	20	24			Target not reached. MalariaCare, per the PY5 work plan, planned to train 24 laboratory staff during MDRT; 20 (83% of target) attended the training as no additional facilitators were available.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
16	Percentage of targeted clinical supervisors trained in supervision of malaria diagnostics.	Number of clinical supervisors trained in supervision of malaria diagnostics/Total number of targeted clinical supervisors.	3.1, 3.4	Supervisor Training Reports	96%	23	24	96%			Target reached. MalariaCare, per the PY5 work plan, planned to train 24 clinical supervisors in supervision of RDTs during the supervisor training; 23 (96% of target) attended the training.
17	Percentage of targeted laboratory supervisors trained in supervision for laboratory diagnosis of malaria.	Number of supervisors trained in supervision for laboratory diagnosis of malaria/Total number of targeted laboratory supervisors.	3.1, 3.4	Supervisor Training Reports	95%	83%	20	24			Target not reached. MalariaCare, per the PY5 work plan, planned to train 24 laboratory staff during MDRT; 20 (83% of target) attended the training as no additional facilitators were available. Participants were given another opportunity for training during the upcoming distance-based learning course.
Objective 2: Increase percentage of patients suspected to have malaria or febrile illness who receive a diagnostic test for malaria											
Description: Increased percentage of patients suspected to have malaria or febrile illnesses who receive a diagnostic test for malaria. These activities relate to addressing health care provider performance in the use of diagnostic tools after appropriate training. Emphasis is on supervision and use of performance monitoring tools.											
Intermediate Objectives											
Providers demonstrate competence in detecting suspected malaria cases											
Providers demonstrate competence in ordering/conducting malaria diagnostic tests for suspected cases											
Private facilities are linked with the public sector											
Intermediate Outcomes											
19	Country has full national guidelines for determining suspected malaria cases.	Country has full national guidelines for determining suspected malaria cases (including age, duration of fever, fever history) that meet global standards.	N/A	National Guidelines	1/1	1/1	1	1			Target reached. The Government of Zambia's national guidelines for malaria case management, which includes guidelines for determining suspected malaria cases, adhere to global standards.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
20	Percentage of providers demonstrating competence in identifying suspected malaria cases according to global standards.	Number of providers who demonstrate correct procedures for differential diagnosis of possible malarial symptoms according to global standards during team supervision observation/Total number of providers targeted for team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	99% provin. 95% sub-district	100% provin. 100% sub-district	37 provin. 141 sub-district	37 provin. 141 sub-district			Target reached. Of the 178 providers observed during OTSS, 178 (100%) asked about history of fever or checked the patient's temperature.
21	Percentage of providers demonstrating competence in testing suspected patients for malaria.	Number of providers who appropriately order or perform testing of suspected malaria patients according to global standards during team supervision observations/Total number of providers targeted for team supervision observations during the reporting period.	3.2, 3.3	OTSS Data From EDS	99% provin. 95% sub-district	95% provin. 100% sub-district	35 provin. 141 sub-district	37 provin. 141 sub-district			Provincial: target not reached; sub-district: target reached. Of the 178 providers observed during OTSS, supervisors agreed with 176 (99%) of them on whether to order a malaria test for a febrile patient. Targets were based on previous performance, indicating a slight decline in performance among provincial OTSS facilities. This information was shared with NMCP and during the LLW.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
22	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for determining possible malaria cases.	Number of targeted countries whose national clinical supervision tools adhere to global standards for determining possible malaria cases/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include determining possible malaria cases, adhere to global standards. In Zambia this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
Objective 3: Increase percentage of patients who receive appropriate treatment for malaria or other febrile illnesses - consistent with the result of the diagnostic test											
Description: Increased percentage of patients who receive appropriate treatment for malaria or other febrile illnesses—consistent with the result of the diagnostic test. The activities described in this section relate to addressing health care provider performance in delivering appropriate treatment after training has occurred. Emphasis is on supervision and ongoing use of performance monitoring tools.											
Intermediate Objectives											
Country has full national policies for malaria treatment											
Service providers demonstrate competence in malaria treatment											
Facilities are able to provide high quality case management services for malaria and other febrile illness											
Country has supervisory structures and implementation of supervision of malaria case management practices											
Intermediate Outcomes											
24	Country has full national guidelines for malaria treatment.	Country has full national guidelines for malaria treatment, incl. QA/QC procedures, training of informal health providers, and recommendations for home treatment of febrile illness, suspected malaria, and recognition of the common danger signs that meet global standards.	N/A	National Guidelines	1/1	1/1	1	1			Target reached. The Government of Zambia's national guidelines for malaria case management adhere to global standards.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
25	Percentage of targeted countries with national clinical supervision tools whose indicators adhere to global standards for malaria treatment.	Number of targeted countries whose national clinical supervision tools adhere to global standards for malaria treatment/Total number of targeted countries.	3.2, 3.3	NMCP	1/1	1/1	1	1			Target reached. MalariaCare's clinical supervision tools, which include supervision of malaria treatment, adhere to global standards. In Zambia, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
26	Percentage of targeted clinics that meet standards (including appropriate materials, documentation, and qualified staff) for quality treatment of malaria.	Number of targeted clinics that meet 90% or greater on facility checklists during supervisory visits /Total number of targeted facilities who received a supervisory visit during the reporting period.	3.2, 3.3	OTSS Data From EDS	55% provin. 25% sub-district	42% provin. 51% sub-district	8 provin. 56 sub-district	19 provin. 110 sub-district			<p>Provincial: target not reached; sub-district: target reached.</p> <p>Data for this indicator was available for 129 (98%) of the 131 facilities visited for OTSS. Facilities must meet all conditions below to achieve the standard for quality malaria treatment. Of the 129 facilities with data:</p> <ul style="list-style-type: none"> - 108 (84%) had the most recent malaria case management guidelines - 88 (68%) had at least 1 staff formally trained in malaria case management in the previous 2 years - 120 (93%) had no stock-outs of a first-line antimalarial lasting more than 7 days in the previous 3 months - 112 (87%) had no stock-outs of paracetamol lasting more than 7 days in the previous 3 months. <p>Targets were developed based on performance in the previous project year, indicating that formal training in malaria case management has not significantly improved in provincial OTSS facilities. Although MalariaCare activities, per the PY5 work plan, have a limited role in improving this indicator, we shared this information with the national malaria program for future action.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
27	Percentage of targeted providers demonstrating compliance to treatment with WHO-recommended ACT for cases with positive malaria test results.	Number of providers who comply to treatment with a WHO-recommended anti-malarial for cases with positive malaria test results during clinical assessment visits measured through direct observation during team supervision visits/Total number of providers that received team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	99% provin. 98% sub-district	100% provin. 97% sub-district	139 provin. 494 sub-district	139 provin. 511 sub-district			Provincial: target reached; sub-district: target not reached. Of the 650 records of positive test results reviewed by OTSS supervisors, 633 (97%) included a prescription for an ACT in accordance with global standards.
28	Percentage of providers demonstrating adherence to negative test results according to global standards.	Number of providers demonstrating adherence to negative test results according to global standards during team supervision measured through direct observation during team supervision visits/Total number of providers that received team supervision during reporting period.	3.2, 3.3	OTSS Data From EDS	95%	90% provin. 97% sub-district	124 provin. 498 sub-district	138 provin. 515 sub-district			Provincial: target not reached; Sub-district: target reached. Of the 653 records of negative test results reviewed by OTSS supervisors, 622 (95%) had no corresponding ACT prescription documented, in accordance with global standards.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
29	Percentage of supervisors demonstrating competence in malaria treatment.	Number of supervisors who score greater than 80% on a treatment post-test during TOTs/Total number of supervisors who completed a post-test during a TOT.	3.1	Supervisor Training Reports	90%	78%	18	23	83%	83%	Target not reached. Of the 23 clinical participants at the supervisor training, 18 (78%) obtained a post-test score of 80% or greater. This contrasts with the previous clinical case management training for supervisors, where all supervisors obtained a score of 80% or greater. Possible reasons for low scores are the high turnover of clinical supervisors in the final year and poor facilitator to participant ratio.
Outputs											
30	Percentage of targeted facilities receiving at least two clinical supervisory visits per annum for malaria treatment.	Number of facilities receiving at least two clinical supervisory visits per annum for malaria treatment with WHO-recommended ACTs/Total number of targeted facilities.	3.3	OTSS Data From EDS	95%	39%	39	100			Target not reached. Per the PY5 work plan, MalariaCare planned to visit 5 facilities in each of the 20 districts during the 2 sub-district rounds. However, due to increases in DSA and fuel costs MalariaCare could only visit approximately 40% of the proposed facilities in the final round. Ultimately, a total of 39 facilities received a total of 2 visits from a clinical supervisor.
31	Percentage of targeted providers trained in malaria treatment.	Number of providers trained in malaria treatment with WHO-recommended ACTs/Total number of targeted providers.	N/A	N/A	N/A	N/A	N/A	N/A			Target not applicable. No training including malaria treatment was planned for PY5 except for the clinical supervisor training; results for that training are described in indicator 33.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
32	Percentage of targeted providers that received training in malaria treatment by supervisors during the reporting period.	Number of providers that received training in malaria treatment by supervisors based on documented errors during the reporting period/Total number of providers that had documented errors during team supervision during the reporting period.	3.2, 3.3	OTSS Data From EDS	95%	100% provin. 100% sub-district	20 provin. 140 sub-district	20 provin. 140 sub-district			Target reached. Of the 160 clinical providers observed during the most recent rounds of OTSS, supervisors reported providing feedback to 160 (100%).
33	Percentage of targeted clinical supervisors trained in supervision for treatment of malaria.	Number of clinical supervisors trained in supervision for treatment of malaria with WHO-recommended ACTs/Total number of targeted clinical supervisors.	3.1, 3.4	Supervisor Training Reports	95%	96%	23	24			Target reached. MalariaCare, per the PY5 work plan, planned to train 24 clinical supervisors in supervision of malaria treatment during the supervisor training; 23 (96% of target) attended the training.

Objective 4: Strengthen laboratory systems at the country level for detecting malaria and other infectious diseases

Description: Strengthened laboratory systems at the country level for detecting malaria and other infectious diseases. These activities relate to addressing the health systems issues that are a barrier to achieving universal access to malaria diagnostics and appropriate case management practices such as physical health facilities, human and financial resources, and support systems required to deliver quality diagnosis and treatment services.

Intermediate Objectives

Reference laboratories and facilities able to provide high quality diagnostics for malaria and other febrile illnesses

Private sector laboratories are integrated into national QA/QC and supervision strategies

Reporting and monitoring information for malaria is integrated, complete and accurate

Intermediate Outcomes

#	Indicator	Definition	Relevant Activity #	Data source	Target	PYS Results					Comment
						%	Num.	Den.	Mean	Median	
35	Percentage of targeted countries with national laboratory supervision tools whose indicators adhere to global standards for laboratory system analysis.	Number of targeted countries whose national laboratory supervision tools adhere to global standards for laboratory system analysis/Total number of targeted countries.	3.2, 3.3	NMCC	1/1	1/1	1	1			Target reached. MalariaCare's diagnostic supervision tools adhere to global standards. In Zambia, this tool is endorsed by the national government and used by the government and partners as the national supervision tool.
Outputs											
36	Percentage of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards.	Number of targeted facilities with complete and updated guidelines for malaria diagnosis that meet global standards/Total number of targeted facilities.	3.2	OTSS Data From EDS	80%	45%	9	20			Target not reached. Of the 20 health facilities visited for provincial OTSS, 9 (45%) had updated MOH guidelines on microscopy. Targets were developed based on performance in the previous project year, indicating that the availability of malaria microscopy guidelines has deteriorated. MalariaCare has a limited role in improving this indicator; we shared this information with NMEC for future action.

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
37	Percentage of targeted laboratories that meet global standards for quality malaria diagnostics	Number of targeted laboratories that meet 90% or greater on re-checking of malaria slides during supervisory visits/Total number of targeted who received a supervisory visit during the reporting period.	3.2	OTSS Data From EDS	95%	79%	15	19	93%	100%	<p>Target not reached. Data for this indicator was available for 19 of the 20 facilities (95%) visited for provincial OTSS. Of these 19 facilities, 15 (79%) scored 90% or greater on slide rechecking.</p> <p>The target was based on performance from the previous round. More stringent supervisor selection (those Level A or B on parasite detection were recommended to supervise this year's OTSS visits) may have led to them being more rigorous in their slide rechecking.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
38	Percentage of targeted laboratory facilities with all the required materials to confirm malaria diagnosis according to global standards.	Number of targeted facilities with all the required materials to confirm malaria diagnosis according to the global standards (including functioning microscope, slides, giemsa stain, and a trained lab technician)/Total number of targeted facilities with labs.	3.2	OTSS Data From EDS	5%	0%	0	19			<p>Target not reached. Data for this indicator was available for 19 of the 20 facilities (95%) visited for provincial OTSS.</p> <p>In order to meet this indicator, facilities must have: a functional microscope; no stock-outs of 8 malaria microscopy supplies that would impede malaria microscopy lasting more than 7 days in the previous 3 months; a microscopy bench aid or standard operating procedures present in the lab; and at least 1 lab staff formally trained in microscopy in the previous 2 years. Of these requirements, the most commonly missed were pH paper (only 11% of facilities reported having no significant stock-outs)</p> <p>Targets were developed based on performance in the previous project year, indicating that stock-outs of pH paper has not significantly improved. Although MalariaCare activities, per the PY5 work plan, have a limited role in improving this indicator, we shared this information with NMEC for further action.</p>

#	Indicator	Definition	Relevant Activity #	Data source	Target	PY5 Results					Comment
						%	Num.	Den.	Mean	Median	
39	Percentage of targeted facilities receiving at least two laboratory supervisory visits per annum.	Number of facilities receiving at least two laboratory supervisory visits per annum/Total number of targeted facilities.	N/A	N/A	95%	41%	41	100			Target not reached. Per the PY5 work plan, MalariaCare planned to visit 5 facilities in each of the 20 districts during the 2 sub-district rounds. However, due to increases in DSA rates and fuel costs, MalariaCare could only visit approximately 40% of the proposed facilities for the final round. Ultimately, a total of 41 facilities received a total of 2 visits from a lab supervisor.

Appendix C: Environmental mitigation and monitoring report

In PY5, MalariaCare organized malaria diagnostic, clinical, and supervisor training. During this training, small amounts of biomedical waste were generated: sharps, medical waste such as blood-exposed tubes and devices, and chemical waste (standard laboratory reagents) used for preparation of malaria microscopy slides. MalariaCare worked with in-country teams and NMCPs to assure that all sponsored training and onsite supervision activities discussed and adhered to the following three principles of medical waste management:

1. Safe collection of potentially infected body fluids or tissue samples.
2. Proper disposal of sharps and potentially infected body fluids/tissues into collection receptacles.
3. Appropriate disposal and/or destruction of infectious waste materials.

This section describes the environmental mitigation measures taken by MalariaCare in the project-supported countries.

Laboratory training was conducted in nationally accredited laboratories with appropriate safety measures in place. When clinical and supervisor training occurred outside of a health facility, and RDT demonstration and role-play were part of the training, as a standard practice facilitators used RDT kits with appropriate waste-collection equipment and transported any waste generated from the training sites back to the nearest health facility for appropriate disposal. Table 76 below describes key results for generation and management of biohazardous waste during MalariaCare-sponsored training.

Table 76. Environmental mitigation and monitoring plan

Describe specific environmental threats of your organization's activities (based on analysis in Section 3 of IEE)	Describe mitigation measures for these activities as required in Section 5 of IEE	Who is responsible for monitoring	Monitoring indicator	Monitoring method	Countries with implicated training in PYS	Proportion of countries adhering to mitigation measures
1. Education, technical assistance, training etc.						
<p>Training activities will generate small-scale medical waste (the mitigation of which is described below under "2. Management of medical waste").</p>	<p>MalariaCare includes in its training curriculum procedures to handle, label, treat, store, transport, and properly dispose of medical waste.</p>	<p>MalariaCare country coordinator (or country technical lead) in collaboration with trainers.</p>	<p>Training materials include appropriate references to management of medical waste.</p> <p>Proportion of countries conducting MalariaCare training with curriculum on proper medical waste management.</p>	<p>Review training materials; training reports</p>	<p>Burma Burundi DRC Ghana Kenya Malawi Mali Mozambique Tanzania Zambia</p>	<p>MalariaCare reviewed training materials for 32 clinical, diagnostic, and supervisor training for ten countries. Five of these countries (Burma, Ghana, Kenya, Malawi, and Mozambique) adequately addressed all three principles in all training activities, and five countries (Burundi, DRC, Mali, Tanzania and Zambia) addressed components, but not all three key principles. For three countries of the latter group, DRC, Tanzania, and Zambia, the materials used for training were national materials that were not created by MalariaCare. Of the 32 training sessions, 26 (81 percent) addressed all three principles, six addressed some, but not all three principles.</p>

2. Management of medical waste						
Describe specific environmental threats of your organization's activities (based on analysis in Section 3 of IEE)	Describe mitigation measures for these activities as required in Section 5 of IEE	Who is responsible for monitoring	Monitoring indicator	Monitoring method	Countries with implicated training in PY4	Proportion of countries adhering to mitigation measures
In most MalariaCare-supported countries, the project procures materials and reagents used for small-scale malaria microscopy slide preparation. The slides are generated for training purposes only—to improve diagnostic provider skills on slide preparation and reading. Biohazard waste materials generated during training include: contaminated latex gloves and plastic packaging, some hazardous chemicals (excess methanol and Giemsa solution), and blood-contaminated items (test tubes, needles, syringes, and rapid diagnostic tests).	MalariaCare used availability of appropriate waste management structures and processes as a criterion for training site selection. MalariaCare inspected medical waste disposal procedures and processes at facilities where training occurred to ensure that they met national guidelines and World Health Organization (WHO) best practices ("WHO's Safe Management of Waste from Healthcare Activities"). MalariaCare instituted processes to ensure that waste materials generated from MalariaCare training were disposed of in compliance with this international standard.	MalariaCare country coordinator (or country technical lead); MalariaCare training expert.	Completed training report that endorses appropriate collection and disposal of medical waste compliant with the three principles outlined above; copy of medical waste management procedures provided to project staff.	Training reports; site inspections	Burma Burundi DRC Ghana Kenya Malawi Mali Mozambique Tanzania Zambia	For the 32 relevant diagnostic, clinical and supervisor training sessions conducted in ten countries, MalariaCare received and reviewed training reports. Nine countries (Burundi, DRC, Ghana, Kenya, Malawi, Mali, Mozambique, Tanzania and Zambia) included in their training reports a section focused on waste management. MalariaCare also assessed medical waste management during outreach training and supportive supervision (OTSS) visits during rapid diagnostic test (RDT) and microscopy observations as well as in the general OTSS checklist section. (See Table 77 below showing analysis of the data from these sections of checklists)

Describe specific environmental threats of your organization's activities (based on analysis in Section 3 of IEE)	Describe mitigation measures for these activities as required in Section 5 of IEE	Who is responsible for monitoring	Monitoring indicator	Monitoring method	Countries with implicated training in PY4	Proportion of countries adhering to mitigation measures
MalariaCare procured and developed slides for the national archive of malaria slides (NAMS) for national quality assurance programs.	<p>As part of all training, MalariaCare provided procedures on the handling of medical waste and made the procedures available to staff if they are unavailable.</p> <p>As part of all training, MalariaCare trained project staff on medical waste protocols.</p>	MalariaCare country coordinator; MalariaCare training expert.	Completed training report that included information determining proper disposal and management of medical waste; copy of medical waste management procedures provided to project staff.	Training reports; site inspections	Malawi	In the country in which NAMS training occurred in PY5, the materials adequately addressed all three principles in the training.

Note: IEE=initial environmental examination; PY=project year; DRC=Democratic Republic of the Congo.

Table 77. Summary of waste management indicators picked up from site inspections during most recent outreach training and supportive supervision (OTSS) visit

Competency Area	Burundi	DRC	Ghana	Kenya	Malawi	Mali	Mozambique	Tanzania	Zambia	Overall
Microscopy		n=126		n=395	n=223	n=40	n=116	n=286	n=60	n=1246
Waste management: Sharps waste segregated and safely disposed in a safety box	Microscopy not performed in mobile clinics	90%	Not included in checklist	98%	96%	93%	100%	99%	98%	97%
Waste management: Infectious waste disposed of in appropriate waste containers		88%		94%	94%	85%	100%	95%	95%	94%
Waste management: Liquid waste appropriately washed off/disinfected		85%		92%	96%	50%	100%	98%	95%	93%
RDT	n=119	n=129	n=1559	n=1333	n=581	n=292	n=165	n=803	n=272	n=5253
Used tests, transfer devices, and other blood-contaminated material disposed	100%	92%	94%	93%	89%	75%	99%	91%	95%	92%
Used lancet disposed in sharps container	100%	91%	92%	99%	91%	86%	99%	97%	95%	95%
Facility practices	n=40	n=38		n=933	n=404	n=144	n=75	n=443		n=2077
Disposes of medical waste appropriately*	100%	92%	Not included in checklist	93%	99%	80%	35%	95%	Not included in checklist	92%
Has guidelines on standard precautions for infection prevention	Not included in checklist	69%		71%	57%	63%	91%	73%		68%

Note: For the indicators under microscopy and RDT, the n refers to the number of unique providers observed during OTSS in PY5. For the indicators under facility practices, the n is the number of facilities that submitted data on these indicators.

*Appropriately disposing of medical waste includes burning (incinerator or in a protected environment) and without burning (protected environment)

Appendix D: Documents developed with MalariaCare support

Over the course of the project, MalariaCare developed and adapted a standard set of tools for use during project implementation as applicable in each country. These 28 tools (listed in Table 78 below) are available at malariacare.org/resources/toolkit.

Table 78. Documents available in the MalariaCare toolkit

Tools for improving the quality of malaria diagnosis using microscopy and rapid diagnostic tests (RDT)		
RDT Training	Microscopy training	National archive of malaria slides (NAMS)
<ul style="list-style-type: none"> Malaria diagnostic refresher training learner’s manual Reading and interpreting malaria RDT results Malaria RDT knowledge test Checklist: Assessing RDT use 	<ul style="list-style-type: none"> Pre-external competency assessment and accreditation course National malaria microscopy competency assessment and accreditation course—facilitator’s manual Mentoring on common problems in slide preparation Evaluation form for laboratory supervisors Checklist: assessing malaria microscopy skills 	<ul style="list-style-type: none"> NAMS quality assurance visit structure
Tools for building competency in quality clinical case management		
Outreach training and supportive supervision (OTSS) clinical assessment	Mentoring on severe malaria	
<ul style="list-style-type: none"> MalariaCare clinical case management training guide Job aid: Completing malaria indicators on the monthly outpatient department morbidity forms Standard operating procedures (SOPs): health facility malaria committees SOPs: conduct of OTSS Evaluation form for clinical supervisors Checklist: Assessing clinical management of patients suspected of having malaria Checklist: Assessing health facility readiness 	<ul style="list-style-type: none"> Severe malaria—triage, diagnosis, and treatment – MalariaCare continuing malaria education module (English and French) Severe malaria clinical mentoring mentor activity report Severe malaria clinical mentoring mentee evaluation form Checklist: Assessing management of severe malaria 	
Tools for strengthening the quality of data collection and use for decision making		
Lessons learned workshops (LLWs)	MalariaCare’s Electronic Data System (EDS) supervisor training materials	
<ul style="list-style-type: none"> LLWs: sample terms of reference, agenda, and facilitator and participant action planning handouts (English and French) 	<ul style="list-style-type: none"> EDS supervisor training materials from Kenya and instructor slides EDS user manual from Kenya 	

In addition to the standard tools, such as training curricula and the OTSS checklists, MalariaCare provided financial and/or technical input into the development of the following documents in each country:

Table 79. Country-specific documents developed with technical and/or financial support from MalariaCare

Country	Documents developed/handed over
Burma	Volunteer profiles Village population data, including RDT testing and positive testing rates across project years
Burundi	Burundi malaria diagnostic QA manual National malaria treatment guidelines Mobile clinic supervision checklist Mobile clinic supervision activities dataset Malaria-related deaths patient file review tool Malaria-related hospitalizations of pregnant women patient file review tool Referral hospital file reviews dataset Report on malaria-related morbidity of pregnant women and malaria-related mortality within Burundi referral hospitals
Democratic Republic of the Congo	Laboratory SOPs and malaria diagnostics bench aids National guidelines for QA of malaria diagnostics National guidelines for selecting antimalarial commodities (included in National Strategic Plan 2016-2020) National case management guidelines Training materials and pocket guide for the updated national case management guidelines National Case Management Working Group terms of reference Haut Katanga iCCM Task Force terms of reference
Ethiopia	PT scheme manual and grading template WHO malaria microscopy reference materials
Ghana	M&E OTSS checklist National guidelines for laboratory diagnosis of malaria (second edition) National malaria microscopy and rapid diagnostic test QA manual (first edition) Revised national laboratory register Fever case management algorithm Revised national malaria case management guidelines National iCCM guidelines SOP on health information management OTSS process and data management manual PT scheme manual and grading template Ghana NAMS operations manual
Guinea	Report on supervision assessment PT implementation SOPs
Kenya	Clinical job aid Severe malaria and anemia management OTSS checklist PT implementation SOPs
Liberia	Integrated malaria, tuberculosis, HIV supervision checklist National diagnostics QA guidelines PT implementation manual
Madagascar	NAMS development training materials

Country	Documents developed/handed over
Malawi	<ul style="list-style-type: none"> National guidelines for laboratory diagnosis of malaria Malaria laboratory registers Laminated job aids for RDT use by HSAs iCCM mentorship handbooks iCCM mentorship tools and SOPs for RDTs PT implementation SOPs
Mali	<ul style="list-style-type: none"> Advanced User Guide for the Biological Diagnosis of Malaria National guidelines for malaria case management Job aid for treatment of uncomplicated malaria with ACTs Algorithm for management of uncomplicated malaria in pregnant women National guidelines for the management and distribution of long-lasting insecticide-treated nets; sulfadoxine pyrimethamine and seasonal malaria chemoprevention
Mozambique	<ul style="list-style-type: none"> PT implementation SOPs
Nigeria	<ul style="list-style-type: none"> MalariaCare Evaluation Report
Senegal	<ul style="list-style-type: none"> Assessment of National Parasitology Reference Laboratories' Capacity to Support the National Malaria Control Program (NMCP) in Senegal Procurement summary for SLAP equipment
Tanzania	<ul style="list-style-type: none"> National RDT testing accuracy quality control package (national RDT QA training materials) Fever case management algorithm (Swahili version) National malaria microscopy QA manual Malaria Services and Data Quality Improvement (MSDQI) package/tool PT implementation SOPs
Zambia	<ul style="list-style-type: none"> National malaria case management framework 2013 national malaria laboratory training manual Algorithm charts for severe and uncomplicated malaria Report on artemisinin therapeutic efficacy study PT implementation SOPs

Appendix E: MalariaCare webinars, presentations, and publications

Webinars presented by MalariaCare

- **Getting to universal diagnosis and treatment of malaria**, September 2013. Andrea Bosman, WHO; Doreen Ali, Malawi NMCP; Mwinyi Msellem, ZAMEP.
- **Engaging private providers in malaria case management**, March 2014. Larry Barat, PMI; Andrew Nyandigisi, Kenya Malaria Control Unit; Joyce Wanderi, PSI Kenya; Nkiru Anonvuo, Society for Family Health; Martin Dale, PSI.
- **Community case management of malaria**, September 2014. Hailemariam Legesse, UNICEF Ethiopia; Tanya Guenther and Emmanuel Chimbalanga, Save the Children Malawi; Sarah Andersson, John Snow, Inc.; Franco Pagnoni, WHO Global Malaria Program.
- **Quality of malaria rapid diagnostic testing in the field**, April 2015. Jane Cunningham, WHO; Daniel Kyabayinze, Foundation for Innovative New Diagnostics, Uganda; Yunhee Kim, Standard Diagnostics; Daouda Ndiaye, Cheikh Anta Diop University.
- **Communication and training to improve the quality of malaria case management**, September 2015. Scott Wittet, MalariaCare USA; Raphael Ntumy, MalariaCare Ghana; Kafula Silumbe, MACEPA, Zambia; Hnin Su Su Khin, PSI Burma.
- **Quality assurance approaches to improve malaria outcomes at health facility level**, March 2016. Alexander Rowe, US Centers for Disease Control and Prevention; Troy Martin, MalariaCare USA; Raphael Ntumy, MalariaCare Ghana.
- **Lessons learned from planning and implementation of proficiency testing schemes for malaria diagnosis**, March 2017. Jane Carter and Dennis Mwitwi, AMREF Africa; Bhavani Moodley, National Institute for Communicable Diseases, South Africa; Nicole Whitehurst, MalariaCare USA.

Presentations at international conferences

American Society of Tropical Medicine and Hygiene (ASTMH)

Philadelphia, 2015

- Building a System of Quality Assured Malaria Diagnostics in the Democratic Republic of the Congo (poster). Presented by Seraphine Kutumbakana.
- Greater Impact at Lower Cost: Prioritizing Support to Private Patent Medicine Vendors for Increased Quality Fever Case Management in Ebonyi State, Nigeria (poster). Presented by Victor Lara.
- Lessons Learned: Improving Malaria Case Management Competencies in Malawi (poster). Presented by Doreen Ali.

Atlanta, 2016

- Building a System of Quality Assured Malaria Case Management in the Democratic Republic of Congo (oral presentation). Presented by Fozo Alombah.
- Improving the Quality of Malaria Case Management in Public Health Facilities: MalariaCare's Experience in Western Kenya (oral presentation). Presented by Beatrice Onyando.
- Assessment of the use of Malaria Rapid Diagnostic Tests in Health Facilities in Ghana (poster). Presented by Andrew Quao.
- Pre-service Training Institutions: an Important Contributor to Scale-up of High Quality Malaria Case Management Services in Malawi (poster). Presented by Fozo Alombah.
- Lessons Learned: Malaria Case Management Training in Madagascar (poster). Presented by Pharath Lim
- Introduction of a Competency-based Selection Criterion for the WHO External Competency Assessment of Malaria Microscopists (poster). Presented by Nicole Whitehurst.
- Improving Quality of Care for Common Childhood Illness among Private Drug Vendors in Ebonyi State, Nigeria (poster). Presented by Jolene Wun.
- Using Outreach Training and Supportive Supervision (OTSS) Results to Monitor Adherence to Revised Malaria Treatment Guidelines in the Eastern Region of Ghana (poster). Presented by Jamie Eliades.
- Targeted Clinical Mentoring to Improve Quality of Malaria Case Management in Malawi: Preliminary Results (poster). Presented by Fozo Alombah.
- Improving Quality of Malaria Rapid Diagnostic Testing and Test Adherence through Enhanced Quality Assurance in Tanzania (poster). Presented by Goodluck Tesha.
- Development of Integrated Community Case Management in Rural Health Zones of Haut-Katanga, Democratic Republic of the Congo (poster). Presented by André Bopé.
- Efficacy and Safety of Artemether-lumefantrine for the Treatment of Uncomplicated Falciparum Malaria in Mainland Tanzania (poster). Presented by Deus Ishengoma.

Baltimore, 2017

- Using Outreach Training and Supportive Supervision to Maintain Microscopy Competency in Seven Sub-Saharan African Countries (oral presentation). Presented by Troy Martin.
- Building and Maintaining Health Care Worker Performance of Malaria Rapid Diagnostic Tests in Eight Sub-Saharan African Countries (oral presentation). Presented by Fozo Alombah.
- Lessons Learned: Malaria Diagnostic Refresher Training in Africa Francophone Countries (poster). Presented by Pharath Lim.
- MalariaCare Ghana: Experiences from the Field on Community Health Officers' Internship Program (poster). Presented by Julie Heinsen.
- Improving Adherence to the Kenya National Malaria Diagnosis and Treatment Guidelines: An Outreach, Training and Supportive Supervision (OTSS) Approach in Vihiga County, Western Kenya (poster). Presented by Elizabeth Marube.

- Improvements in Quality of Malaria Case Management through County Referral Hospital Medicine and Therapeutics Committees in Western Kenya – the Migori County Experience (poster). Presented by Elizabeth Marube.
- Improving Health Care Worker Performance in Clinical Case Management of Malaria and Other Febrile Illnesses in Eight Sub-Saharan African Countries (poster). Presented by Fozo Alombah.
- Improving Health Care Worker Performance in Adherence to Testing and Test Results for Malaria in Eight Sub-Saharan African Countries (poster). Presented by Troy Martin.
- Prevalence of mdr1 and k13 Polymorphisms in *P. falciparum* after a Decade of using Artemisinin-Based Combination Therapy in Mainland Tanzania (poster). Presented by Deus Ishengoma.
- PMI MalariaCare: Five years of Country Support to Improve Quality of Malaria Case Management in Sub-Saharan Africa and South East Asia (independent symposium). Presented by Troy Martin; MalariaCare USA; Pharath Lim, MalariaCare USA; Fozo Alombah, MalariaCare USA; Sarah Burnett, MalariaCare USA; Kwame Ankobea, PMI Ghana; Jamie Eliades, PSI Asia; Daouda Ndiaye, Cheikh Anta Diop University; Meera Venkatesan, PMI USA.

African Society for Laboratory Medicine (ASLM)

- Introduction of a Competency-based Selection Criterion for the WHO External Competency Assessment of Malaria Microscopists (poster). South Africa 2016. Presented by Nicole Whitehurst.

Peer-reviewed publications (in progress)

- Performance Outcomes From Africa-based Malaria Diagnostic Refresher Training Courses
- Effect of Supportive Supervision on Competency of Febrile Case Management in Sub-Saharan Africa
- Introduction and Evaluation of an Electronic Tool for Improved Data Quality and Data Use During Malaria Case Management Supportive Supervision
- Effect of Supportive Supervision on Malaria Microscopy Competencies in Sub-Saharan Africa
- Effect of Supportive Supervision on Performance of Malaria Rapid Diagnostic Tests in Sub-Saharan Africa
- Perspectives on Implementation Considerations and Costs of Malaria Case Management Supportive Supervision



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