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IMaD
Improving Malaria Diagnostics

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

IMPROVING MALARIA DIAGNOSTICS ANNUAL REPORT FY08

COOPERATIVE AGREEMENT: GHS-A-00-07-00022-00
MEDICAL CARE DEVELOPMENT INTERNATIONAL

IMPROVING MALARIA DIAGNOSTICS

FY2008 ANNUAL REPORT

USAID | IMaD PROJECT

The USAID | IMaD PROJECT is funded by the U.S. Agency for International Development (USAID) under contract no. GHS-A-00-07-00022-00, beginning September, 2007.

The project is run by Medical Care Development International (MCDI) in collaboration with the African Medical and Research Foundation (AMREF), Hydas World Health (HWH), the Swiss Tropical Institute (STI) and Cheikh Anta Diop University (CAD).

ABSTRACT

This work plan details IMaD activities from October 1, 2007 through September 30, 2008. Implementation activities covered in this report span four major areas which form the basis of IMaD's program objectives:

- National malaria policy development
- Laboratory baseline assessment
- Training, supervision and quality assurance
- Procurement assistance

This report discusses the major activities associated with each objective, the monitoring and evaluation criteria used to measure success and major accomplishments made throughout the year. In addition, this report highlights constraints and proffers potential solutions to overcome program challenges.

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Abbreviations

AMREF	African Medical and Research Foundation
CDC	Centers for Disease Control and Prevention
CSB	Centre de Santé de Bas
CSReF	Centre de Santé de Reference (Reference/District Hospital)
DOMC	Division of Malaria Control
EQA	External Quality Assurance
GFATM	Global Fund for AIDS, TB, and Malaria
Hb	Hemoglobin
HC	Health Center
HIV/AIDS	Human Immunodeficiency Virus/ Acquired immune deficiency syndrome
HSSP	Health Services and Systems Program
HWH	Hydas World Health
IMaD	Improving Malaria Diagnostics
INRSP	Institut Nationale de Recherche en Sante Publique
INSP	Instituto Nacional de Saude Publica
IPM	Pasteur Institute (Madagascar)
JSI	John Snow International
LIBR	Liberian Institute of Biomedical Research
M&E	Monitoring and Evaluation
MACEPA	Malaria Control and Evaluation Partnership in Africa
MCDI	Medical Care Development International
MOH	Ministry of Health
MOH&SW	Ministry of Health and Social Welfare
MOP	Malaria Operational Plans
MRTC	Malaria Research and Training Center
MSC	Mali Service Center
NGO	Non-governmental Organizations
NIAID /NIH	National Institute of Allergy and Infectious Diseases/National Institutes of Health
NMCC	National Malaria Control Center
NMCP	National Malaria Control Program
NPHL	National Public Health Laboratory

NPHRL	National Public Health Reference Laboratory
PEPFAR	President's Emergency Plan for AIDS Relief
PMI	President's Malaria Initiative
PNLP	Programme National de Lutte contre le Paludisme
PPE	Personal Protective Equipment
PT	Performance Testing
QA	Quality Assurance
RDT	Rapid Diagnostic Test
SOP	Standard Operating Procedure
STI	Swiss Tropical Institute
TA	Technical Assistance
TOR	Terms of Reference
TWG	Technical Working Group
USAID	United Stated Agency for International Development
USG	United States Government
WHO	World Health Organization

EXECUTIVE SUMMARY

This annual report describes the FY2008 activities of the Improving Malaria Diagnostics (IMaD) Project under USAID Cooperative Agreement GHS-A-00-07-00022-00. The work detailed in this document covers the period October 1, 2007 through September 30, 2008.

IMaD is a consortium of four non-governmental and academic organizations led by Medical Care Development International (MCDI) with collaborating partners: African Medical and Research Foundation (AMREF), Hydas World Health (HWH) and the Swiss Tropical Institute (STI). Consortium partners provide expertise in clinical laboratory diagnosis, strategic planning and policy development, preparation of national guidelines, training strategies and development of training materials, quality assurance programs and technical assistance on procurement to the U.S. Government President's Malaria Initiative (PMI) funded under USAID.

IMaD has four main objectives concerning improvement of malaria diagnostics under the PMI as per the MOPs:

1. To perform comprehensive baseline laboratory assessments to inform activities;
2. To develop and assist with the implementation of malaria laboratory diagnostic policy;
3. To provide training (clinical and laboratory diagnostics and management) and technical assistance for establishing quality assurance programs and supervision as they pertain to improving malaria diagnostics; and
4. To provide technical input on required equipment and supplies (PMI commodities) at country level.

Under these objectives, IMaD has developed a stepwise approach to building capacity that is tailored specifically to each country's requirements. Activities performed in support of IMaD objectives during FY2008 included:

1. Performance of comprehensive baseline laboratory assessments:
   - development and field testing of clinical and laboratory diagnosis assessment tools;
   - country-wide planning for the diagnostic assessment;
   - organization and training of assessment teams;
   - collection and analysis of assessment data.

The President's Malaria Initiative (PMI)

The President's Malaria Initiative is a five year, $1.2 billion commitment to reducing the malaria burden by 50% in 15 focus countries.

Goals:

- *Reduce malaria deaths by 50%*
- *Provide a standard care package to 85% of the most vulnerable (including women and children).*

♦♦♦♦♦♦♦♦

Laboratory Services

Accurate and prompt diagnosis of malaria is the cornerstone of quality care and treatment.

IMaD's main objective is to ensure quality laboratory testing services at hospitals and healthcare centers in nine countries across sub-Saharan Africa.

Country Missions

In 2008, IMaD provided technical assistance to nine countries:

Angola

Benin

Ghana

Kenya

Liberia

Madagascar

Mali

Zambia

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The Approach

IMaD's approach is based on a model of outreach training using local expertise to assess, train and supervise staff at regional, district and primary health care facilities.

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Outreach Training

Goals:

- ❖ *Establish routine supervision.*
- ❖ *Improve communication between clinicians and lab staff.*
- ❖ *Establish quality control.*
- ❖ *Reduce presumptive treatment.*
- ❖ *Provide options for fever investigation.*

2. Development of malaria laboratory diagnostic policy:
   - formation of local technical working groups;
   - development of generic national policies and guidelines;
   - dissemination of national standards
3. Provide training and technical assistance for establishing quality assurance programs and supervision:
   - development of training materials and job aids;
   - organization and training of local trainers;
   - implementation of national outreach training and supervision program.
4. Provide technical input on required equipment and supplies:
   - development of a standard list (including specifications) of equipment and supplies required by the various levels of the health care service;
   - tailoring essential equipment and supply lists to specific needs based on site assessments;
   - working with DELIVER Project to complete procurement requests for specific countries.

During 2008, IMaD prioritized start up activities to ensure collection of sufficient baseline data for country program scale up. The initial planning phase focused on in-country technical assistance workshops and comprehensive site assessments.

IMaD's major accomplishments for FY2008 include:

- ✶ Establishment of a nine-country technical working group in Ghana;
- ✶ Identification of focal persons in a further 8 countries;
- ✶ Policy document and national guidelines developed in Ghana;
- ✶ Comprehensive assessments of 59 laboratories in 6 countries;
- ✶ Facilitated laboratory assessment of 5 sentinel sites in Mali
- ✶ Development of generic training curricula, SOPs and job aids;
- ✶ Training provided to 28 laboratory supervisory staff to undertake a base-line assessment in Ghana.

This report covers the major planning phase of FY2008 and is divided into four sections: 1) detailed activities concerned with each program objective; 2) specific major accomplishments; 3) major challenges and suggested solutions; and 4) IMaD's planned activities for the coming year.

The FY2008 Annual Report forms the foundation for FY2009, the major implementation and scale up phase of the IMaD Project.

Section 1 | Description of Activities

FY2008 was the first year of the IMaD Project. During the initial months, MCDI carried out planning workshops with its partners. The main consortium members (MCDI, AMREF, HWH and STI) brought specific expertise to the IMaD Project. MCDI, AMREF and HWH are the parties responsible for managing IMaD. Specifically, MCDI has managed large-scale malaria control projects with a case management component, including malaria diagnostics. AMREF brings clinical and laboratory expertise coupled with a long history of diagnostics development in sub-Saharan Africa. HWH has experience in the implementation of laboratory quality assurance programs. STI brings expertise in monitoring and evaluation as well as the management of drugs and supplies. Over the course of the year, the IMaD team has expanded to include larger numbers of program staff and consultants. The current organizational chart can be found in appendix A.

IMaD Management Team

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CORE STAFF (% effort)

Diagnostics Management Director:
Dr. Luis Benevente (100%)

Technical Deputy Director:
Dr. Jane Carter (75%)

Deputy Director:
Dr. Roy Prescott (25%)

Nicole Whitehurst (100%)

Chris Petruccelli (100%)

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SUPPORT STAFF

Contract Management:
Deborah Gau

Finance Management:
Moussa Dambo

Information Technology:
David Jituboh

• • •

Screening with RDTs - Benin

IMaD activities for FY2008 centered on gap analyses, implementation planning and preparation of generic documents in response to requests made in the respective country PMI malaria operational plans (MOP). Activities requested within the MOP are defined by the PMI country team, in conjunction with National Malaria Control Programs. IMaD used core funds to respond to activities that were not country specific for example the development of generic training materials.

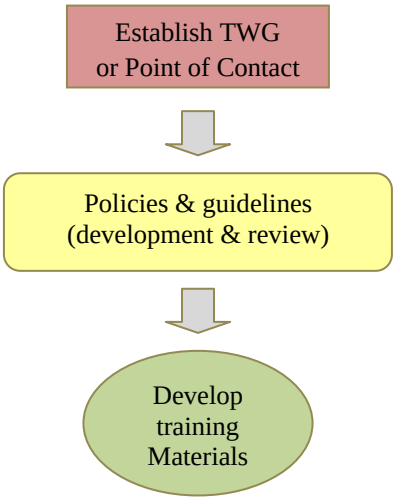
1.1. *Start-up activities*

Start up activities were concentrated on three main areas: introduction of the IMaD team to USAID in-country missions and MOH focal persons to review and define in-country activities; development of assessment tools (checklists) to conduct in-country rapid assessments of clinical and laboratory diagnostic activities relating to malaria; and development of standard curricula, training tools and job aids for adaptation to countries' requirements.

In-country planning meetings

Planning meetings usually involved the in-country PMI team, members of the MOH, NMCP and the visiting IMaD team. The teams visited seven out of the ten IMaD countries identified for activities within the first year. Teams consisted of one laboratory specialist and one clinical specialist with representation from at least one member of the IMaD management team on every trip. In-country planning meetings were a critical first step to not only meet key stakeholders but provide a forum for establishing IMaD technical working groups (TWG), identifying points of contact and determining strategies for providing technical assistance via the most efficient and economical means.

1.2. *Objective 1: Development and implementation of malaria diagnostic policy.*



In many countries, the lack of a gudelines for laboratory diagnosis for malaria severely hampers Ministry of Health efforts to support health systems strengthening. A national policy for health laboratory services and relevent guidelines are needed to determine minimum requirements for infrastructure, choice of testing services and to guide national educational programs to train laboratory staff and clinicians at every level of the health care system.

IMaD is mandated with providing technical assistance at the MOH level to develop national policies and guidelines for the diagnosis of malaria.

IMaD uses established international standards and guidelines to develop national policy and guideline documents. These standards are consensus driven by international experts in the field of malaria diagnosis. We have encouraged the creation of national technical working groups to adapt the drafts supplied by IMaD to the malaria situation in country. Initial and finalization meetings will be facilitated by IMaD in coordination with the NMCP involvement through the technical working group (TWG) and stakeholder workshops. IMaD will assist senior laboratory staff to develop or revise relevant SOPs for distribution throughout MOH laboratories.

IMaD technical assistance for developing national policy and guidelines has been specially requested by the NMCP in Angola, Benin, Liberia, Madagascar and Mali. IMaD will share the

generic documents with the NMCP in these countries. In Ghana IMaD will share these documents with the NMCP as requested in the MOP. In Ethiopia and Zambia, IMaD will provide technical assistance to update existing materials and cover printing and distrubutive costs associated with the final production.

1.3. *Objective 2: Performance of comprehensive baseline laboratory assessments.*

Counting parasites in Benin

A comprehensive assessment of clinical and laboratory services is a prerequisite to strengthening the quality and utilization of laboratory services. A well-designed laboratory assessment tool is easy to use and accurately captures information concerning laboratory infrastructure, safety, human resources, training, diagnostic services, supply chain, recording, reporting and implementation of quality assurance procedures. The inclusion of the clinical component is used to capture information pertaining to the utilization of diagnostic services by clinicians, sample collection and the return of results.

Development of the clinical assessment tool.

Two separate tools were developed, one to assess clinical functions and the other to assess laboratory services and facilities. A summary of the clinical and laboratory tools are shown in Tables 1 and 2 respectively. Both tools were initially developed and tested for the assessment of services in Ghana. The aim is to collect data relevant to malaria diagnosis and to gather information relating generally to clinical and diagnostic services. It is important to identify systemic issues within the health service as these can impact heavily on all areas of laboratory service and patient care.

Table 1. Clinical Assessment Tool

Section	*Description*
General information	Contact details, type of facility, means of communication.
Essential facilities	Water, power, safety and first aid.
Referral facilities	Medical, surgical and laboratory.
Cost to patient	With and without insurance. Drugs.
Clinical services	Inpatient, outpatient and capacity.
Staff	Breakdown by cadre.
Equipment	Clinical diagnostic.
Common diseases	Patient numbers.
Reference books	Guidelines, SOPs.
Supervision and training	Frequency, numbers trained.

The clinical assessment tool identifies barriers to accessing patient care. It includes questions concerning costs of physician / healthcare provider visits and availability of referral services. In addition, data collected on the supervision and training of clinicians enables an assessment of continuing education and professional development. The tool also assesses the availability of clinical supervision and monitoring within the health care setting. Clinicians are asked if they use the laboratory data to make therapeutic decisions, if they have confidence in it, and how they handle disagreements with the laboratory.

Development of the laboratory assessment tool.

Both tools assess basic infrastructure. Within the laboratory, it is essential to determine the availability of running water and power supply. The WHO recommends that a binocular microscope with a built-in electrical light source is the gold standard for malaria microscopy. Laboratory supplies requiring cold chain ideally must be kept at the recommended temperature at all times, such as RDTs. Interruptions in power supply throughout the day may compromise accurate and prompt malaria diagnosis.

Table 2. Laboratory Assessment Tool

Section	*Description*
Laboratory services	Layout, infrastructure and utilities.
Staff	Level and education.
Equipment	Details and status.
Equipment repair	Maintenance, spares and records.
Supplies	Items used and supply chain system.
Workload	Blood film, RDTs, Hb.
Supervision and training	External supervision and nos. trained.
Reference books	Guidelines, SOPs.
Quality assurance	Internal, external and records.
Safety	PPE and waste disposal

Adaptation of tools.

The initial assessment tools were designed for use in Ghana. The design process commenced during the initial country visit. The tools were refined after the orientation visit and were used for an assessment of 30 laboratories in Ghana. A database was developed for collection and analysis of quantitative and qualitative data. Finally, report templates to facilitate uniform recording and reporting were made available to all members of the IMaD team. All other countries requested a rapid assessment and therefore a smaller number of facilities were visited.

1.4. *Objective 3: Provide training and technical assistance for QA and supervision.*

IMaD capacity-building and the outreach training paradigm

One of the greatest challenges to building quality laboratory systems is sustaining good laboratory practice. Good laboratory practice is not intrinsic and does not develop as a result of implementing external quality assurance programs without added support. Rather, training and simultaneous implementation of external quality assurance (that is proficiency testing coupled with on-site supervision) are essential to building and maintaining quality assurance systems.

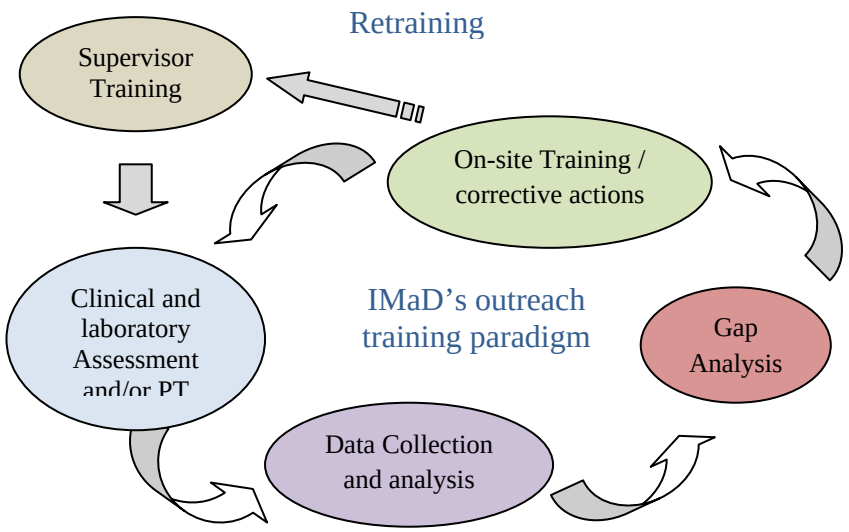
IMaD has developed a model for capacity building that combines training, proficiency testing and on-site supervision.

The outreach model has three objectives:

1. To impact those health centers furthest from the central health referral system.
2. To combine ongoing training and support supervision with quality assurance.
3. To promote interaction between the clinicians and laboratory staff.

The IMaD model for building laboratory capacity is implemented in a step-wise fashion. The process begins with in-country planning and establishment of technical working groups (TWG) or points of contact. This is followed by the development of national policies and guidelines based on recognized international standards (e.g. WHO recommendations) and tailored to the requirements of the country. Once finalized, these guidelines are used to customize training materials to the extent possible.

The initial phase of the outreach model is composed of clinical and laboratory supervisor training followed by on-site comprehensive baseline assessment of both clinical and laboratory diagnostic services, gap analysis and roll out of training using structured checklists. The model is a continuous cycle consisting of implementation of on-site supervision, external quality assessment (proficiency testing, PT) for laboratories and clinical audit, followed by data collection and analysis, identification of gaps and on-site follow-up training with corrective action. It is crucial to maintain this cycle of assessment and retraining to ensure sustainability of quality improvements.



Of key concern in IMaD's capacity building model are the requirements of individual countries. IMaD is flexible in its approach to capacity building to be able to respond to differences or even changes in requests of the MOPs. Although IMaD prefers a fully integrated approach, there is built-in flexibility to allow for concentration on laboratory diagnosis pertaining to malaria.

1.5. *Objective 4: Provide technical input for required equipment and supplies.*

IMaD has been requested to support USAID's DELIVER Project[1] with respect to strengthening malaria diagnostics. Under USAID Task Order 3, JSI has been assigned with the procurement of RDTs, bed nets, anti-malaria pharmaceuticals and laboratory equipment to the 15 malaria focus countries. As part of this effort, IMaD will provide information on laboratory equipment and supply needs. These needs will be determined from data collected during both the initial

[1] John Snow International | DELIVER Project: http://deliver.jsi.com/dhome

laboratory assessments as well as the ongoing Outreach Supervisory Visits once they are initiated.

1.6. *Monitoring and evaluation.*

Monitoring and evaluation is a critical component of the IMaD program. IMaD partners work together to ensure that the data collected are both relevant and accurate. Choice of indicators is essential if program progression is to be measured and assessed. IMaD's program indicators are chosen according to the "SMART" qualities: specific and simple, measurable, achievable and attributable, relevant and realistic and time-bound. Indicators are chosen to be in line with the monitoring and evaluation toolkit and current PMI indicators. A summary of IMaD monitoring and evaluation indicators can be found in Appendix C.

Section 2 | Accomplishments

2.1. *Development of curricula, tools and job aids*

IMaD has developed the following documentation in draft form to support FY2008 and future implementation activities:

1. IMaD Clinical and Laboratory Diagnostic Assessment Tool
2. IMaD Laboratory Training Curriculum and Timetable
3. IMaD Clinical Training Curriculum and Timetable
4. IMaD Laboratory Outreach Training and Supervision Checklists (Tools I and II)
5. IMaD Clinical Outreach Training and Supervision Checklists (Tools I and II)
6. IMaD Guidelines for Laboratory Diagnosis of Malaria
7. Quality Assurance Validation of Blood Slides for Malaria
8. Individualized Work plans developed for nine countries for FY2009
9. IMaD Monitoring and Evaluation Matrix

With the exception of the workplans, the above mentioned documents are considered to be in generic format until the IMaD team and PMI resident advisors are able to share the materials with the Ministries of Health. A review period will take place prior to an IMaD visit whereby material will be made country specific in terminology and focus.

1. **IMaD Clinical and Laboratory Diagnostic Assessment Tool:** An assessment instrument was developed and field tested to capture the following information at health facilities with a laboratory (for a more detailed description please see section 1.3):
    - Essential facilities
    - Human Resources
    - Workload and Laboratory Services
    - Quality Assurance and training

- Major and Minor Laboratory Equipment
- Laboratory Consumables
- Biosafety
- Attitudes towards the laboratory
- Documentation

2. **IMaD Laboratory Training Curriculum and Time Table:** The goal of the IMaD Training Course for Laboratory Supervisors is to train supervisors who will conduct on-site visits in their areas of responsibility. They will improve the quality of malaria diagnostic services through strengthening on-site training and supervisory activities of senior laboratory staff. The course material provides an opportunity for continuing education with a focus on refresher microscopy training, laboratory management, supervision and mentorship.

   The timetable is flexible with respect to the number of days and course content depending on a country's specific requirements.

3. **IMaD Clinical Training Curriculum and Time Table:** The goal of the IMaD Training Course for Clinical Supervisors is to improve clinical diagnostic activities at the peripheral level through strengthening on-site training and supervisory activities of senior clinicians. The course includes knowledge, skills, and attitudes in good malaria diagnostic practice, specifically providing alternatives to fever investigation and promotion of effective communication with laboratory staff.

   This timetable is also subject to reasoned change in the number of days and course content depending on a country's specific requirements.

4. **IMaD Laboratory Outreach Training and Supervision Checklists (Tools I and II):** Developed as a resource for the Outreach Supervisor to assess performance and identify areas of the laboratory services that require strengthening. Wherever possible, on-site laboratory supervision will be integrated with existing supervisory systems relating to other disease control or national programs.
   - Tool I: checklist to be used for initial visit to a health facility and to collect basic information.
   - Tool II: checklist to be used for subsequent visits. A new form will be completed for each visit.
5. **IMaD Clinical Outreach Training and Supervision Checklists (Tools I and II):** Developed as a resource for the Outreach Supervisor to assess performance and identify areas of the clinical services that require strengthening. Wherever possible, on-site clinical supervision will be integrated with existing supervisory systems relating to other disease control or national programs.

- Tool I: checklist to be used for initial visit to a health facility and collects basic information.
- Tool II: checklist to be used for subsequent visits. A new form will be filled for each visit.

6. **IMaD Guidelines for Laboratory Diagnosis of Malaria:** We encourage the creation of national technical working groups to adapt the drafts supplied by IMaD to the malaria situation in country. Initialization and finalization meetings will be facilitated by IMaD in coordination with the NMCP through the technical working groups and stakeholder workshops. The following items will be included in IMaD's recommended policy:

   i. Country-specific introduction: background, occurrence and distribution of malaria, malaria life cycle and transmission, clinical features of malaria, reasons for ordering a diagnostic test for malaria, use and interpretation of diagnostic tests for malaria, levels of management
   ii. Guidelines on confirmatory diagnostic tests for malaria: diagnostic tests for malaria, microscopy, RDTs for malaria, other laboratory diagnostic techniques
   iii. Laboratory Management: general laboratory management, principles of quality assurance and quality control, laboratory safety and first aid
   iv. Standard Operating Procedures

7. **Quality Assurance Validation of Blood Slides for Malaria:** IMaD has developed a slide rechecking protocol to ensure a standard method of validating test performance in malaria diagnosis. Rechecking of stained slides can be done on-site by the visiting supervisors and/or at designated national or regional reference laboratories. The purpose of rechecking slides is to assess overall laboratory performance; it is NOT intended to confirm an individual patient's diagnosis.

8. **Country Work plans for FY2009:** IMaD has completed Work Plans for the following countries: Angola, Benin, Ethiopia, Ghana, Kenya, Liberia, Mali, Madagascar, and Zambia. The work plans have been reviewed by the specific PMI country teams and will guide implementation during FY2009

9. **IMaD Monitoring and Evaluation Matrix:** Malaria reporting should be integrated with all disease reporting systems, particularly at lower levels. In all cases the malaria information system will be harmonized with the existing health information system, and other stakeholders supporting malaria and other disease control programs (GFATM, PEPFAR, World Bank). The final IMaD M&E indicators were revised during the 2009 Annual Planning Meeting under the advisement of USAID and CDC.

2.2. *Objective 1: Development and implementation of malaria diagnostic policy.*

Ghana

In Ghana, two focal persons from the MOH were identified to support IMaD activities. Mr. Ekow Biney, the Acting Director of the National Public Health Reference Laboratory (NPHRL) is providing technical support for IMaD activities. Mr. Biney is an experienced Medical Laboratory Technologist within the Ghana Ministry of Health who will play a key role in the establishment of the national quality assessment program for malaria diagnosis. In addition, a senior clinician has been identified as the focal person for IMaD communications. She is a member of the National Malaria Control Program (NMCP) and will provide a significant role in guiding the program on malaria diagnostics. While visiting Ghana, the IMaD team drafted a preliminary version of the National Guidelines for Laboratory Diagnosis of Malaria with input from the MOH. The draft version was shared with the NMCP at the inaugural meeting of the Malaria Diagnostic Working Group. IMaD will facilitate a final stakeholders meeting to finalize the Ghana National Guidelines for Laboratory Diagnosis of Malaria. This will include adaptation and finalization of Standard Operating Procedures addressing all technical areas of malaria diagnosis.

Madagascar

In Madagascar, IMaD staff met with the in-country PMI team. The purpose of this initial visit was to identify constraints to improving malaria diagnosis using microscopy and RDTs; training and supervisory needs to strengthen malaria diagnosis; and explore mechanisms for establishing a national malaria diagnostic QA system. Based on discussions with the PMI team, IMaD will focus on developing a National Guidelines for Laboratory Diagnosis of Malaria to include the use and interpretation of microscopy and RDTs and development of SOPs for laboratory diagnosis. IMaD will also help develop national procedures for malaria diagnosis, training and establishing means-tested fees. IMaD has developed a design for a detailed assessment of performance using RDTs in health centers, in collaboration with IPM, CDC, Santenet and the NMCP. This assessment is expected to provide guidance to policy changes related to RDT use in HCs.

Zambia

In August 2008, the IMaD team completed an initial assessment visit to Zambia. During this meeting, IMaD held discussions with officers from the USAID Mission, National Malaria Control Centre (NMCC), Laboratory Unit at the Ministry of Health, DELIVER, Health Services and Systems Program (HSSP), Malaria Control and Evaluation Partnership in Africa (MACEPA), Centers for Disease Control and Prevention (CDC), Clinton Foundation, and the Evelyn Hone Training Institute. As a result of this meeting, IMaD was tasked with engaging partners in a comprehensive review of the existing guidelines for malaria diagnostic procedures used throughout the country. The review will be the first step in supporting Zambia to develop updated written guidelines and tools.

Mali

IMaD completed an orientation visit to Mali in July 2008. The purpose of the visit was to meet with PMI staff and build a rapport with the Malaria Control Program staff. There are currently no national guidelines on laboratory diagnosis or guidelines on the use of RDTs. National Guidelines for Laboratory Diagnosis of Malaria in Mali therefore need to be developed, in discussion with the PNLP and stakeholders. The guidelines will be incorporated into refresher training course curricula and into outreach training programs for clinical and laboratory staff.

Liberia

IMaD completed an orientation visit to Liberia in March, 2008. At this meeting, the team examined existing policies, plans for development of a national public health reference laboratory at the Liberian Institute of Biological Research (LIBR), and the current system of integrated supervision of health facilities. A follow up meeting took place in June 2008 at which IMaD proposed to assist in finalizing the draft national documents. This activity is scheduled to take place in early 2009.

Ethiopia

The first IMaD trip to Ethiopia will take place during December 2008. IMaD will take part in a microplanning meeting to discuss the way forward. This meeting will be held in Addis Ababa during 3-4 December to discuss malaria laboratory diagnosis and monitoring. Participants will be from the Federal Ministry of Health (NMCP- EHNRI), USAID/PMI Ethiopia and Columbia University/ICAP Ethiopia.

2.3. *Objective 2: Performance of comprehensive baseline laboratory assessments.*

A total of 59 laboratory and clinical assessments were conducted in FY2008. These took place in 6 countries: Angola, Ghana, Madagascar, Mali, Zambia, Benin and Liberia. The major findings from these assessments were as follows:

- Absence or outdated National Guidelines for Laboratory Diagnosis of Malaria
- Lack of adequately trained laboratory workers and MOH staff.
- Poor communication between clinical and laboratory staff.
- Limited opportunities for professional development of clinical and laboratory staff.
- Limited communication between MOH and laboratories.

A summary of site assessments and major findings for each country are as follows:

Ghana

In response to a request by the Ghana MOH, this assessment contained the greatest numbers of facilities assessed as part of IMaD's start up activities. Thirty health facilities were visited and assessed using the IMaD tool in FY2008 (see Table 3 for details of each facility). Generally, all facilities had adequate power and water supplies. Most had a disposal system for biohazardous waste; however, only half had on-site facilities for incineration. Government Health Centers (secondary to Government Hospitals) had below average facilities compared with all facilities assessed. With respect to human resources, most Government Hospitals were staffed with adequate numbers of biomedical scientists and assistants. The level of human resources was much poorer at Government Health Centers. The numbers of blood films performed for malaria varied greatly. In most cases, clinical diagnosis was observed to be the common method rather than laboratory diagnosis. When laboratory diagnosis was performed, testing turn-around-time was determined to be good. Overtreatment was thought to be a likely issue. Many laboratories, particularly at the lower levels of the health care system, were using obsolete methods for hemoglobin determination. Less than half of all sites assessed were implementing QA. Those that did were mainly performing internal QA. More encouraging was information that over half of the sites had some kind of supervisory visit in the last 6 months. Interestingly, although the majority of laboratories had SOPs, few films were reported as "good" upon rechecking. More than half of the staff at Government Hospitals had received recent training in malaria diagnosis. The numbers were far lower at health centers. Almost all facilities visited had a least one functioning microscope. Equipment for hemoglobin analysis was severely

Table 3. Ghana laboratory assessments

Region	*Center*	*Type*
Ashanti	Ejura GH	Government
	Suntreso GH	
	Pramso	Mission
	Nsuta	Health center
	Kumawu	
Brong-Ahafo	Sunyani Memorial	Government
	Holy Family	Mission
	Chiraa	Health center
Central	Agona Swedru	Government
	St. Francis Xavier	Mission
	Kasoa	Health center
Eastern	Kwahu	Government
	Kade	Health center
	Ridge	Government
Greater Accra	Manna	Mission
	37 Military	Quasi
	Kaneshie	Poly clinic
	Dodowa	Health center
	Holy Trinity	Private
	West Gonja	Mission
NorthernUpper East	Yendi	Government
	West Gonja	Mission
	Bolgatanga	Health center
	Tongo	Mission
Upper West	WAR Memorial	Government
Volta	Dorimon	Government
	Shia	Government
Western	Kpando	Mission
	Effia-Nkwanta	Government
	St. Martins de Porres	Mission
	Agona Nkwanta	Health Center

lacking. Availability of standard documents and laboratory records was good compared with other PMI countries where assessments had taken place. There was relatively good communication between laboratory staff and clinicians.

Madagascar

The IMaD team assessed 9 health facilities in Madagascar. The catchment areas range from 15,000 to 315,000. Infrastructure and utilities varied by site. All laboratories had backup generators and mains power failures varied from daily to once per month. Running water was available at all sites. Centers were using RDTs however, these were reserved for clinicians. The RDT supply chain requires significant improvement (both storage and disposal of expired kits). The lack of equipment for measurement of hemoglobin was a major issue. The quality of malaria films assessed that day ranged from poor at 2 centers to good at 2 others. Internal quality assessment was absent from all sites and 2 sites participated in EQA and supervision from the NMCP. Clinical and laboratory staff received little or no refresher training. There was reasonable use of PEP.

Region	*District*	*Center*	*Type*
Analamanga	Ambohidratrimo	CHD 2 Mahitsy	Centre Hospitalier District 2
	Ankazobe	CHD2 Ankazobe	Centre Hospitalier de District 2
Betsibaka	Maevatana	CHRR Maevatana	Referral Hospital
Alastra Mango	Moramanga	CHRR Moramange	Centre Hospitalier de District 2
Atsimanane	Vatomandry	CHD 2 Vatomanry	Centre Hospitalier de District 2
Boeny	Marovoay	CHD 2 Marovoay	Centre Hospitalier de District 2
Atsinanana	Mahanoro	CHD 2 Mahanoro	Centre Hospitalier de District 2
Betsiboka	Brickaville	CHD 1 Brickaville	Centre de Sante de Base 1
	Maevatana	CSB 2 Ambalanjanakomb	Centre de Sante de Base 2

Zambia

The IMaD team assessed six sites in Zambia in August 2008. Six sites were assessed. Laboratory infrastructure required improvement with most labs suffering numerous power and water supply cuts throughout the day. Disposal of biohazardous waste was generally carried out by incineration. Turn-around-time of samples to test result was very good at the sites visited. There was limited internal QA and a virtual absence of external QA and supervision. Some written SOPs were available. There was no recent record of refresher training for malaria diagnosis having taken place. Training in the basic principles of laboratory safety is urgently required.

Table 5. Zambia laboratory assessments

District	*Center*	*Type*
Kalomo	Kalomo District Hospital	Government
	Namienga Health Center	Faith-based
	Kayama Clinic	Government
Monze	Monze General Hospital	Faith-based
	Monze Urban Health Center	Government
	Keema Rural Health Center	Government

Benin

The health facilities observed had reasonably reliable electrical service, though all reported that outages do occur and sometimes interfere with the ability to perform light microscopy. The water supplies to laboratories were from the national water distribution system in all cases but one. All laboratories experienced at least some shortages of essential equipment and supplies. Procedures for preparing blood films were not directly observed, but the slides seemed to be adequately prepared. Presence of stain artifacts resulting from the apparent lack of pre-filtering was an issue. Species identification was not generally performed, positives were all assumed to be *P. falciparum*.

Table 6. Benin Laboratory Assessments

District	*Type*
Ouidah	Zonal Hospital
Comé	Zonal Hospital
Dassa-Zoume	Zonal Hospital
Savè	Zonal Hospital
Savalou	Zonal Hospital
Cove	Community Health
Abomey	Center
Kouande	Zonal Hospital

Outpatient register, Benin – RDT results and treatment details.

Slides were generally batch-processed with results returned to the clinicians late in the day, resulting in a reporting delay up to seven hours. The results of the slide readings were generally below the level of acceptability (90%), with most labs showing a deficiency in either sensitivity, specificity or density determination. Neither internal quality control measures nor external quality assurance was apparent at the sites visited, but MdS personnel said that such a program in fact existed. Safety measures appeared to

be adequate in all facilities visited. There were limited reference books, manuals and Standard Operating Procedures (SOPs) for laboratory staff at the facilities visited. Staff had received little or no refresher training in the recent past. There is a system for laboratory and clinical supervision from the MOH that requires additional strengthening.

Liberia

Most health facilities had limited power and many microscopes were being operated using daylight mirrors. All laboratories were short of essential equipment and supplies. Some reagents used for preparing malaria slides were observed to be of poor quality. Storage of supplies was inadequate. Procedures for preparing blood films were not uniformly correct. Hemoglobin estimation was mostly performed using comparator techniques except in larger laboratories with electronic blood cell analyzers. There was an absence of internal quality control and external quality assurance. Safety was a major concern in all facilities visited. There were limited reference books, manuals and Standard Operating Procedures (SOPs) for laboratory staff. Most laboratory staff has received no refresher training for several years. Techniques for malaria slide preparation; staining and microscopy were not standardized and in some cases were incorrect. Record keeping for laboratory services was not standardized and regular reports are not made and submitted to the central authority. Clinicians had limited basic diagnostic equipment and no access to diagnostic and treatment guidelines.

Angola

Almost all facilities had electricity with the frequency of power cuts ranging from biweekly to 3 times per day. Only one site, the Malaria Reference Laboratory in Benguela, did not have a back-up power supply. Around 50% of laboratories reported power supply problems that interfered with malaria microscopy. Standard methods for malaria diagnosis were in use and all labs had functioning microscopes although spares were in short supply. RDTs were used to pre-screen patients. There were generally adequate numbers of laboratory trained staff however, most facilities lacked support staff such as administrative assistants and janitors. There was a lack of staff trained in the management of laboratory supplies. Staff would benefit greatly from the provision of in-service training. There is no formal, regular supervisory review or quality assurance program (neither internal nor external). Safety standards could be improved in all laboratories.

Table 7. Angola Laboratory Assessments

Region	*District*	*Hospital*
Cacuaco	Luanda	Centro de Saude de Cacuaco
	Viana 1	Centro de Saude Viana 1-Ana Paula
	Viana 2	Centro de Saude Viana 2 – Projecto Morar
		Hospital Geral Provincial
Benguela	Lab Malar HP	Laboratrio de Referência de Malaria - Hospital Provincial de Benguela
	CS Fronteira	Centro de Saude de Fronteira

Table 8. Mali Sentinel Assessments	
Epidemiological Profile	*Sentinel Site*
Sudanese	Kadiolo, Kita
Sahelian	Djenné.
Saharan	X
Marsh	Sélingué
Urban	Commune IV

Mali

IMaD's first priority in Mali is to provide assistance to the Malaria Research and Training Center (MRTC) to strengthen five sentinel sites through a laboratory assessment to enable reliable data reporting to the PNLP during the last quarter of 2008. In order to achieve this goal IMaD established a relationship with the Malaria Servicing Center (MSC). The MSC was established by joint decree of the University of Bamako and NIAID/NIH in order to provide transparent financial management and administrative support for research conducted in Mali. A contract was signed between IMaD and the University of Bamako Vice Rector (Prof. Amadou Diallo); thus, the MSC could establish a unique bank account for the project. Funds are to be dispersed to the MRTC based on deliverables outlined in TORs. The 5 sites in Table 9 have been assessed by the MRTC and we are awaiting their report.

2.4. *Objective 3: Provide training and technical assistance for establishing QA and supervision.*

As reflected in previous sections, the majority of IMaD activities for FY2008 were focused on meeting in-country stakeholders, planning in-country activities and completing comprehensive site assessments. In FY2009, IMaD will focus on training and technical assistance to establish quality assurance and supervision through IMaD's outreach training paradigm.

IMaD has provided technical input to the WHO malaria EQA protocols. Dr. Jane Carter of AMREF attended two meetings with WHO to discuss the EQA protocol. Dr. Carter has made significant contributions to the manual and channeled IMaD's feedback. The protocol consists of collecting 5 weak positives and 5 negatives per laboratory per month and for these samples to be re-read by a supervisory team and/or a referral laboratory. Since ten is a small sample, results are collected over 3-4 month intervals. Remedial actions will be taken once the aggregated data are analyzed at a node (NMCP, or another location).

Dr Ndiaye (in red shirt) trains MOH counterparts in the use of a checklist to assess diagnostic capacities. Benin.

Despite this year's focus, IMaD has carried out training and quality assurance activities in Benin and Ghana. Summaries of these activities will be presented here.

In Benin, the staff at seven zonal hospitals were asked to read pre-prepared malaria blood films. The purpose of this exercise

was to establish baseline performance levels, in preparation for a more formal QA system to be established in FY2009. Twenty known prepared blood films were read for parasite presence/absence, species identification, and density. Collaboration among staff was encouraged. Results of the slide reading were found to be generally below the level of acceptability (see Benin country report). As this was an initial proficiency test, staff were allowed to confer, the situation differed greatly from a testing norm and there were no time constraints, these results should be taken as a guide to the baseline. However, this exercise will be a useful marker in monitoring IMaD's performance in training and implementation of QA programs and should therefore (if possible) be implemented as a routine part of the initial baseline assessment. The IMaD team trained two staff members from the Ministry of health to administer subsequent laboratory assessments and to implement the proficiency testing program.

Faculty members and participants at the Ghana Laboratory Assessment workshop. Accra, March 12 and 13, 2008.

In March, 2008, members of IMaD travelled to Ghana to carry out a workshop in partnership with the National Public Health Reference Laboratory. The workshop was organized to orient the regional supervisors to the assessment instrument that was used to perform the baseline assessment of laboratory capacity.

The first day of the two-day workshop centered on reviewing and discussing the assessment tool. Participants were split into teams and role-play was used to teach participants how to carry out the survey. The class then returned to discussion on how the tool could be improved for the field. Improvements were made based on participant's input and the following day role-play was used to retest the tool. Once tool reviews were complete, the class focused on assessment timing. The participants also discussed the process of providing on-site feedback and corrective actions. The provision of corrective actions was a major area of concern for most participants. Faculty spent time teaching the basics of providing corrective actions during site supervisions and assessments. At the end of the second day of training the participants put together a schedule for site assessments. The IMaD team trained a total of 26 staff who came from all of the 10 regions in Ghana.

In Mali, the MRTC, through the support of IMaD, provided training to clinical and laboratory staff at five sentinel sites in Kadiolo, Kita, Sélingué, Commune IV, and Djenné. These five sites are representative of the different epidemiological profiles in Mali. The IMaD team reviewed and made comments to the MRTC's curriculum. The MRTC's report of the activity is forthcoming,

2.5. *Objective 4: Provide technical input for required equipment and supplies.*

IMaD has developed essential equipment and supplies list for each level of the health system to perform malaria diagnosis. These lists will be shared with the MOH and NMCP and tailored to country needs and specifications. In addition IMaD envisions that supplies will be managed and monitored to some extent through the Outreach Supervisory Visits once the program is established in country. As supply lists become finalized IMaD will send the order to the PMI resident advisor, who will place orders through the DELIVER project. Malaria microscopy kits are available through DELIVER and provide approximately enough reagents and supplies for 1,000 patient diagnoses. The estimated time for delivery is approximately 13 weeks after the confirmation order from the PMI Mission. An additional 1-2 weeks is needed for transportation and necessary customs clearance.

2.6. *Development of SharePoint IMaD Website*

SharePoint is a browser based collaboration and document management platform. It is used to host websites that access shared workspaces and documents. IMaD has created a workspace for each of the nine countries in which we have been active during FY2008. The database contains "final documents" such as reports, presentations, training materials and job aids, maps, papers and other technical resources, workplans, calendars, MOPs, partner information, resumes, curricula, proposals submitted, contact data among many others. Additionally the repository contains a library of working documents that can be reviewed and/or edited by authorized partners. SharePoint may not work as well in places with slow internet connections, but in general is expected to facilitate document sharing between IMaD partners and PMI counterparts and to improve communication within the IMaD Consortium.

Section 3 | Challenges and Lessons Learned

3.1. *General challenges and solutions*

During this first year of activities, IMaD was confronted with the common difficulty of finding suitably qualified laboratory staff with field experience in limited resource settings. In addition, IMaD realized the need to expand organizational capacity. IMaD has addressed these constraints by scaling up both scientific and administrative support. The program now has an added 5.5 Full Time Employee (FTE) (excluding an additional open position) within the consortium plus a further 6 short term technical experts.

Due to the nature of the laboratory capacity building program, IMaD, as a general rule, has been discouraged from establishing in-country offices. As a result, IMaD's ability to proceed with activities was found challenging in the absence of dedicated representation from within each country. During the first quarter of FY2008, IMaD began identifying in-country points of

contact. This has increased communication between the MOH and IMaD head office in the US and is expected to greatly enhance implementation of in-country activities.

IMaD originally designed a generic outreach paradigm for capacity building. However, this one-size fits all approach cannot work in all countries. IMaD has designed a flexible implementation strategy informed by baseline information, outreach supervision data, field studies, and consultation visits. These data will be used to make informed decisions to improve malaria diagnostics in specific settings.

IMaD predicts major challenges in implementing quality-assured malaria diagnosis in post-conflict countries as most, if not all, qualified staff have left. In such countries, short term technical assistance will have little impact and therefore IMaD advises mid-term technical assistance periods of at least 3 months in duration for Angola and other countries in need of rapid implementation. IMaD is pleased that some missions (Ghana, Liberia) have given a green light to long term technical assistance. Where possible, IMaD will also seek to integrate activities with existing TB and HIV projects as well as clinical training and supervision (Benin, Angola).

3.2. *Country-specific challenges and suggested solutions*

The main challenges experienced by IMaD within each country are outlined in Table 9 below. In addition to current challenges, predicted future problems have been included. These issues are based on areas where the current data show a potential constraint. The major issues for each country are outlined along with recommended or planned steps IMaD will take to resolve each problem.

Table 9. Country-specific challenges and suggested solutions.

Country	Challenge	Course of action
Angola	• Post-conflict setting, difficulty in organizing logistics/facilitating communication	• Identify potential IMaD local TA and local support mechanism
	• Travel logistics difficult	• Organize travel at least 3 months in advance
	• Lack of national reference lab	• Support utilization of INSP • Form a Technical Working Group to define the role of and establish reference lab within NMCP
	• Too many RDT products	• Encourage regulation/establish country policy • Advise on lot testing and purchase from WHO-approved suppliers only
	• Resource-rich country willing to spend more in social programs, needs guidance to do so effectively	• Training in lab management; TA required to develop diagnostic policy
Benin	• Lab data not used in clinics	• Provide training in lab management, reduce

		turnaround time, improve communication with clinicians, propose change in policy
	• NMCP has few supervisors, limited resources for lab support supervision	• Piggyback lab supervision on routine health facility supervision; coordinate with PISAF/URC Project • Leverage World Bank Booster Program Funding
	• Request from country PMI staff to identify local IMaD TA	• Reach agreement on details and terms
Ethiopia	• Mixed parasite species • Unstable malaria transmission	• Adapt training materials to focus on responding to mixed infections • Include training for emergency outbreak response • Cascade training on malaria microscopy • Include epidemic preparedness and response in National Malaria Strategy
Ghana	• Lack of support for laboratory and clinical outreach due to limited support for transport and per diem	• Coordinate with GFATM for funding • Seek funds through PMI
	• Request from country PMI staff to identify local IMaD TA	• Reach agreement on details and terms
Liberia	• Request for full integration of vertical programs	• Ensure other programs e.g. TB and HIV are informed of IMaD's activities and provide them with opportunity to coordinate interventions
	• Lack of technical capacity, no refresher training	• Supportive actions for the development of long-term capacity (i.e. support pre-service training of laboratory technicians)
	• Lack of Quality Control/Quality Assurance	• Develop a national policy and national guidelines for laboratory diagnosis of malaria; support the NMCP to provide supervision and assure quality control
	• Need to confirm terms for local staff identified to provide Technical Assistance to the IMaD Project	• Reach agreement with USAID and NMCP on acceptable terms
Madagascar	• Limited resources for supervision	• Leverage funding from several agencies (Global Fund/WB/other) to fund supervision
Mali	• Lack of national reference lab	• Investigate other partner activities such as PEPFAR
	• Inefficiencies with training • No standard approach to malaria diagnosis and case management	• Integrate activities of MRTC and INSP • Develop outreach training and supervisory visits for malaria case management, diagnostics, data management, and reporting system for clinician

		and laboratory staff in conjunction with NMCP, MRTC, INRSP
	• IMaD proposes to identify local IMaD TA to facilitate technical/communication issues	• Reach agreement on terms/location for TA
Zambia	• High attrition rate of clinical and laboratory personnel at MOH	• Support Clinton Foundation rural hardship allowance • Recommend re-introduction of 2-year certificate course
	• Lack of national reference lab • Lack of integration of clinical & laboratory supervision at peripheral levels	• CDC may be identifying funds for this activity • Existing supervisory structure can be strengthened to include malaria issues

Section 4 | Planned Performance Objectives for FY2009

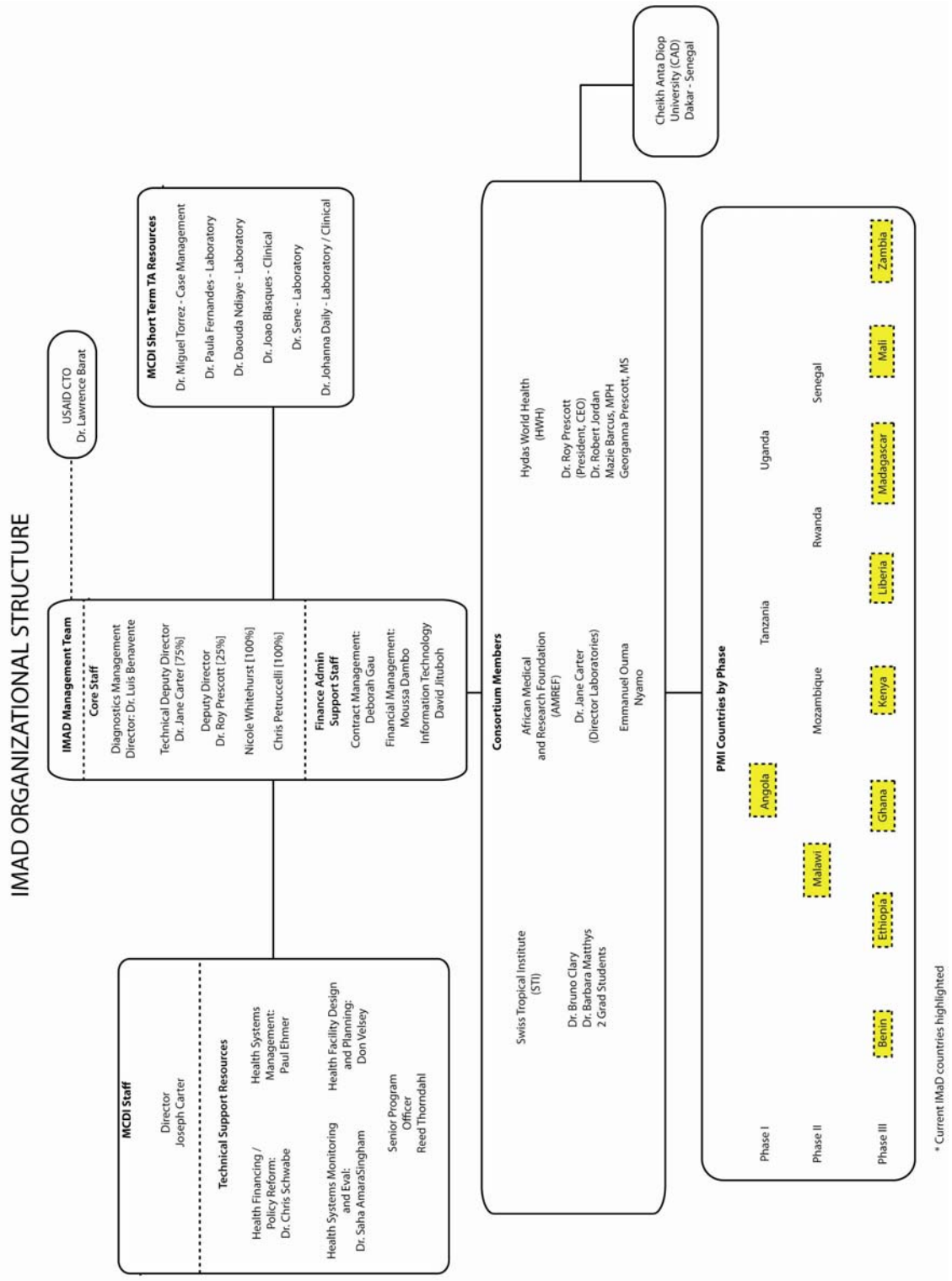
The planned performance objectives for IMaD during FY2009 were discussed in detail in the IMaD FY2009 Work Plan. This section serves as an overview of the work plan and planned quarterly activities for each country. Section 1.6 contains details of the monitoring and evaluation of particular deliverables.

Table 10. Country-specific challenges and suggested solutions.

Country	Task	Activity	Quarter			
			1	2	3	4
Angola	Training	Identify and train supervisors	X	X		
		Conduct outreach training			X	X
	QA	Implement training and EQA plan				X
Benin	Training	Train supervisors		X		
	QA	Identify IMaD outreach coordinator	X			
		Conduct outreach and supervision			X	X
Ethiopia	Assessment	Assessment planning workshop	X			
		Identify and train supervisors	X			
		Assessment conducted by supervisors		X		
	Policy	Develop draft national guidelines pending lab		X		
	QA	assessment results			X	
Ghana	Assessment	Assess PHRL network	X	X		
	Policy	Finalize national guidelines	X	X		
	Training	Outreach training of 40 staff			X	X
	QA	Distribute materials and carry out outreach			X	
		site visits			X	X
Kenya	Assessment	Baseline assessment	X			
Liberia	Develop NRL	Compile SOPs and bench top references for				
		malaria diagnosis		X		
		Provide documents, equipment and supplies			X	
	Policy	Develop draft national guidelines		X		
	Training	Outreach training for 5-10 staff		X		
	QA	Planning meeting			X	
Madagascar	Policy	TWG meeting and establish guideline		X		
	Training	documents			X	
		Identify and train supervisors				
	RDT evaluation	Plan and conduct evaluation				X
Mali	Assessment	Assess 5 sentinel survey sites			X	
	Policy	Develop draft national guidelines	X			
	Training	Training of 5-10 sentinel site staff				
	QA	Identify outreach supervisors				X
Zambia	Policy	Stakeholders meeting and update guidelines	X			
	Training	Provide refresher training to 40 staff		X		
	QA	Distribute materials and carry out orientation		X		
		site visits			X	

Section 5 | Appendices

A. IMaD Program Structure and Management



B. IMaD's Core Staff

Position	CORE	Field	
		In-country	Non-country
Project Director (PD). Dr. Luis Benavente (LB) 100%	Represents IMaD prime recipient, MCDI, in overall management, planning and coordination. Liaises with IMaD partners. Tracks progress towards benchmarks based on work plan maintained by DD. Liaises with partners in maintaining updated M&E data, to include overseeing database development, data processing and data analysis. Ensures partner compliance with federal regulations, including marking policies. Develop overall QA framework for diagnosis with RDTs. Coordinates presentations in technical conferences. Budgeting. Assigns country-specific responsibilities to partners. Coordinates development of technical scopes of work for consultants.	Oversight of field activities Assessments Madagascar, Angola, Benin, Malawi.	Point person in Angola, Malawi, Benin and Madagascar.
Technical Director (TD) Dr. Jane Carter (JC) 75%	Point of contact with WHO. Supervises the development of assessment and training materials. With PD, develops technical scopes of work for consultants. Oversees the development of EQA protocols for microscopy. Reviews EQA protocols for RDTs. Oversees AMREF's staff hired via IMaD. Coordinates presentations at technical conferences in Africa. Oversees technical content of deliverables.	Participates in assessments, other site visits as per specific ATPs Oversees AMREF's field activities aimed at IMaD objectives	Point of contact for: Ethiopia, Kenya, Zambia Reviews country technical reports and work plans.
Deputy Director (DD), Dr. Roy Prescott (RP) 25%	Assists PD in maintaining communications with country leads and NMCPs. Oversees HWH's staff hired with IMaD funding. Liaises with PD in providing day-to-day technical/ logistical/ administrative support to selected country teams. Maintains work plan and tracks progress towards benchmarks.	Participates in assessments, other site visits as per specific ATPs. Oversees HWH's field activities aimed at IMaD's objectives.	Point of contact: Angola, Mali Assists PD in deliverables for selected countries.

	Oversees regular updating of IMaD's website and SharePoint files.		
Program and Technical Support Officer (PO) Nicole Whitehurst 100%	Works closely with PD to ensure good communication with CTO. Liaison between IMaD partners, PMI and CDC. Maintains communication in countries where IMaD has LTTA. Ensures timely submission of deliverables to PMI. Supervises interns/temps. Monitors production of deliverables: semiannual reports, country reports.	Participates in assessments, other site visits	Assists in the production of country reports and work plans. Point person: Ghana, Liberia and Ethiopia
Program associate Chris Petruccelli (100%)	Assists with ATPs, contracts and other administrative activities. Assists with the organization of teleconferences, conferences, presentations, and other technical/scientific events. Other activities as needed by project.	Assists with data analysis, report production, and other deliverables.	Point of contact for: Ghana, Kenya and Zambia.
Financial officer TBN (100%)	Assists with contracting and financial management by IMaD's financial officer. Assists with budgets, tracking expenditures, pipeline analysis, capturing matching funds from all partners, preparation of financial reports. Assists with procurement.	None	None
IT Specialist David Jituboh (25%)	Design website, provide orientation to all team members on how to upload content, assists with maps, presentations and publications in electronic format	May assist in installing communication systems in selected locations	None

C. Monitoring & Evaluation Matrix

IMAD WORK PROGRAM MATRIX -- List of Indicators

(Synthesis of IMAD Illustrative Implementation Plan 04 September 2007, USAID RFA 30 March 2007, IMAD Consortium Partners Planning Workshop Sessions 23 October 2007, review in June 2008)

GOAL **Support the National Malaria Control Program in the strengthening laboratory diagnosis in national, provincial, and district-level health facilities**			
Program Strategy and Interventions		**Performance Monitoring and Evaluation Plan**	
Activities	**Expected Results**	**Indicators**	**Data Sources**
1. Develop detailed plans for implementing, expanding and improving laboratory-based diagnosis of malaria in Ministry of Health facilities, and any other facilities agreed upon with MOH	• Current status of diagnostic policy and strategy reviewed in all priority countries • Assessment tools developed and used by teams for in country assessments • IMAD selected countries assessed during program life (if requested by the country) • A realistic and feasible action plan to improve malaria diagnostics in accordance with NMCP and/or national policy is available in the selected country	**Outputs** # of IMaD countries with a national malaria program that have a comprehensive malaria diagnostic policy/guideline and action plan in line with national laboratory policy (if present) # of in country assessments completed (report available on IMaD website)	1) NMCP, MoH (or IMaD website if uploaded there 2) IMaD website: country reports
2. Contribute to procurement and in-country logistics of PMI commodities	• Assessment of current procurement, storage and distribution systems for laboratory equipment, supplies and commodities for existing diagnostic labs conducted in all priority countries (when requested) • Procurement Plans developed for all IMaD countries (if requested), in coordination with Deliver project • The NMCP and/or unit in the Ministry of Health (MOH) that is responsible for the procurement and distribution of medicines and medical supplies has been assisted by IMaD team when required	**Outputs** # and % of IMaD countries with Procurement Plans for laboratory available and prepared by IMaD (if requested)	3) NMCP, MoH
3. Develop training materials on malaria diagnosis as determined by the national	• Training materials developed (and translated into the national language) for microscopic/RDT diagnosis according to national malaria diagnostic policy	**Outputs** # of IMaD countries with training curricula for	4) NMCP, MoH

policy and WHO standards	• Development and adaptation of bench aids, additional training materials and reference materials (and translated into the national language)	clinicians and laboratory staff on malaria diagnostics and malaria case management, using microscopy and RDTs, according to national malaria policy and diagnostic guidelines # and % of targeted health facilities which are performing malaria diagnosis (microscope and/or RDTs) that have appropriate reference material (SOPs, bench/job aids) adapted according to national policy	5) NMCP: supervisory visit reports/Laboratory outreach checklists
4. Train health care providers and laboratory staff on malaria diagnosis and case management, according to national policy	• Training of core national teams completed in the selected countries • Laboratory personnel trained/refreshed on malaria microscopy diagnostics and laboratory management according to national policy • Health workers (clinicians) trained/refreshed on malaria diagnostics using RDT • Health care providers and other relevant health personnel are trained/refreshed on malaria case management according to national policy	**Outputs** # of clinicians trained by IMaD on case management and malaria diagnostics based on a) microscopy, b) RDTs, c) or both # of laboratory staff trained by IMaD on malaria diagnostics using a) microscopy, b) RDTs, c) or both # and % of targeted health facilities with at least one staff trained to perform laboratory malaria diagnostics (microscopy, RDTs) **Outcomes** % of slides correctly read (checked/controlled during supervisory visits and later from QA system)	6) and 7) Attendance lists of training course/ Laboratory outreach checklists 8) NMCP and/or Laboratory department: supervisory visit reports/Laboratory outreach checklists 9) NMCP and/or Laboratory department: supervisory visit reports/Laboratory outreach

			checklists, Quality assurance system
5. Contribute to the development of a Logistic Management Information System (LMIS)	• In-country stock management systems have been assessed • If required, a new Logistic Management Information System has been developed in coordination with DELIVER and/or any relevant stakeholders • A (simplified) LMIS tool to manage laboratory stocks and supplies is introduced in the selected country	**Outcomes** 10) % of health facilities with no reported stock-outs lasting ≥ 7 days in a row of essential laboratory supplies required for malaria diagnostics or RDTs at any time during the year or epidemic period (to be defined by the country)	10) NMCP and/or Laboratory department: supervisory visit reports/Laboratory outreach checklists
6. Develop a quality assurance system for maintaining diagnostic quality over time	• Quality Assurance /Quality Control policies and procedures are developed and implemented in coordination with the NMCP and/or laboratory system and/or MOH • Supervisory visits take place on a regular basis (frequency according to national malaria policy) • A mechanism for cross-checking of a sample of slides has been established in collaboration with the NMCP and the laboratory system • Malaria diagnostic competency over time is maintained • The sensitivity and specificity of microscopy is monitored in pilot areas on an annual basis • The sensitivity and specificity of RDTs is monitored in pilot areas on an annual basis • An External Quality Assurance (EQA) program through re-reading of slides has been established	**Outputs** # of IMaD countries active in Quality Assurance with a national QA system in place Cumulative # of supervisory visits done in targeted health facilities according to IMaD guidelines % of targeted health facility laboratories that received at least 2 supervisory visits per year **Outcomes** % of slides correctly read (checked/controlled during supervisory visits and later from QA system)	11) NMCP, MoH, (or IMaD website if uploaded there) 12) and 13) NMCP and/or Laboratory department: supervisory visit reports/Laboratory outreach checklists 9) NMCP and/or Laboratory department: supervisory visit reports/Laborato

			ry outreach checklists, Quality assurance system
7. Develop surge capacity to respond to increased demand for diagnostic capabilities during malaria epidemics	• Mechanisms established to detect malaria outbreaks or epidemics in a timely manner in countries requesting surge capacities support • Mechanisms to forecast surges in demand for diagnostic supplies and lab technician is established in countries requesting surge capacities support	14) # of IMaD countries requesting surge capacities support with available documentation on formal mechanisms for rapid response to malaria outbreaks and epidemics	14) NMCP, MoH (or IMaD website if uploaded there)
PROGRAM OUTCOME INDICATORS		# and % of malaria cases among children under 5 years old that are laboratory confirmed (when recommended by country policy) # and % of malaria cases among patient of 5 years and older that are laboratory confirmed % of patient that have a negative diagnostic test result for malaria, who are prescribed/treated with an anti-malarial treatment	15 and 16) National data, e.g. annually aggregated data from monthly reports from HMIS 17) Annual IMaD survey performing subset of health facilities or from outreach supervision