

This Malaria Operational Plan has been endorsed by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. If any further changes are made to this plan, it will be reflected in a revised posting.



**PRESIDENT'S MALARIA INITIATIVE**

**Malaria Operational Plan — FY 11**

**MOZAMBIQUE**

## TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS .....	3
EXECUTIVE SUMMARY .....	5
INTRODUCTION .....	9
Global Health Initiative .....	9
President’s Malaria Initiative.....	9
Malaria Situation in Mozambique .....	10
Current Status of Malaria Indicators.....	11
Malaria Control Plan and Strategy.....	12
GOAL AND TARGETS OF THE PRESIDENT’S MALARIA INITIATIVE.....	13
EXPECTED RESULTS — YEAR FIVE.....	13
INTERVENTIONS — PREVENTION.....	14
Insecticide-Treated Bed Nets.....	14
Indoor Residual Spraying .....	19
Malaria in Pregnancy .....	23
INTERVENTIONS — CASE MANAGEMENT.....	25
Malaria Diagnosis.....	25
Malaria Treatment.....	28
CAPACITY BUILDING AND HEALTH SYSTEM STRENGTHENING .....	34
INTEGRATION OF HEALTH ACTIVITIES, HIV/AIDS, AND MALARIA .....	36
BEHAVIOR CHANGE AND COMMUNICATIONS .....	37
MONITORING AND EVALUATION OF MALARIA CONTROL ACTIVITIES .....	40
IN-COUNTRY STAFFING AND MANAGEMENT .....	44
ANNEXES.....	46

## ABBREVIATIONS AND ACRONYMS

ACT — Artemisinin-based combination therapy  
 AIDS — Acquired immune deficiency syndrome  
 AL — Artemether-lumefantrine  
 ANC — Antenatal clinic  
 APE — ‘Agentes Polivalentes Elementares’ (Community-based healthcare worker)  
 APHL — American Public Health Laboratories  
 ARV — Anti-retroviral therapy  
 AS–AQ — Artesunate-amodiaquine  
 BCC — Behavior change and communications  
 BES — ‘Boletim Epidemiológico Semanal’ (Weekly Epidemiologic Bulletin)  
 CDC — Centers for Disease Control and Prevention  
 CISM — ‘Centro de Investigação em Saúde Manhiça’ (Maniça Research Center)  
 CMAM — ‘Central de Medicamentos e Artigos Médicos’ (Central Medical Stores)  
 DDT — Dichloro-diphenyl-trichloroethane  
 DDS — ‘Departamento Distrital de Saúde’ (District Health Department)  
 DEPROS — ‘Departamento de Promoção de Saúde’ (Health Promotion Department)  
 DHS — Demographic and health survey  
 DIFD — United Kingdom Department for International Development  
 DNAM — ‘Direcção Nacional de Assistência Médica’ (National Directorate of Medical Assistance)  
 DPS — ‘Departamento Provincial de Saúde’ (Provincial Health Department)  
 ELISA — Enzyme-linked immunosorbent assay  
 FAO — Food and Agriculture Organization  
 FBO — Faith-based organization  
 FP — Family planning  
 FY — Fiscal year  
 Global Fund — Global Fund to Fight AIDS, Tuberculosis, and Malaria  
 GHI — Global Health Initiative  
 HCW — Healthcare worker  
 HIV — Human immunodeficiency virus  
 IEC — Information and education campaign  
 IMCI — Integrated management of childhood illnesses  
 INCAM — ‘Inquérito sobre Causas de Mortalidade’ (Cause of Death Survey)  
 IPTp — Intermittent preventive treatment of pregnant women  
 INS — ‘Instituto Nacional de Saúde’ (National Institute of Health)  
 INSIDA — ‘Inquérito de Indicadores de SIDA’ (AIDS Indicator Survey)  
 IRS — Indoor residual spraying  
 ITN — Insecticide-treated bed net  
 JHPIEGO — Johns Hopkins University affiliated non-governmental organization  
 LLIN — Long-lasting insecticide-treated bed net  
 LATH — Liverpool Associates for Tropical Health  
 LSDI — Lubombo Spatial Development Initiative  
 M&E — Monitoring and evaluation  
 MCH — Maternal and child health

MICOA — ‘Ministério de Coordenação de Acção Ambiental’ (Ministry of Coordination of Environmental Affairs)  
MICS — Multiple Indicator Cluster Survey  
MINAG — Ministério de Agricultura (Ministry of Agriculture)  
MIP — Malaria in pregnancy  
MIS — Malaria Indicator Survey  
MISAU — ‘Ministério de Saúde’ (Ministry of Health)  
MOP — Malaria operational plan  
NGO — Non-governmental organization  
PCR — Polymerase chain reaction  
PEPFAR — U.S. President’s Emergency Plan for AIDS Relief  
PIRCOM — ‘Programa Inter-Religioso contra a Malária’ (Inter-Religious Campaign Against Malaria)  
PMI — President’s Malaria Initiative  
PMTCT — Prevention of mother-to-child transmission (of HIV/AIDS)  
PNCM — ‘Programa Nacional de Controlo da Malária’ (National Malaria Control Program)  
PSI — Population Services International  
RH — Reproductive health  
RBM — Roll Back Malaria  
RDT — Rapid diagnostic test  
SCIP — Strengthening Community Through Integrated Program  
SEA — Supplemental environmental assessment  
SP — Sulfadoxine-pyrimethamine  
TAM — Together Against Malaria  
UNICEF — United Nations Children’s Fund  
USAID — United States Agency for International Development  
USG — U.S. Government  
WHO — World Health Organization

## **EXECUTIVE SUMMARY**

The President's Malaria Initiative (PMI) is a core component of the Global Health Initiative (GHI), a comprehensive US Government (USG) effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the USG will invest \$63 billion over six years to help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children. The GHI is a global commitment to invest in healthy and productive lives, building upon and expanding the USG's successes in addressing specific diseases and issues.

The President's Malaria Initiative (PMI) is a core component of the GHI, along with HIV/AIDS and tuberculosis. The PMI was launched in June 2005 as a 5-year, \$1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos-Hyde Act, funding for PMI has now been extended through FY2014. Programming of PMI activities follows the core principles of GHI: encouraging country ownership and investing in country-led plans and health systems; increasing impact and efficiency through strategic coordination and programmatic integration; strengthening and leveraging key partnerships, multilateral organizations, and private contributions; implementing a woman- and girl-centered approach; improving monitoring and evaluation; and promoting research and innovation.

Mozambique was one of four countries selected for the second year of the President's Malaria Initiative (PMI). The goal of PMI is to assist African countries, in collaboration with other partners, to reduce malaria mortality by 50% by rapidly scaling-up coverage of vulnerable groups with four highly effective interventions: artemisinin-based combination therapy (ACT), intermittent preventive treatment of pregnant women (IPTp), insecticide-treated bed nets (ITNs), and indoor residual spraying (IRS). With the passage of the 2008 Lantos-Hyde Act and the launch by President Barack Obama of the GHI, PMI has been extended until Fiscal Year (FY) 2014.

Despite signs of decreasing malaria prevalence from the Mozambican Ministry of Health (MISAU) health information system, malaria remains a major cause of morbidity and mortality in Mozambique. In a national survey conducted after the 2007 national census, which used verbal autopsy methodology, malaria was the most common cause of the death (29%). Among children less than five years old, 42% of deaths were due to malaria, while HIV/AIDS accounted for 26% of deaths overall and 13% in children less than five years old.

Malaria transmission takes place year round with a seasonal peak extending from December to April. All 21.5 million people in Mozambique are at-risk of malaria. The Government of the Republic of Mozambique considers malaria a priority for poverty reduction and its development agenda. Although the MISAU is committed to increasing access to health services and increasing the efficiency and quality of those services nationwide, a weak health infrastructure and a shortage of health workers are formidable obstacles. In 2000, Mozambique adopted a sector-wide approach for health led by MISAU and with the participation of more than 15 bilateral and multilateral agencies.

A PMI-supported Malaria Indicator Survey (MIS), conducted in June–July 2007, showed that only 18% of households with a child less than five years and/or a pregnant woman owned at least one ITN, and only 7% of pregnant women and 7% of children less than five years old had slept under an ITN the previous night. Only 4% of children less than five years old with fever had received an ACT within 24 hours of onset of symptoms. With support from partners, scaling up of malaria prevention and control interventions is well underway, and the 2008 Malaria Indicator Cluster Survey (MICS) demonstrated some improvement. Thirty-one percent of households with a child less than five owned at least one ITN, and 23% of children under five had slept under an ITN the night before the survey. Mozambique’s Round 2 Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) proposal for \$28 million has yet to be fully disbursed as there have been difficulties due to its pooling in the central basket funding. Mozambique was also awarded a two-year, \$36 million Round 6 grant, which began to disburse funds in 2008; however, no disbursements occurred in 2009. Mozambique’s proposal for Round 9 was accepted but has not been signed as of October 2010. It is hoped that the difficulties with the prior rounds will be resolved prior to the initiation of disbursements of Round 9.

In 2009, a five-year, \$35 million World Bank health sector credit, which includes approximately \$12 million for malaria control, was approved. This credit will primarily focus on system strengthening at the national and provincial levels, with a particular emphasis on three Northern provinces. However, the implementation of this project had not started as of October 2010.

The FY11 PMI Malaria Operational Plan for Mozambique was based on the progress and experiences of the first four years of PMI support and was developed during a planning visit in May 2010 by representatives from the United States Agency for International Development (USAID), the Centers for Disease Control and Prevention (CDC), and USAID Health team and PMI staffs in Mozambique. Activities of the FY11 plan were shared and developed in close consultation with the National Malaria Control Program (PNCM) and nearly all national and international partners involved in malaria prevention and control in the country. Not long after the planning visit, a new PNCM director was named and it is expected that this new leadership will impact significantly the management of PNCM.

With the proposed FY11 PMI funding of \$32,299,000, the following activities will be supported:

**Insecticide-Treated Bed Nets (ITNS):** Since 2007, 5 million long-lasting ITNs (LLINs) have been distributed in Mozambique with PMI contributing approximately three million. LLIN distribution has been through antenatal clinics (ANCs) and through two mass campaigns. In the first PMI-supported campaign nearly 800,000 LLINs were distributed to children less than five years old in Nampula Province in 2008 and, in the second campaign, 140,000 LLINs were distributed to nearly 60,000 households in Sofala Province. PMI will continue to be the main source of LLINs for routine distribution through ANCs to maintain high ITN ownership coverage between universal coverage campaigns. With FY11 funding PMI is expecting to procure 1.2 million LLINs, which is sufficient to cover all routine needs in 2011. In addition, PMI will support PNCM’s universal coverage distribution in districts not covered in the Global Fund Round 9 proposal, as well as post-campaign surveys.

**Indoor Residual Spraying (IRS):** The 2010–2014 National Malaria Prevention and Control Plan has set the target for IRS coverage at 40% of the population, or about 8 million people. PMI has been supporting IRS in Zambézia Province since 2007 and, in 2010, PMI expanded its geographic coverage of IRS within the province of Zambézia by spraying two additional districts. The addition of these two districts translates into approximately 646,000 households or nearly 3 million residents covered. With FY11 funding, PMI will again support spraying of eight districts in Zambézia Province, covering 3 million residents. PMI has also supported entomology monitoring in Zambézia Province. In addition, PMI will continue to provide entomology technical assistance through an entomologist placed with the PNCM who supports entomology monitoring of IRS activities conducted by MISAU outside Zambézia Province. Entomology facilities at the National Institute of Health in Maputo and in Zambézia Province have been refurbished with PMI support.

**Malaria in Pregnancy (MIP):** With FY11 funds, training with guidelines previously developed for antenatal care visits in selected sites will be expanded nationally. PMI will support supervisory visits by MISAU personnel to ensure the guidelines are appropriately implemented and standards of care are maintained. PMI will also cover all needs for LLINs to be distributed free at ANC visits.

**Malaria Diagnosis:** Since 2009, PMI supported production of the malaria laboratory diagnostic manual, purchased and distributed 80 microscopes to health facilities in selected provinces, assisted with refurbishing of the National Reference Laboratory for Blood Parasites, conducted microscopy training, supported the development of a laboratory informatics system through the hiring of a laboratory advisor, as well as supported MISAU to conduct laboratory supervisory visits nationally. With FY11 funds, PMI plans to purchase nearly 5 million rapid diagnostic tests (RDTs) and, based on the results of an assessment of RDT use in Mozambique, assist MISAU in improving healthcare worker (HCW) use of RDTs nationally. In addition, PMI will continue support for laboratory supervision, with emphasis on improving standards of care through quality control and assurance. Finally, PMI will continue support for supplies for the National Reference Laboratory for Blood Parasites and to the informatics system.

**Malaria Treatment:** In 2009, artemether-lumefantrine (AL) became the new first-line treatment for uncomplicated malaria in Mozambique. Implementation of this new policy, which included a new diagnostic approach, was supported almost entirely by PMI. Since 2007, PMI has been the primary source of AL in-country, having procured and distributed over 8 million treatments. With support from PMI, more than 12,000 HCWs were trained during the new case management policy roll-out.

PMI has been building MISAU's logistic capacity at the central level for quantifying, forecasting, warehousing, and transporting antimalarials. Since 2010, PMI has been supporting provincial pharmaceutical advisors. With FY11 funds, PMI will purchase 6 million AL treatments and continue technical support to strengthen the supply chain management system in collaboration with the President's Emergency Plan for AIDS Relief (PEPFAR). PMI will continue to support provision of technical assistance for provincial-level warehouse management as well as clinical supervision through an integrated approach, to improve standards of care at the health facility level.



**Capacity Building and Health Systems Strengthening:** Consistent with GHI principles, PMI is building capacity and supporting health system strengthening in Mozambique at various levels. In 2010, PMI supported the refurbishment of the National Reference Laboratory for Blood Parasites aiming to revitalize its role as a reference center for training and quality assurance and quality control methods for malaria diagnosis. This effort will continue with support for refresher training, strengthening supervision, and the implementation of quality control of diagnostic testing procedures to be expanded to the provincial level. A laboratory information system is being planned with PMI and PEPFAR funds to monitor laboratory commodities and infrastructure, including human resources, and to improve the management of the laboratory and laboratory services across the board. PMI has contributed to the Field Epidemiology and Laboratory Training Program (FELTP) since 2009. PMI has also hired a monitoring and evaluation (M&E) specialist and an entomologist, both of whom are seconded to the PNCM as part of the staff. The in-country PMI team actively participates in technical working groups engaged with the development of national-level policy documents. PMI has integrated with other USAID health programs and PEPFAR projects to strengthen health services, as well as to avoid duplicative effort. PMI has contributed to an integrated antenatal care service package development where malaria in pregnancy training and services play an important role. PMI has also contributed to the Strengthening Community through Integrated Program project. This project is supporting the revitalization of community HCWs in Mozambique. These workers will be trained in case management and the use of RDTs among other health services.

**Behavioral Change and Communication (BCC):** Since 2007, PMI has supported malaria social mobilization through a consortium of religious groups, the Inter-Religious Campaign Against Malaria (PIRCOM). This group has trained more than 20,000 religious leaders in four provinces, Zambézia, Nampula, Sofala, and Inhambane. These religious leaders have reached more than 1.5 million people with malaria prevention messages. In addition, in 2010, PMI shifted its capacity building support for Behavior Change Communication from the PNCM to the Health Promotion Department (DEPROS) of MISAU. FY11 funds will continue to maintain technical assistance to DEPROS, mainly to develop the national malaria branding strategy and the overall malaria communication strategy. With FY2011 funds, PMI will continue to support the BCC for malaria in pregnancy activities, mass distribution of ITNs by universal coverage and the IRS campaign all under the newly developed PNCM “brand.” This is expected to unify and standardize the messages and enhance PNCM’s visibility.

**Monitoring and Evaluation:** PMI supported the 2007 MIS, which provided a baseline for malaria indicators as malaria prevention activities began scaling up. PMI hired technical assistance for PNCM in 2009 and this assistance will continue with FY11 funds. This support is aimed at improving PNCM’s M&E capacity to manage LLINs, IRS, and commodities for case management. Other M&E activities to be maintained in FY11 include the evaluation of LLIN durability after a campaign in 2008, the evaluation of an LLIN universal coverage distribution model, and support for the data base manager for the laboratory informatics system.

## **INTRODUCTION**

### **Global Health Initiative**

Malaria prevention and control is a major foreign assistance objective of the U.S. Government (USG). In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the United States will invest \$63 billion over six years to help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children. The GHI is a global commitment to invest in healthy and productive lives, building upon, and expanding, the USG's successes in addressing specific diseases and issues. Addressing wide-ranging health needs in partnership with host country governments, communities, and other partners represents an ambitious agenda that can be met only if we work together, aligned toward common goals with a commitment to fundamentally improve the way we do business.

The GHI aims to maximize the impact the United States achieves for every health dollar it invests, doing this in a sustainable way. The GHI business model is based on implementing a woman- and girl-centered approach; increasing impact and efficiency through strategic coordination and programmatic integration; strengthening and leveraging key partnerships, multilateral organizations, and private contributions; encouraging country ownership and investing in country-led plans and health systems; improving metrics, and monitoring and evaluation (M&E); and promoting research and innovation. The GHI will build on the USG's accomplishments in global health, accelerating progress in health delivery and investing in a more lasting and shared approach through the strengthening of health systems.

### **President's Malaria Initiative**

The President's Malaria Initiative (PMI) is a core component of the GHI, along with HIV/AIDS and tuberculosis. PMI was launched in June 2005 as a 5-year, \$1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos–Hyde Act, funding for PMI has now been extended through fiscal year 2014 (FY14), and, as part of the GHI, the goal of PMI has been adjusted to reduce malaria-related mortality by 70% in the original 15 countries by the end of 2015. This will be achieved by reaching 85% coverage of the most vulnerable groups — children less than five years old and pregnant women — with proven preventive and therapeutic interventions, including artemisinin-based combination therapy (ACT), insecticide-treated bed nets (ITNs), intermittent treatment of pregnant women (IPTp), and indoor residual spraying (IRS). With the passage of the 2008 Lantos–Hyde Act, funding for PMI has been extended through FY14 and, in 2010, two additional countries were selected for PMI — Democratic Republic of Congo (DRC) and Nigeria.

In implementing this initiative, the USG is committed to working closely with host governments and within existing national malaria control plans. Efforts are coordinated with other national and international partners, including the Global Fund, Roll Back Malaria (RBM), the World Bank Malaria Booster Program, and the non-governmental and private sectors, to ensure that investments are complementary and that RBM and Millennium Development goals are achieved.

Country assessment and planning activities for PMI are highly consultative and held in collaboration with the national malaria control program and other partners.

This document presents a detailed one-year implementation plan for the fifth year of PMI in Mozambique. It briefly reviews the current status of malaria control and prevention policies and interventions, identifies challenges and unmet needs if the goals of the Mozambican National Malaria Control Program (PNCM) and PMI are to be achieved, and provides a description of planned FY11 activities under PMI. It should be noted that, after the MOP planning visit, the directorship of PNCM has changed. The new PNCM Director took her position in August of 2010 and it is expected that this new leadership will impact significantly the management of the PNCM. The document was developed in close consultation with the PNCM and with participation of many national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit well with the Ministry of Health's (MISAU's) National Malaria Prevention and Control Plan and build upon investments made during the first four years of PMI in the country. The total amount of PMI funding requested for Mozambique is \$32.3 million for FY11.

### **Malaria Situation in Mozambique**

According to the PNCM's 2009 Annual Report, the burden of malaria in Mozambique is decreasing. The basis for this statement is the mortality and morbidity data collected through the existing health information system, the Weekly Epidemiologic Bulletin (BES). Comparing the same time period in 2008 and 2009, there were 5,168,684 reported malaria cases and 3,191 malaria deaths in 2008 versus 4,020,574 and 2,786, respectively, in 2009. Malaria cases included both clinically diagnosed as well as those that had laboratory confirmation by either blood smears or rapid diagnostic tests (RDTs). However, the accuracy of data collected from BES is questionable. Additionally, RDTs have been progressively implemented since 2008, and the impact of this intervention on case reporting is unknown.

Most of Mozambique has year-round malaria transmission with a seasonal peak from December to April (during the rainy season). Mozambique is, however, prone to natural disasters; such as drought, cyclones, and floods; and these may have contributed to increases in malaria transmission in recent years, particularly in low-lying coastal areas and along major rivers.

*Plasmodium falciparum* infections account for 90% of all malaria infections, with *P. malariae* and *P. ovale* responsible for about 9% and 1%, respectively. The major vectors in Mozambique are *Anopheles gambiae s.s.*, *A. arabiensis*, *A. funestus s.l.*, and *A. funestus s.s.* Among the major subspecies of the *A. gambiae* complex, *A. arabiensis* is more prevalent in the south and *A. gambiae* in the north.

The national census of 2007 documented the population of Mozambique to be approximately 21.5 million, with 1 million people residing in urban Maputo and 1 million in the peri-urban Maputo. By 2010, it is projected that there will be 3,800,000 children less than five years old and 1.1 million pregnant women.

In the previous years, malaria transmission was assumed to be very low in Maputo city. In April 2009, however, a rapid urban malaria assessment was conducted within the city limits of

Maputo. Data from this assessment suggests on-going transmission at higher-than-expected levels, even in urban areas of the city. Using RDTs, the prevalence of malaria among febrile patients presenting for care to public health facilities was 10.8% in urban Maputo, 16.5% in peri-urban areas surrounding Maputo, and 24.2% in rural areas in Maputo City. Based on these results, both urban and peri-urban areas of Maputo City should be targeted for malaria prevention and control activities.

A Cause of Death Survey (INCAM) post-census survey carried out between 2007 and 2008 confirmed malaria as the overall primary cause of death (29%), followed closely by AIDS (27%) in Mozambique. Among children less than five years old, this difference is more pronounced: malaria accounted for 42% of the deaths, followed by AIDS at 13%.

The 2008 Multiple Indicator Cluster Survey (MICS) estimated at 138 per 1,000 live births the probability of dying before the age of five (under-five mortality rate). This represents a reduction of 15% compared to 153 per 1,000 live births from the 2003 DHS.

### **Current Status of Malaria Indicators**

A PMI baseline Malaria Indicator Survey (MIS) carried out in June–July 2007, at the end of the rainy season, showed that 15.8% of households had at least one ITN, but only 7.3% of pregnant women and 6.7% of children less than five years old had slept under an ITN the previous night (see table below). This represents no improvement in use of ITNs compared with the 2003 DHS (data not shown).

Fifty-two percent of those houses targeted for IRS had been sprayed and 16% of pregnant women had received two or more doses of IPTp. Only 4.5% of children less than five years old with fever had received an ACT within 24 hours of onset of symptoms.

The 2008 MICS shows an improvement in ITN use and treatment with an antimalarial within 24 hours of onset of fever as compared to the 2007 MIS (see table below). Also, the proportion of women who received two or more doses of IPTp during their last pregnancy also increased from 16.2% to 43.1%.

An AIDS Indicator Survey (INSIDA) was carried out in July 2009 with a limited number of questions on bed net use, IPTp, and IRS. Results show improvement in the use of bed nets compared to prior surveys for both pregnant women and children less than five years old. The trend was reversed for IRS and IPTp.

### **Malaria Indicators in Mozambique: Data from 2007 MIS, 2008 MICS, 2009 INSIDA**

<b>Malaria Indicators</b>	<b>2007 MIS %</b>	<b>2008 MICS %</b>	<b>2009 INSIDA %</b>
Proportion of households with at least one ITN	15.8	30.7	NA
Proportion of children less than five years old who slept under an ITN the previous night	6.7	22.8	NA
Proportion of children less than five years old who slept under a bed net the previous night	15.7	42.1	48.7

Proportion of pregnant women who slept under an ITN the previous night	7.3	NA	NA
Proportion of pregnant women who slept under a bed net the previous night	19.3	NA	42.1
Proportion of women who received two or more doses of IPTp during their last pregnancy in the last two years	16.2	43.1	33
Proportion of targeted houses adequately sprayed with a residual insecticide in the last 12 months	52.4	NA	47.8
Proportion of children less than five years old with fever in the last two weeks who received treatment with an antimalarial within 24 hours of onset of fever	17.6	22.7	NA
Proportion of children less than five years old with fever in the last two weeks who received treatment with an ACT within 24 hours of onset of fever	4.5	NA	NA

### Malaria Control Plan and Strategy

The PNCM has yet to obtain final MISAU approval for the National Malaria Prevention and Control Plan 2010 to 2014. This plan focuses on continuing the national scale-up of six key malaria prevention and control interventions, comprised of:

**1. Integrated vector management (IRS, ITNs, and environmental management):**

IRS has been a core malaria control strategy in Mozambique for a number of years, with national targets aiming for coverage of at least 40% of the population located mostly in the more densely populated areas in Mozambique. Free long-lasting ITN (LLIN) distribution focuses on people at risk of malaria outside the areas covered by IRS, principally located in the rural areas. The plan emphasizes universal coverage distribution of LLINs.

**2. Prompt diagnosis and correct treatment:** The PNCM rolled out a new case management policy in late 2009, which expands diagnostic testing to all persons suspected of having malaria. This policy applies to both healthcare workers (HCWs) in health facilities and in the community. The first-line treatment of uncomplicated malaria was also updated: artesunate-sulphadoxine-pyrimethamine (AS-SP) was replaced with artemether-lumefantrine (AL).

**3. Malaria prevention in pregnancy:** Use of IPTp with SP was scaled-up nationally beginning in early 2006; national surveys indicate significant improvement in uptake nationally. Because of the high prevalence of HIV infection in Mozambique, all pregnant women should receive three, instead of two, monthly doses of IPTp during pregnancy beginning after quickening.

**4. Health promotion and community participation and involvement:** To improve the knowledge of rural communities, the PNCM promotes increased community participation in developing solutions to significantly impact malaria mortality and morbidity. In addition, a cadre of community HCWs, known as community-based HCWs (APEs), is being revitalized. APEs will play a key role for the largely rural population in Mozambique in both health promotion and malaria case management.

**5. Emergency and epidemic preparedness and response:** Coordination between MISAU and the National Disasters Management Institute is intended to facilitate

forecasting and timely detection of malaria outbreaks using health information systems data and weather forecasts.

**6. Program management, monitoring and evaluation, and health system strengthening, including operational research:** Strengthened management and planning of malaria activities and capacity at all levels will direct limited resources more effectively; the consolidation and coordination of malaria-related systems to cope with rapid scale-up of malaria control interventions is a cornerstone of the strategy. Effective M&E systems (including data collection, processing, and use) and operational research will measure progress towards established milestones and help guide evidence-based decision making.

## **GOAL AND TARGETS OF THE PRESIDENT’S MALARIA INITIATIVE**

With the six-year extension of PMI under the GHI, the new goal is to reduce malaria-related mortality by a total of 70%, considering the initial 2006–2007 baseline and the end of 2015, when FY14 funding has been expended. During this period, PMI will continue to work toward consolidating the following coverage targets in populations at risk of malaria in Mozambique:

1. More than 90% of households with a pregnant woman and/or a child less than five years of age will own at least one ITN;
2. 85% of children less than five years old will have slept under an ITN the previous night;
3. 85% of pregnant women will have slept under an ITN the previous night;
4. 85% of houses in geographic areas targeted for IRS will have been correctly sprayed;
5. 85% of pregnant women and children less than five years old will have slept under an ITN the previous night or in a house that has been sprayed with a residual insecticide within three months before the last transmission season;
6. 85% of pregnant women who have completed a pregnancy in the last two years will have received two or more doses of SP for IPTp during that pregnancy;
7. 85% of government health facilities will have ACTs available for the treatment of uncomplicated malaria; and
8. 85% of children less than five years old with suspected malaria will have received treatment with an ACT in accordance with national malaria treatment policies within 24 hours of the onset of symptoms.

## **EXPECTED RESULTS — YEAR FIVE**

At the end of Year 5 of PMI in Mozambique, the following targets will have been achieved:

### Prevention:

- Approximately 5 million LLINs will be procured and distributed free-of-charge. The bulk of PMI’s LLIN contribution goes to pregnant women through antenatal clinics (ANCs) but PMI will also contribute to universal coverage campaigns through assistance with the planning and distribution of LLINs, as well as post-campaign surveys. Between these two approaches the national household ownership of at least one ITN is expected to be at least 70%.

- At least 90% of houses in eight districts (roughly 650,000 households or almost 3 million residents) targeted for IRS in Zambézia Province will have been sprayed with support from PMI.
- With PMI, the President’s Emergency Plan for AIDS Relief (PEPFAR), and other USG funding support, quality antenatal clinic (ANC) services, including IPTp, will be available in all 11 provinces with 60% of all pregnant women receiving at least two doses during their pregnancies.

#### Diagnosis and Treatment:

- PMI will support MISAU in the procurement and distribution of approximately 5 million RDTs, which along with Global Fund’s support for diagnostic procurement, will make diagnostic testing for malaria available for at least 80% of health facility–based HCWs.
- PMI will procure and distribute approximately 6 million AL treatments and together with antimalarials procured with Global Fund support, at least 60% of malaria episodes in children less than five years old will be treated with an ACT.
- With the support from the USG, and other donors and partners, MISAU will recruit approximately 2,500 community-based HCWs. These newly recruited APEs will be trained in case management and use of RDTs.
- With PMI and PEPFAR support for logistics management at both the central and provincial levels, at least 60% of health facilities will report no disruption of stock of antimalarial drugs for more than one week during the previous three months.

## **INTERVENTIONS — PREVENTION**

### **Insecticide-Treated Bed Nets**

#### Current Status, Challenges, and Needs

**National plan for ITNs:** In January 2006, MISAU declared malaria a national emergency and, as such, malaria prevention and treatment services must be provided free-of charge to at-risk populations through the public health service. Children less than five years old and pregnant women were targeted for ITN distribution from 2006 until 2009. These populations were reached either through mass campaigns targeted to children less than five years old or delivered to pregnant women during ANC visits.

The draft National Malaria Control Strategic Plan for 2010 to 2014 outlines the new national ITN distribution policy, which focuses on universal coverage (approximately one LLIN for every two persons, although this estimate is used for calculating needs only and not for the actual proposed distribution method, see explanation below) for the entire population at risk of malaria in areas not covered by IRS. This strategy foresees the distribution to pregnant women (one of the high risk groups) through ANCs as a platform to maintain the universal coverage in Mozambique. The policy also states that LLINs should continue to be distributed free-of-charge.

The primary objective of this new distribution strategy is to achieve high levels of coverage for the entire population at risk of malaria in areas not covered by IRS. Mozambique developed this universal coverage distribution model based on local and international experience. UNICEF completed a pilot universal coverage campaign in Mabalane District in Gaza Province and three

small district-level campaigns in 2009. PMI also supported a large scale pilot universal coverage LLIN distribution campaign where 140,000 LLINs were distributed. Planning activities started in August 2009 and distribution was scheduled to take place in September 2009, but, due to presidential elections, the distribution was postponed until early 2010.

The model is based on the creation of a list of all community members through a “mini census”. This mini census is conducted by enlisting the assistance and leadership of the community chiefs to register all the members of their community by household and create a list with this information. This list then becomes the basis for the number of LLINs to be allocated to each household in the community; the allocation is done by the local public health authorities. Distribution occurs at fixed points in the community, where community residents who are on the list come to pick up the LLINs allocated to them. The distribution takes place over several days, thereby allowing for all community residents to get to the distribution point during the campaign to pick up their LLINs.

In the Global Fund Round 9 proposal, which was approved but not yet signed as of October 2010, MISAU requested support for the procurement and distribution of 10 million LLINs for universal coverage campaigns over the five-year duration of the grant. The Global Fund Round 9 proposal has the civil society, composed of in-country local and international non-governmental organizations (NGOs), as a second Principal Recipient. The core activity of the civil society’s proposal is support for community involvement for malaria prevention and support of universal coverage of LLIN distribution. Other sources for LLINs, such as PMI, are taken into account to achieve universal coverage in the Round 9 narrative. The proposal also includes warehousing provisions, as well as personnel costs, to manage LLIN distribution at provincial level.

The nationwide scale-up of universal coverage campaigns with Round 9 funds is planned to start in late 2010–early 2011. The objective is to cover in a “rolling” campaign approach all districts not covered by IRS in each province and to repeat this roughly every three years.

Distribution of LLINs during ANC visits (92% of pregnant women attend ANC at least once, 2008 MICS) will continue throughout all of Mozambique, including Maputo Province and city, where ITNs have recently been added to the ANC package. However, targeted distribution to other vulnerable populations, such as orphans and vulnerable children and people living with HIV, will be discontinued as the universal coverage campaigns are expected to reach these populations. Many partners conducting the distribution to these special populations found the logistics overwhelming and inefficient, as well as stigmatizing to the recipients.

A key component of Mozambique’s current approach to ITN distribution is to focus on building domestic capacity for distribution at provincial and district level. In some previous campaigns provincial level public health authorities relied significantly on technical support of in-country partners. As the strategy shifts to universal coverage, the focus on domestic capacity building will need to increase. In addition, with the new leadership at the PNCM, PMI will work closely with the PNCM on an integrated vector control policy, which will address the LLIN distribution strategy of universal coverage.



### ITN Distribution to Provincial Warehouses by Province, 2006–2009

Source: UNICEF, Population Services International, MISAU

Province	2007	2008	2009
Cabo Delgado	294,051	131,075	197,657
Gaza	66,195	39,237	171,672
Inhambane	191,157	159,861	107,611
Manica	20,386	106,755	248,324
Maputo Province	132,346	64,350	116,520
Maputo City			60,000
Nampula	228,578	1,045,901	94,018
Niassa	161,121	38,811	254,577
Sofala	47,923	76,150	38,029
Tete	82,675	231,604	273,752
Zambézia	282,043	192,624	66,923
Total	1,506,475	2,086,368	1,629,083

#### Progress to date

According to data from the PNCM, UNICEF, and partners, approximately 5.2 million LLINs were distributed in 2007 through 2009 (see table above). PMI procured almost 3 million of these. In addition, PEPFAR resources were used to procure an additional 367,000 LLINs for persons living with HIV/AIDS, orphans, and vulnerable children from 2006 to 2008. In 2009, 183,778 LLINs procured with PEPFAR funds were distributed. According to the PNCM 2009 Annual Report, a total of 1,292,159 LLINs were distributed directly to beneficiaries in 2009; 838,130 of these were to pregnant women, representing 76.6% coverage in this target group.

Other sources of LLINs are UNICEF and MISAU. In 2009, UNICEF procured 368,000 LLINs; 267,053 were distributed through campaigns and through ANCs. Almost 1 million LLINs were procured by PNCM in 2009 using funding from Global Fund Rounds 2 and 6 as well as Government funds. In addition, World Bank has recently announced plans to purchase LLINs for Mozambique as part of the Health Commodity Security Program. It is expected that approximately 1.5 million LLINs will be procured by 2011 through World Bank funding.

Several district-level campaigns for children less than five years old have been conducted by either the Provincial Health Department (DPS) or UNICEF since 2007 in the following provinces: Zambézia, Niassa, Cabo Delgado, and Inhambane. A province-wide distribution in Nampula in October 2008 during the national measles–Vitamin A–deworming campaign also took place. PMI provided 720,000 of the 800,000 LLINs distributed and provided significant financial and technical support for the distribution. PMI, through CDC’s technical assistance in collaboration with the National Institute of Health (INS), has an on-going assessment of the durability of these LLINs until year 2011, or three years after the LLIN distribution.

PMI also supported an LLIN universal coverage pilot campaign in four districts in Sofala Province in late 2009 and early 2010. This pilot campaign, done by the Sofala DPS and the District Health Department (DDS) from Gorongosa, Cheringoma, Muanza, and Nhamatanda in close collaboration and support from Population Services International (PSI), was the first large-scale universal coverage campaign: 140,000 LLINs were distributed to approximately 60,000 households. PMI is supporting an evaluation of this pilot, since Mozambique intends to use this experience to establish a standard universal coverage methodology for the rest of the rolling universal coverage campaigns. This evaluation is led by the PNCM with technical support from Centro de Investigação de Saúde Manhíça (CISM) and is being implemented by the Sofala DPS and DDS with logistic support from PSI. The evaluation was initiated at the time of the distribution campaign and has a follow-up survey over the two years after the campaign.

For routine ANC distribution, PMI LLINs are distributed to provincial warehouses and the DPS of the receiving province is responsible for the distribution to the district warehouses and from there to the health facilities. NGOs or UNICEF assist the DPSs in the distribution from the provincial to district level: PSI for Zambézia, Maputo Province, and Maputo City; UNICEF for Niassa; Tete and Gaza; and Malaria Consortium for Inhambane, Cabo Delgado, Nampula, Manica, and Sofala. Malaria Consortium received funding from the United Kingdom Department for International Development (DfID) but this source of funds ended in May 2009. Support to the mentioned provinces will be continued by either PSI (in Niassa and Tete) or UNICEF.

Despite enormous investments in LLINs and the goal for universal coverage, the performance and durability of these products in real-life settings has not been systematically monitored. Product durability is extrapolated from laboratory data from the manufacturers and a small number of small-scale field trials. Conventionally a 3- to 5-year lifespan has been assumed. To assess the true durability of LLINs in field conditions, PMI is supporting an evaluation in which a sample of bar-coded LLINs distributed in the Nampula campaign in October 2008 have been collected yearly for three years (2011 will be the last year to collect samples of the LLINs distributed in 2008) to determine LLIN longevity and durability.

***Communications and behavior change for LLIN uptake and appropriate use:*** Funding from PMI for communications activities focused on increasing demand for LLINs in rural communities, particularly in Zambézia, Nampula, and Sofala Provinces, mainly around campaigns. PSI also conducted a survey to better understand barriers to LLIN use in three provinces. Data collected from this survey has served to tailor communications and behavior change activities in efforts to further scale-up LLIN ownership and use.

PSI also collaborated with Together Against Malaria (TAM) and the Inter-Religious Campaign Against Malaria (PIRCOM) to train religious leaders to mobilize communities around the control of malaria. These two groups are working to coordinate messages around the use of LLINs.

Other behavior change and communication (BCC) efforts specifically related to LLIN distribution are supported through other partners (UNICEF and Malaria Consortium) during campaigns or through mass media efforts at provincial level. Messages developed for these

efforts require MISAU approval, which ensures that the content is appropriate. However, the delivery (presentation and means) of these messages varies from partner to partner.

**Projected ITN requirements for FY11:** The LLIN gap in Mozambique is based on the MISAU's goal of universal coverage of all areas that are not targeted for IRS. In addition to LLIN distribution campaigns, routine distribution of LLINs through ANCs is carried out in all areas of the country. The most recent census listed that Mozambique has a population of 21.5 million people, of which roughly 40% live in urban or peri-urban areas, which are normally targeted for IRS activities. Excluding the population covered by IRS, 12.9 million people remain as the target for universal coverage. If we assume approximately 4.5 persons per household, then over 6 million LLINs are needed to provide all 2.87 million target households with enough LLINs to cover all sleeping spaces in the household (more than two LLINs per household).

The PNCM laid out a plan in the Global Fund Round 9 proposal to start universal coverage campaigns in provinces that have not had mass campaign distributions since 2007 (three years before the start of Global Fund Round 9 activities implementation) and based their yearly calculations on this and having most of the campaigns across Mozambique taking place every three years. Maintenance ANC distribution would be continuous and is approximately 1.2 million LLINs a year on top of the universal coverage LLIN needs.

Currently, IRS activities are aimed at high levels of coverage in the targeted urban and peri-urban areas but do not necessarily cover the entire district where these targeted areas are located. PMI will give technical support to PNCM on the LLIN universal coverage distribution strategy to include areas that are in districts where IRS activities take place only in the urban and peri-urban areas but not in the remaining more rural parts of the district. PMI funds may be needed to support LLIN universal coverage distribution costs in these districts where Global Fund civil society partners are not present to assist with LLIN distribution campaigns. Because proposed LLIN needs calculations for universal coverage in the Global Fund Round 9 proposal were based on target population, the number of LLINs needed to cover the population in districts with incomplete IRS coverage is adequate. However, not all such areas have civil society partners present to assist with the campaign implementation or costs.

#### **Estimated LLIN Need and Gap Based on Country Targets as Presented in Global Fund Proposal Round 9**

<b>LLIN variable</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Country target	7,539,764	1,006,556	1,030,108	8,081,383	1,078,494
LLINs from sources other than Global Fund	2,801,135	1,006,556	1,030,108	2,737,550	1,078,494
Gap for Global Fund	4,738,629	0	0	5,343,833	0

Proposed FY11 USG Component: (\$9,250,000)

PMI will make a significant contribution towards increasing LLIN ownership and use in Mozambique. With PMI's support in 2010, all pregnant women in Mozambique will have access to LLINs through ANCs, and universal coverage campaigns will take place in areas of districts where IRS activities are not carried out, narrowing the gap towards achieving the PNCM's goal. As in the past, LLINs procured through PMI will be delivered free-of-charge.

The proposed activities for PMI Year 5 are as follows:

- **LLIN procurement:** Approximately 1,200,000 LLINs will be procured and delivered to the country, assuming a cost per LLIN of approximately \$5.85 each (\$7,000,000);
- **LLIN distribution through ANCs:** Continue support to provincial and district health teams for management, logistics, and promotional activities related to LLIN delivery through ANCs (\$1,500,000); and
- **LLIN distribution universal coverage campaigns:** Continue support for technical and logistic support for universal coverage campaigns where needed nationwide. This activity will also include complementary funds for the evaluation of the pilot universal coverage campaign conducted in Sofala in 2010 (\$750,000).

### **Indoor Residual Spraying**

Current Status, Challenges, and Needs

IRS remains a priority vector control intervention for MISAU in Mozambique. MISAU considers IRS to be the backbone of their malaria control strategy. For the 2009 IRS campaign, MISAU led a countrywide IRS program using Mozambique government funds along with PMI support for Zambézia Province and LSDI support for Maputo and Gaza Provinces. The MISAU-led program sprayed 2 million structures, protecting an estimated 6.2 million people. In total, 2009 Mozambican IRS campaigns (MISAU, PMI, and LSDI) covered 10 provinces, protecting about 42% of the population. At the end of the 2009 IRS campaign, the Minister of Health unexpectedly requested that IRS be expanded geographically, with at least one additional district to be sprayed in each province in 2010.

Several neighboring countries; including South Africa, Zimbabwe, and Zambia; have large-scale IRS programs using dichlorodiphenyltrichlorethane (DDT). The LSDI, a private–public trilateral program among the governments of Mozambique, South Africa, and Swaziland, developed a program with the aim of reducing malaria in the region to encourage economic and tourism investments in the region. Since 2000, the LSDI has supported large-scale IRS in Maputo Province, initially using bendiocarb in two spray rounds per year.

Between 2000 and 2002, resistance testing was carried out at 17 localities throughout Mozambique by the PNCM in collaboration with the Medical Research Council of South Africa and the Liverpool School of Tropical Medicine. Insecticide resistance did not appear to be an

operational impediment to vector control activities except in Maputo Province, where *A. funestus* populations resistant to both pyrethroids and carbamates and *A. arabiensis* resistance to carbamates were observed. In addition, *Anopheles gambiae s.s.* showed low-level resistance to pyrethroid and carbamate. The *kdr* mutation in the mosquito gene, which is associated with resistance to pyrethroid insecticides and cross-resistance to DDT, was not detected in Mozambique. In late 2005, the Government of Mozambique withdrew its ban on DDT, and it was re-introduced in the Maputo Province with one spray round per year.

The MISAU-led IRS program in Zambézia Province began in 2005 in three districts (Quelimane, Namacurra, and Nicoadala) and used DDT. It was then expanded into parts of three additional districts (Morrumbala, Mocuba, and Milange) in 2006. In 2007, the PNCM and provincial health authorities requested PMI to support the spraying operations in those six districts. After the first PMI-supported spray operation in 2007, the PNCM and PMI agreed to consolidate the IRS operations focusing on the more densely populated areas, as opposed to blanket spraying of the entire population. The primary insecticide used in Zambézia has been DDT, consistent with PNCM's strategy of using DDT in highly populated urban and peri-urban areas. However, deltamethrin was used in towns where structures with finished or painted walls were found.

At the request of MISAU and with support from PMI, a multi-disciplinary team from the World Health Organization (WHO), Food and Agriculture Organization (FAO), and the Ministry of Health from Brazil, conducted an external assessment of the insecticide management system in five provinces (Maputo, Zambézia, Nampula, Sofala, and Gaza) in January and February 2008. This assessment was conducted due to concerns expressed by MISAU regarding the potential leakage of DDT outside of the public health sector. This assessment focused on the logistics, transportation, stock management, and warehousing of insecticides used for IRS, with particular emphasis on DDT. The assessment found that, although leakage from warehouses in Zambézia was documented, this was considered relatively small. It did acknowledge the potential for leakage throughout all of the steps of the insecticide management system, however. This assessment, along with anecdotal reports from the agricultural industry of high levels of DDT in agricultural products, prompted MISAU in 2008 to reconsider further DDT purchases. In 2008, MISAU transitioned away from the organochlorine (DDT) to pyrethroids, and, in 2009, five of the six targeted districts in Zambézia Province were sprayed with a pyrethroid. However, in the sixth district, Mocuba, DDT was continued since there was sufficient stock to cover the entire district, as well as the needed infrastructure to support DDT spraying.

In order to decentralize entomology-related infrastructure and human resources, PMI supported the establishment of an entomology laboratory in Quelimane in Zambézia Province. This was completed in 2009 and will serve as a regional entomology facility for entomologic activities in other provinces in central Mozambique. The entomology laboratory has been staffed by a biologist from the INS, who was supported through a Research Triangle Institute (RTI)/Liverpool Associates for Health (LATH) subcontract, and two malaria technicians from the DPS. As the LATH subcontract ended in May 2010, the entomology laboratory biologist left. This has caused a delay in the work as another biologist to staff the entomology laboratory has not been identified as of October 2010.

PMI is supporting entomologic strengthening at the central level with the upgrade of the central entomology laboratory and insectary at the INS, which houses most of the laboratories of the various programs in MISAU. The upgrade and re-equipment of the laboratory and insectary will support identification of mosquito species complexes, ELISA testing for malaria-infected mosquitoes, ELISA- and PCR-based monitoring for insecticide resistance, susceptibility bioassays, and insecticide efficacy monitoring for IRS and LLINs.

#### Progress to date

At the request of the PNCM, PMI continues to focus on IRS operations in Zambézia Province, providing strategic, technical, operations, and management support for IRS activities in collaboration with provincial and district health offices and the PNCM. The 2009 IRS campaign in Zambézia Province was implemented six districts (Nicoadala, Namacurra, Quelimane, Milange, Morrumbala, and Mocuba) in mid-July, well before the rainy season began. The timing of the initiation of IRS is of concern to PMI and this concern has been raised with MISAU. To maximize efficacy of this particular insecticide, spraying should start closer to the peak malaria transmission season. The IRS campaign for 2010 started in the first week of September 2010. Areas with limited access during the rainy season were sprayed first.

There were sufficient stocks of the pyrethroid lambda-cyhalothrin wettable powder (WP) in 2009 to cover five of the six districts covered by PMI. The remaining stocks of DDT from the 2008 IRS campaign were used for Mocuba in the structures and houses made of cement blocks. The rest of the structures in Mocuba were sprayed with lambda-cyhalothrin.

A total of 1,349 men and women were hired and trained as spray operators, team leaders, locality and district supervisors, coordinators, and warehouse keepers. A total of 161 persons participated as information and education campaign (IEC) mobilizers. Of the 590,031 structures visited in the targeted districts 571,194 were sprayed, representing 97% coverage. A total of 2,263,409 persons were protected out of which 19% (429,529 persons) were children less than five years old and 5.1% (116,457 persons) were pregnant women. The refusal and house-closed rates were low at 1% and 2%, respectively.

The DPS, Ministry of Coordination of Environmental Affairs (MICOA), and the Ministry of Agriculture (MINAG) remained involved in the IRS campaign in Zambézia Province to monitor environmental compliance and spray quality standards. To mitigate the likelihood of DDT leakage, MICOA and MINAG make unannounced visits to local markets to check for unauthorized sale of insecticide sachets and unscheduled stock inspections of all operational base stores. In addition, in order to adhere to stringent USG environmental mitigation measures described in the supplemental environmental assessment (SEA), PMI constructed evaporation tanks to evaporate IRS waste water at 23 operational sites in Zambézia. At the end of the 2009 IRS season, all evaporation tanks were dried and emptied of contaminated water. Residues were scraped off, packed, labeled and transferred to a warehouse for storage for disposal through South Africa. Evaporation tanks will not be utilized during the 2010 IRS round because of change in insecticide class from organochloride (DDT) to pyrethroid (lambda-cyhalothrin). Instead, the tanks will be converted into soaking pits, which are needed for the pyrethroid class. Empty sachets from the IRS operations were collected, counted, and stored in a warehouse until disposal at a certified incineration facility in South Africa.

The current plans to continue entomologic monitoring in Zambézia Province include technical assistance from the Malaria Research Council from South Africa, and collaboration with the PNCM and INS. At the request of the PNCM, PMI supported a 2-year entomology technical assistance. An entomologist was hired in 2009 and placed within the PNCM to support the national entomology surveys and to assist in the IRS surveillance in Zambézia.

The refurbishment of the INS Maputo entomology laboratory for PCR and ELISA capability has been completed. The insectary and entomology laboratory for species identification and insecticide testing at INS is expected to be completed by late 2010. With the INS laboratory refurbishment, the entomologic material collected for PCR and ELISA from Zambézia Province should be processed in Maputo. The building initially identified by the PNCM for the Pemba regional entomology laboratory in Cabo Delgado Province was found to be structurally defective. The plans were modified and two insulated containers were purchased and have been placed at a health center in Eduardo Mondlane Bairro, Pemba. The refurbishment of these containers is continuing and is also expected to be completed before the end of 2010.

Proposed FY11 USG Component: (\$6,575,000)

At the request of the MISAU, IRS operations in 2010 are being expanded to two more districts, Mopeia and Maganja de Costa, in addition to the six districts covered during the previous spray campaigns. The targeted number of structures in the eight districts is estimated to be 646,698. In 2011, PMI will support a fifth round of focal IRS in eight districts of Zambézia Province. Resources will be targeted to build the technical and managerial capacity of the PNCM and the provincial health authorities. PMI will work closely with the PNCM in forecasting the quantity of insecticide needed in FY11 to ensure that the required quantities will be available.

The proposed activities for PMI Year 5 are as follows:

- **Spraying in Zambézia:** Continue to support the PNCM with IRS operations in Quelimane, Namacurra, Nicuadala, Morrumbala, Mocuba, Milange, Mopeia, and Maganja de Costa. With the new leadership at PNCM, PMI will work closely with PNCM on an integrated vector control policy, which will address the timing of the start of the spray season as it relates to the transmission season and insecticide selection. This will include operations, hiring of personnel, training, and supervision over a three-month period (\$5,000,000);
- **Support a process to develop a rational IRS strategy:** PMI will work with the PNCM and different stakeholders to develop and agree on a comprehensive and rational national IRS strategy (\$75,000); and
- **Purchase equipment and supplies for the IRS operations in these eight districts:** Procure adequate supplies of pyrethroid, personal protective equipment, and spray equipment spare parts (\$1,500,000).

## **Malaria in Pregnancy**

### Current Status, Challenges, and Needs

According to the MICS conducted in 2008, 92% of women received prenatal care during their pregnancy. This represents an increase from the 2007 MIS, which showed attendance of pregnant women at least once to an ANC to be 84%. These visits, however, tend to take place late in pregnancy and ANC attendance rates tend to be lower in rural areas. Anecdotal reports suggest that free distribution of ITNs has increased ANC attendance.

Since May 2006, the MISAU has promoted the use of IPTp for all pregnant women. The PNCM and MISAU Maternal and Child Health (MCH) Program have collaborated in developing an IPTp policy. At least three monthly doses of SP after quickening are recommended in Mozambique because of high HIV prevalence. While the use of IPTp is national policy in Mozambique since 2006, its uptake was found to be limited in the 2007 MIS (16.2% for two doses of SP), particularly in the Northern provinces. In the MICS conducted in 2008, IPTp coverage of at least two doses of SP had improved to 43%; in the 2009 INSIDA, it was found to be 33%. Although these figures represent improvement relative to the 2007 MIS, the uptake continues to be low. This is probably due to a combination of factors, including poorly coordinated training of staff, lack of supervision together with poor reporting practices.

Assuming that pregnant women make up about 5% of the population, an estimated 1.2 million women will be pregnant in 2011. Using this figure, a total of 3.6 million treatments annually will be required if each woman is to receive three doses of IPTp. Currently, according to Central Medical Stores (CMAM), stocks of SP are low and the existing stocks are expected to expire in July 2010. For unknown reasons, this was not accounted for during CMAM's budget planning, and external support is apparently going to be required to fill this gap.

In Mozambique, many pregnant women are also HIV-positive and first learn their serologic status when they present for ANC services. HIV-positive women are referred for CD4 testing and enrollment in antiretroviral therapy, as appropriate. Many of the PEPFAR Prevention of Mother-to-Child Transmission (PMTCT) partners have introduced cotrimoxazole prophylaxis for HIV-infected women, precluding the use of SP for IPTp in these women. To date, though, comprehensive guidelines for preventing malaria in HIV-positive pregnant women have not been finalized.

A 2008 PEPFAR-funded assessment of integration of PMTCT and IPTp found that little investment had been made to strengthen the communication channels within MISAU and among partners to sustain a high-quality integration of HIV/AIDS, malaria, and MCH programs. To address this, USG-funded MCH, reproductive health, and PEPFAR partners have worked with the MISAU MCH program to support the development and implementation of a comprehensive antenatal care package for pregnant women, consisting of anemia, syphilis, and HIV testing; provision of iron, folic acid, Vitamin A, de-worming, IPTp, and LLINs; PMTCT services; and health education and counseling on breastfeeding, nutrition, HIV, and hygiene.

In early 2009, the needs of antenatal care were identified in collaboration with MISAU, WHO, partners, and other donors. These needs include:



1. Strengthening essential maternal and newborn care, and basic emergency obstetric and newborn care services, including post-partum family planning and MIP, as well as key preventive Reproductive Health (RH) and Family Planning (FP) services;
2. Strengthening the curriculum in all MIS AU training institutions for MCH mid-level nurses; and
3. Providing technical assistance to MISAU to develop an integrated training package for RH/FP and MCH, which is slated to be field-tested in late 2010.

These needs are being addressed through the following strategies:

1. Development or updating of evidence-based service delivery guidelines and protocols in maternal-neonatal-child health and family planning;
2. Strengthening of the in-service training and pre-service education system in maternal, neonatal, and child-health and family planning; strengthening of performance support systems;
3. Strengthening of linkages between communities and health facilities;
4. Implementation of M&E; and
5. Local capacity building.

PMI reprogrammed FY09 funds to support the malaria component of the ANC package and did the same with FY10 funds. These funds are being carried over into a new award that is expected to start in November 2010. Community mobilization activities to educate pregnant women about the importance of early antenatal care, taking all doses of SP, and sleeping under an ITN every night remains an unmet need, which is expected to be filled in the new award.

#### Progress to date

PMI has developed performance measurement standards, which were used at model maternity clinics. These standards are used to assess and guide selected facilities in a variety of aspects of maternal and newborn care, including IPTp. Antenatal care norms, which include elements of MIP, have also been revised. In addition, 175 HCWs were trained in quality maternal and newborn care, focusing on antenatal, birth and post-partum care, using performance standards as reference. The training includes appropriate prevention of MIP.

#### Proposed FY11 USG Component: (\$300,000)

PMI will continue to support provision of comprehensive antenatal care services to pregnant women through the development of guidelines and protocols, training, system strengthening for service provision, and M&E. Although historically the Government of Mozambique funding has covered SP needs for IPTp, due to CMAM budget constraints PMI funded SP needs for 2010. It is not anticipated that further support will be needed in FY11. PMI will continue to support distribution of ITNs to pregnant women through ANCs.

The proposed activity for FY11 is as follows:

- **Integrated training and supervision of HCWs in malaria in pregnancy:** Support pre- and in-service training and supervision to MCH nurses in a comprehensive package of antenatal care to include anemia, syphilis, and HIV testing; provision of iron, folic acid, vitamin A, deworming, IPTp, and ITNs; PMTCT services; and health education and counseling on breastfeeding, nutrition, HIV, and hygiene (\$300,000).

## **INTERVENTIONS — CASE MANAGEMENT**

### **Malaria Diagnosis**

#### Current Status, Challenges, and Needs

Four different organizational units are involved in the parasitological diagnosis of malaria in Mozambique. The PNCM is responsible for establishing malaria diagnostic and case management policies, which includes diagnosis, defining specifications for diagnostic supplies (mainly RDTs), and quantification of needs. The National Directorate of Medical Assistance (DNAM) has overall responsibility for clinical laboratory services in Mozambique. CMAM, MISAU's commodities logistic department that sits within DNAM, procures RDTs, reagents, and other diagnostic supplies. Finally, INS houses the national malaria reference laboratory and is responsible for quality control of malaria diagnosis. As a result of personnel turnover and shifting roles and responsibilities; coordination between these four units has not always been ideal.

Historically, only about 20% of all malaria cases in Mozambique are diagnosed by microscopic examination of a blood slide; the remainder of cases is diagnosed clinically. Refresher training and supervision of microscopists occur irregularly, and the overall quality of microscopic diagnosis of malaria in Mozambique is thought to be poor.

In 2007, RDTs were widely introduced in Mozambique. For this, MISAU approved the "Criteria for Rapid Diagnostic Test Use in Mozambique." These guidelines recommended that laboratory testing be guided by local malaria epidemiology as far as which age group should be tested. The LSDI, which covers Maputo province since 2000, supported case management activities in addition to IRS. Through this support, in line with the guidelines mentioned above, Maputo Province has been conducting laboratory confirmation, either by microscopy or RDTs, on all persons (including children less than five years old) suspected of having malaria at health facilities as well as at the community level. However, little is known about compliance with the diagnostic guidelines for laboratory confirmation outside of Maputo Province, but it is likely that many HCWs did not follow the guidelines, particularly since very few received adequate training on the use of RDTs. Furthermore, quantification of RDTs was done largely based on national morbidity data following the antimalarial treatment quantification assumptions. Overall poor logistic management resulted in RDT stocks being available in central warehouses while stock-outs occurred at peripheral levels. Finally, since introduction of RDTs, the supply was not steady, which also resulted in national stock-outs. This made HCWs continue to rely on clinical criteria to diagnose malaria, not in compliance with RDT guidelines.

A new malaria case management policy was launched in 2009, including an updated policy for diagnostic testing. The new case management policy recommends that persons of all ages and from all parts of the country who are suspected of having malaria receive a diagnostic test for

malaria before treatment is administered. This policy is to be applied at all levels of care, including care provided by APEs. RDTs are the preferred test for primary diagnosis of malaria. Microscopy is reserved for suspected treatment failures, severe febrile illness, and cases referred from lower levels of care. However, the launch of the new case management policy was not preceded by MISAU's approval of the treatment guidelines; in fact, the "Normas de Tratamento" has not been made public as of October 2010. The only policy document outlining the new case management policy is the PNCM's National Malaria Prevention and Control Plan, which is also in draft format as of October 2010. Nonetheless, training materials were drafted and training was conducted based on this national plan.

#### Progress to date

The refurbishment of the National Reference Laboratory for Blood Parasites was delayed due to a change in implementing partner. This laboratory is housed in the INS, and its renovation started in May 2010. It is anticipated to be completed by the end of 2010. The terms of reference for the activities to take place in the laboratory by both INS and PNCM have yet to be finalized.

Eighty microscopes were purchased in 2009 and distributed to provinces specified by the PNCM. Training of microscopy trainers is scheduled to take place in late 2010 with support from CDC. It is anticipated that the trainees ("master microscopists") will include personnel from INS as well as regional master microscopists. Only three highly qualified microscopists remain at the National Reference Laboratory at this time, and they are close to retirement with no identified replacements. INS recognizes the imperative need to build expertise at the central level and also at the regional and provincial levels. All these microscopists will also play a role in the yet to be established diagnostic quality assurance system. Plans for establishing and institutionalizing this system are being developed within the INS and are outlined in the newly drafted INS Strategic Plan.

Although a comprehensive strategic plan for malaria laboratory diagnosis has not yet been developed as such, PMI is supporting the development of malaria diagnosis supervision guidelines and will continue to support quality laboratory supervision collaboratively with PNCM, the Laboratory section of DNAM, and DPSs. PMI, working closely with diagnostics experts from CDC, is also supporting the finalization of the manual for procedures for training of laboratory technicians, quality control of malaria microscopy and RDTs, and quality assurance of laboratory testing procedures. PMI supervision support for laboratory personnel at all levels has particular focus on quality control and assurance of both microscopy and RDTs. Attention will also have to be given to non-laboratory personnel as RDTs are performed outside of the laboratory setting. This focus will include establishing a system of quality control from the district up to the central level at the National Reference Laboratory in INS.

The PNCM, with support from PMI, will revise the curriculum for in-service training of HCWs, which includes training in the performance and interpretation of RDTs. This manual for in-service training was initially developed for the new case management roll out. In addition, a comprehensive curriculum for pre-service training of APEs, which includes training in the use of RDTs, is being finalized with the support of both USAID and other partners.

PMI supported a comprehensive laboratory assessment pilot in Maputo Province in 2009, which provided information on the status of laboratory equipment (availability and functional status) and supplies, as well as the status of human resources availability and their training. The initial purpose of this assessment was to appropriately place PMI's newly purchased microscopes. The information provided from this pilot will be the basis for a new laboratory information database. The establishment of this database is seen as an important step towards evidence-based decision making and planning for equipment, supply, and human resources needs in the laboratory section. PMI will support the creation of this laboratory information database and system through the hiring of laboratory technical support. The American Public Health Laboratories (APHL), a PEPFAR partner, will also contribute to this system through technical assistance and by hiring a data manager.

An assessment of the status of RDT use, including the forecasting, allocation, distribution, and stock management plan, is planned for 2010. This information will be used to improve the allocation and distribution of RDTs, as well as highlight the current challenges of RDT use and interpretation by HCW so that these can be adequately addressed during future laboratory supervisory visits.

Finally, PMI will also contribute to the training and supervision of provincial pharmacy advisors with FY10 and FY11 funds. These advisors were hired with PEPFAR support; there is one advisor per province and although their funding is through PEPFAR their mandate is broad and includes overseeing the logistics of all pharmaceutical commodities in their respective province. It is anticipated that these advisors will oversee the logistics of RDTs, in addition to all other pharmaceuticals including antimalarials, from the provincial warehouse level down to the health facility level.

Although CMAM has procured RDTs in the past, recent RDT tenders were done within MISAU but outside of CMAM. It is anticipated that CMAM will again procure RDTs and transport them to provincial warehouses, where they will be stored prior to their distribution to health facilities by the DPSs. However, to date, it is not known how RDTs will be distributed to the APES nor is it clear that the distribution plan used to date is adequate for health facilities. PMI supported the quantification plan for future consignments of RDTs. This plan took into account the 4 million RDTs included in the successful Global Fund Round 9 proposal.

Proposed FY11 USG Component: (\$3,567,100)

In Year 5, PMI will support the continued strengthening of diagnostic laboratories at all levels, through procurement of necessary commodities, refresher training, supervision, and quality control of diagnostic testing. The proposed activities for PMI Year 5 are as follows:

- **Procure RDTs and laboratory supplies:** Support will be provided to procure approximately 3 million RDTs plus additional microscopy kits (slides, lancets, cotton, and alcohol) and microscopes if needed (\$3,000,000);

- **Support to National National Reference Laboratory for Blood Parasites:** Continue support to the INS National Reference Laboratory with procurement of supplies and repair parts for malaria-related diagnostic needs (\$50,000);
- **Support training and supervision of laboratory diagnosis:** Provide support for in-service training and supervision of laboratory staff in malaria microscopy and use of RDTs, including quality assurance. This activity will be coordinated with efforts to improve laboratory diagnosis of other diseases, e.g., HIV/AIDS and tuberculosis (\$500,000); and
- **Technical assistance from CDC:** CDC staff to provide technical support and supplies to PNCM and INS laboratory strengthening activities (\$17,100).

## **Malaria Treatment**

### Current Status, Challenges, and Needs

***Malaria treatment:*** Because of concerns about resistance to SP, national malaria treatment guidelines were updated in 2007, replacing AS–SP with AL as first-line treatment of uncomplicated malaria. These changes were supposed to take effect in 2008, but were only implemented in 2009. The National Malaria Prevention and Control Plan 2010–2014 includes this new case management policy and also the updated diagnostic strategy. Both the national plan as well as the case management policy (Normas de Tratamento) remains in draft format, although it is reported that they are in the final approval stages. Despite the lack of formal approval of these documents, AL was rolled out in late 2009 along with updates in the diagnostic strategy with PMI support. The roll out included AS–AQ as second-line treatment; however, it anticipated that it will not be included in the pending Normas de Tratamento. Quinine will continue to be the recommended treatment of severe malaria, pregnant women during the first trimester, and suspected failures to AL. The policy also will recommend artesunate rectal suppositories for pre-referral treatment of severe malaria in settings where intramuscular or intravenous quinine cannot be administered. Of note, the new approach recommends that patients of all ages undergo confirmatory diagnostic testing, either microscopy or RDT, and only those with a positive result receive treatment.

Malaria treatment will continue to be available, free-of-charge through all public health facilities and by APEs. Currently, it is estimated that there are no more than 1,500 APEs distributed unevenly throughout the country. MISAU, with support from USG and other partners, has developed a comprehensive, costed plan for rebuilding the cadre of APEs. Implementation of this revitalization is expected to start in 2010. APEs will administer AL and use RDTs in line with the new case management policy.

Supervision of HCWs in health facilities or APEs in the community on malaria treatment is conducted by DDS staff with support by DPS. The quality and frequency of this supervision is not known but is assumed to be inadequate in both aspects with the exception of Maputo Province, which receives support from LSDI for supervision of case management. MISAU is moving towards integrated clinical supervision; however, the necessary tools for this type of supervision have not been developed yet.

**Structure of the pharmaceutical management system:** MISAU bears management responsibility for the DNAM, Human Resources, Medical Assistance, Finance, and Planning and Coordination. CMAM falls under the management of DNAM and has primary responsibility within MISAU for all central-level supply chain functions, including providing the public health system with medicines and supplies. The PNCM falls under the Directorate of Public Health and in collaboration with CMAM, has responsibility for forecasting needs and supervising the procurement, storage, and distribution of essential medicines and related medical supplies from the central level to the provincial warehouses. Although mandated with responsibility for drug selection, CMAM works closely with and often relies upon a therapeutics committee responsible for defining the national formulary as well as setting standard treatment guidelines. In addition to CMAM, the PNCM also has input into these national-level guidelines. CMAM bears ultimate responsibility for ensuring antimalarial products selected by MISAU are appropriate and aligned with best practices for malaria case management.

The current pharmaceutical distribution system in Mozambique consists of two separate logistics systems. Essential medicines supplied through a kit system, with one kit for health centers and health posts, and then a second kit for APEs (formerly, there were three kits — Kits A for health centers; Kit B for health posts and Kit C for APEs but the first two have now been combined). Kits are procured through an international wholesaler, prepared by the supplier at a facility in India, and then delivered typically biannually to each of the four main ports of Maputo, Beira, Quelimane, and Nacala. Kits are then delivered to provincial warehouses, bypassing central medical stores, pushed to the districts, and then to health facilities and APEs. These kits are fully financed using pooled MISAU/donor resources.

The second channel of distribution is called *Via Classica*. Commodities are delivered to one of the two central warehouses in Maputo and a warehouse in Beira, which in turn supply the three central hospitals and ten provincial warehouses. A third warehouse, yet to be incorporated into this supply chain, is in Nampula and will be included when functional. Each of the ten provincial warehouses supply the district warehouses, rural hospitals, general hospitals, and provincial hospitals. Unlike the kit system, *Via Classica* uses a pull system, requiring health facilities to place orders with the higher levels for replenishment. All MISAU-financed medicines and supplies distributed through the *Via Classica* system come from CMAM annual tenders and in-kind donations (such as the USG, and Global Fund voluntary pooled procurement shipments). Inaccurate forecasting of needs, multiple changes in national malaria treatment policy, and inadequate warehousing and distribution — both centrally and peripherally — have resulted in many problems with the management of malaria treatments through the *Via Classica*. A Pharmaceutical Logistics Master Plan, currently under development, proposes significant changes in the management of the *Via Classica* system.

In the past, first-line malaria treatment had been supplied in the kits to health centers, health posts, and APEs, while second- and third-line treatments were distributed through the *Via Classica*. The adoption of AL as the first-line treatment of uncomplicated malaria, with its bulky packaging, necessitated a change in approach. Results from a 2008 PMI-financed pilot designed to help determine delivery preferences of AL suggested that a two-bin pull system would be ideal; however, CMAM preferred the creation of a parallel kitting distribution system for AL

alone. All other antimalarials continue to be distributed to health centers and health posts through the *Via Classica*.

**Quantification of malaria treatments:** Estimates of needs for 2011 were provided by the PNCM based on data captured from the 2007 census and from aggregated morbidity data collected weekly at the provincial level in the form of the BES. These sources were also used to estimate AL needs as part of the Global Fund Round 9 proposal. As customary, assumptions made for antimalarial drug forecasting and quantification considered several variables, including an expected drop in number of malaria cases due to the implementation of preventive measures and introduction of malaria laboratory testing. Although it is reasonable to expect a decrease in number of treatment needs, these assumptions may have overestimated the likely drop in malaria cases in Mozambique. In 2010, AL needs was estimated at 9.3 million treatments, while in 2011, these needs dropped to approximately 5 million (see table below), a reduction in 46% of the first-line antimalarial treatment.

#### Estimated antimalarial drug needs and costs

Treatment	2011 estimated needs (treatments or units)	Cost (US\$)*
<b>AL</b>		
6x1 tablet blister	1,331,040	492,485
6x2 tablet blister	1,073,760	794,582
6x3 tablet blister	584,160	648,418
6x4 tablet blister	2,056,320	2,878,848
<b>Total</b>	<b>5,045,280</b>	<b>4,814,333</b>
<b>Quinine</b>		
Ampoules	1,856,253	259,875
Tablets ( <i>not treatments</i> )	3,334,344	92,028
<b>SP (for IPTp)</b>		
Tablets	12,171,003	243,420

\* Freight and distribution costs not included

The requirement for confirmatory testing of all patients with suspected malaria poses two additional challenges. First, it will eventually result in a significant decrease in the requirements for AL, although the magnitude of that decrease will be difficult to predict prior to implementation and it is likely to change over time. However, this implies correct interpretation and use of RDT results by HCWs in malaria treatment decisions. Second, a logistics system for distributing RDT kits will need to be developed, as these tests will not be in either the essential drug kits or the AL kits.

A number of parameters were also considered when developing the quantification for AL, including the maximum and minimum buffer stock levels required at different levels, the time needed to transport drugs through the system, and the relatively shorter shelf-life of AL compared to other non-artemisinin-based malaria treatments. This quantification also takes into account differences in malaria prevalence by province and age group, accessibility to health

services, and expected impact of IRS and ITNs on malaria transmission. The positivity rate of laboratory testing was not considered a variable and remained constant for purposes of the quantification calculations.

Estimates for parenteral quinine for severe disease and artesunate suppositories for pre-referral treatment were projected to account for 1% of all malaria cases. Artesunate rectal suppositories are to be included in the drug kits but this has not happened to date. Using the 2007 census data, it also was estimated that 5.2% of the population would be pregnant next year and 85% of those would receive SP.

PMI has supported the procurement of antimalarials with FY08, FY09, and FY10 funds. CMAM received an additional 7 million treatments in 2009 and in the beginning of 2010 (3.5 million treatments supported by PMI and 3.5 million treatments supported by the Global Fund through UNITAID). Approximately 5.2 million treatments of AL are available as stock on hand as of May 2010.

**Procurement:** Bearing responsibility for the procurement of all essential drugs and devices for the public sector, CMAM issues international tenders typically twice annually. CMAM's Supply Chain Management System, developed with the support of PEPFAR, has step-by-step instructions to facilitate this process and prevent, to the extent possible, unnecessary delays. This system helps expedite the importation process for drugs procured with PMI's support.

As part of ongoing quality assurance, proper bid documentation accepted by CMAM must meet criteria issued by MISAU that includes certificates of origin for each consignment issued by recognized laboratories, in compliance with WHO's prequalification scheme for pharmaceuticals. Additionally, lot sampling is required and samples are sent for verification by the National Pharmaceutical Quality Control laboratory prior to award of a contract. Furthermore, goods must have at least 75% of their shelf-life remaining upon arrival in port for the consignment to be accepted. While vendors must also demonstrate adherence to good manufacturing practices in order to be considered acceptable to respond to a tender, requirements for compliance with either WHO and/or a stringent regulatory authority are not enforced. Legislation that introduced the requirement that all vendors register medications meant for the public sector was passed in 2010. This law was seen as necessary to guarantee product quality.

**Warehousing & Distribution:** As Mozambique enters Year 5 of PMI, warehousing and distribution capacity of essential drugs continue to pose significant challenges. Historically, poorly managed procurement practices, haphazard inventory management, and insufficient distribution plans have resulted in a supply chain system with a weakened absorptive capacity of centrally managed health commodities. Combined with an equally weak transportation and delivery infrastructure, transportation of commodities, including antimalarials, which should occur quarterly, has been unpredictable. This has resulted in stockpiling of essential medicines at the central or provincial levels and stock outs at more peripheral levels.

To mitigate this problem, both PMI and PEPFAR are supporting improvement of CMAM's capacity to manage stock at the central and provincial warehouses. A particular area of interest on the part of MISAU and CMAM is to focus on strengthening provincial level capacity to



manage commodities both up and down the supply chain. This is to be achieved initially through a provincial pharmacy advisor; this advisor has been supported through PEPFAR funds and PMI started to contribute to this support with FY10 funds. The advisor's scope of work has been drafted by CMAM and broadly covers all commodities received at the provincial warehouse from CMAM, including RDTs and antimalarials. The goal is to generate more reliable consumption data, which will enable more informed forecasting and better inventory management, especially critical as the influx of antimalarial drugs from Global Fund Rounds 2, 6, and 9 continue to funnel into the country over the next five years. As other treatment programs across the health sector scale up interventions, notable increases in the volume of PEPFAR and family planning commodities also need to be absorbed into this system. In response to the growing needs for warehouse space, plans to construct an addition to the Zimpeto facility and to refurbish the Beira warehouse are in progress. Ideally, the Maputo-based Adil warehousing complex and Zimpeto warehouses should be harmonized with Beira and Nacala warehouses to form a centrally managed, national system with accurate information on stock status for all essential commodities. Viable plans for this network have yet to materialize but will likely become a focus once the Beira facility is completed in 2011.

***Pharmacovigilance:*** The pharmacovigilance system in Mozambique historically was implemented by the Center for Drug Information, based at the Universidad Eduardo Mondlane. However, as of November 2009, the Pharmacy Department of MISAU is responsible for the newly drafted National Regulatory Pharmacovigilance System. With the new malaria treatment guidelines there is a need for AL adverse reaction monitoring, although considerable numbers of persons have already been exposed to AL as second-line treatment. There are no current PNCM plans for pharmacovigilance but PEPFAR has allocated funds to build capacity of the Pharmacy Department of MISAU to revitalize the pharmacovigilance system and it is expected that activities will be planned in the near future.

***Non-governmental organizations and the private sector:*** NGOs are not currently involved in providing treatment with ACTs in Mozambique, although many do work with APes. It is believed that use of the formal private sector for malaria treatment of children in Mozambique is uncommon and concentrated primarily in urban areas, where most private health facilities and pharmacies operate. The number of informal drug sellers is thought to be low, but this has not been systematically assessed. Private pharmacies are regulated by the Pharmacy Department and must be registered with the MISAU in order to operate.

Pharmacies are not allowed, by Mozambican statute, to dispense antimalarials without a prescription. A survey of private pharmacies in Maputo City in 2007, which looked at the availability of antimalarials and prescribers' reported treatment practices for malaria, showed that AL was not available in private pharmacies in Maputo, but artemisinin derivatives were available and sometimes prescribed as monotherapy.

#### Progress to date

PMI procured approximately 8.5 million treatments of AL between 2007 and 2009 and 6 million treatments are expected to be procured in 2010; however, only 2,069,499 treatments in the 6x1 and 6x3 presentations have been purchased as of August 2010.

Prior to 2008, there were 10 smaller warehousing facilities throughout greater Maputo managed by private companies contracted by MISAU and CMAM. In an effort to consolidate and strengthen central-level commodities management, one of the three warehouse facilities in the Adil warehousing complex was refurbished in 2008. While initially sufficient to enable CMAM to better manage essential medicines supply and distribution for the public sector, the 8,100 cubic meters facility is too small to handle the volume of commodities now passing through Maputo. With technical assistance from USAID's DELIVER Project and with support from PMI and PEPFAR's Supply Chain Management Strengthening Project, a satellite warehouse in Zimpeto, has recently been completed. In addition to a complete racking system, four warehouse forklifts, and two cold chain storage rooms; a new warehouse management information system, MACS, has been implemented in the Zimpeto facility. Good warehousing practices, including adherence to current supply chain standard operating procedures, are employed throughout the facility. Managed by a CMAM pharmacist and staffed mainly by pharmacists, the warehouse will be used as center of excellence model intended for replication by the Beira facility. Building on these successes, PMI will continue to support warehousing and inventory management capacity building including at the provincial level.

The PMI support for malaria treatment supervision is being initiated with the revision of the manual for in-service training of HCWs. This manual was initially developed for the new case management roll out, but is already inaccurate as it includes AS-AQ as the second-line treatment, which will no longer be used as second line. Field supervision is being planned as part of a broad USG-supported strategy of improving standards of clinical care. This strategy will cover not only malaria case management but also HIV/AIDS, TB, and other disease treatments. The strategy will be implemented in conjunction with PEPFAR-supported partners.

Proposed FY11 USG Component: (\$7,913,500)

Ensuring prompt, effective, and safe ACT treatment to 85% of patients with laboratory-confirmed malaria in Mozambique represents a major challenge for PMI and PNCM. The country's weak pharmaceutical management system, the introduction of mandatory laboratory confirmation for all age groups, the lack of an approved national treatment policy, the short shelf-life of ACTs, and the need for behavioral change of patients and HCWs, all pose major challenges to achieving this goal. If Mozambique is to make progress on the treatment of malaria, action to address all these challenges will be required.

The proposed activities for PMI Year 5 are as follows:

- **Procure AL:** PMI will procure approximately 6 million AL treatments to fill gaps in the first-line treatment (\$6,401,400);
- **Provide technical assistance to strengthen antimalarial supply chain and overall pharmaceutical management system:** Continue to support strengthening CMAM's capacity to forecast and manage antimalarial drugs through improved logistics management capacity, with particular support for the AL distribution through the kit system. Continued assessments of warehousing inventory management, as well as strengthening storage and distribution capability at the central level (\$500,000);

- **Support warehousing and drug management:** Building on achievements already made at the central level warehousing facilities, PMI will support activities to strengthen peripheral-level capacity in selected provinces, as weaknesses in storage and distribution logistics beyond the central level for antimalarial commodities warrant technical assistance (\$500,000);
- **Support refresher training and supervision of clinical staff:** PMI plans to support refresher training and supervision of HCWs at all levels of the public sector to ensure that HCWs are managing patients in line with the new guidelines. Specifically, PMI will support supervisory visits focused on increasing standards of care; these activities will be carried out in close coordination with the PNCM, provincial and district health teams, and partners. This is a new USG strategy of improving standards of care across the various clinical areas along with PEPFAR-supported partners (\$500,000); and
- **TDY from CDC Atlanta:** CDC staff to provide technical support to malaria case management in Mozambique (\$12,100).

## **CAPACITY BUILDING AND HEALTH SYSTEM STRENGTHENING**

### Current Status/ Challenges and Needs

The PNCM is responsible for developing policy, establishing norms, and planning, organizing, and coordinating all malaria control activities in the country. Additional responsibilities include periodic assessment of impact of malaria control, development of training materials on malaria case management for HCWs at all levels, mobilization of domestic and external funds for malaria control activities, promotion of malaria awareness and advocacy, and leading operational research. In August 2010, the PNCM had a change in directorship and currently the staff consists of a newly appointed director, a medical doctor, a medical doctor in charge of malaria case management, a national IRS supervisor, a biologist for ITN-related activities, a biologist dedicated to entomology, two entomology assistants, an information technology technician, a health communications officer, and an administrative assistant. PNCM's coordination with malaria partners and implementation planning are weak, which has caused delays in the implementation of PMI interventions in Mozambique. In addition, several policy and strategic documents have remained in draft form for extended periods of time prior to formal approval. These include the National Malaria Prevention and Control Plan 2010–2014, National Malaria M&E Plan 2010–2014, as well as malaria case management policies and guidelines.

At the provincial level, the implementation and coordination of the health services are the responsibility of the DPS, specifically the Provincial Medical Chief. In 2008, the PNCM increased its regional capacity with the training of 14 biologists in a WHO/PMI-supported workshop, which included basic introductory modules on entomology, epidemiology, and malaria control planning. These biologists have been seconded to the provinces with the DPS to support malaria control activities at the provincial level. They report directly to the Provincial Medical Chief and oversee all malaria control activities in the province, with a focus on vector control and M&E activities. The PNCM has recently revised the scopes of work of these biologists to include activities such as LLIN distribution oversight, AL stock information, and

IRS management. In addition to these biologists, the DPSs may have other personnel within their staff who also oversee malaria activities.

Given the significant lack of professionally trained HCWs, USG is contributing, along with other partners, to revitalize the APE system. The APE system consists of community HCWs who have historically volunteered in a community setting after having received intensive six-month training on the treatment and prevention of commonly seen illnesses, including malaria. APEs were also trained to refer to a health facility persons with illnesses of more complexity. Unfortunately, there have been no APEs recruited and trained in over a decade; however, the existing cadre of APEs received a “kit” with essential medications and medical supplies. A revitalization of this system is expected to start in 2010 with support from the World Bank Health Project, PEPFAR, and USAID health funding. A total of 2,340 new APEs are expected to undergo a four-month training program over the next five years at a cost ranging from \$9 million to \$32 million per year. More specifically, USAID, using other health funds, will be responsible for the revitalization of the APE program in the provinces of Nampula and Zambézia as part of the Strengthening Community Through Integrated Program (SCIP) project. Training of APEs will include the new malaria case management guidelines, including the use of RDTs. This expansion, if successful, will greatly improve access to malaria case management. FY10 PMI funds were reprogrammed to support the supervision of the newly recruited APEs in malaria case management in Nampula and Zambézia.

#### Progress to date

PMI is building capacity for malaria control at a number of levels. Within the PNCM, PMI country advisors and implementing partners have provided technical and implementation support to the PNCM on a range of issues including development of policies on malaria case management, strategies for ITN scale-up and M&E, and curricula for training of HCWs. PMI also assisted the PNCM with forecasting of malaria treatments and commodities and planning of ITN distribution campaigns. In addition, PMI has funded the hiring of a data manager, and an M&E advisor on a time-limited basis, to support key functions of the PNCM until permanent staff can be trained. The National Reference Laboratory for Blood Parasites, the entomology laboratory and an insectary at INS are being refurbished and re-equipped with support from PMI. Moreover, PMI has placed an entomologist at the PNCM to coordinate all vector control activities, e.g., insecticide resistance surveys, provincial entomologic monitoring, and IRS activities.

PMI will also support the Laboratory Section within the DNAM to oversee the establishment of a laboratory information system to monitor laboratory commodities and infrastructure by hiring a laboratory advisor. This will improve the supply management of RDTs, microscopes and reagents. A PEPFAR partner, APHL, will also contribute to this information system by hiring an information advisor (data manager) who will work along with the laboratory advisor. APHL will also provide technical assistance to this team for the laboratory information system.

At the provincial level, PMI has been strengthening capacity at the DPS in Zambézia Province to implement IRS activities and conduct entomologic monitoring, including the establishment of a provincial entomology laboratory and insectary. The PNCM is also expanding its regional entomology capacity and decentralization of entomologic monitoring/surveillance, which

otherwise would be too costly and logistically difficult to support on a routine basis from the central laboratory in Maputo. To that end, PMI agreed to support, with PMI Year 3 funding, the refurbishment of a regional entomology laboratory in Cabo Delgado Province for expansion of entomologic capability in the northern provinces of Mozambique. This will provide an opportunity for the biologists in the Northern region to perform basic entomologic monitoring, such as vector identification, seasonal variations, and insecticide resistance bioassays as part of the ITN and IRS programs.

PMI has contributed FY09 and FY10 funding to the CDC-led Field Epidemiology and Laboratory Training Program (FELTP) activities in Mozambique. To date, FELTP has conducted two short courses on epidemiology, and a two-year Master's level program in FELTP is scheduled to start in August of 2010. The CDC PMI Resident Advisor participates in the FELTP steering committee meetings and the previous PNCM Director oversaw the presentations of the short course participants. It is expected that candidates for the Master in FELTP will come from the PNCM and that projects for the candidates will include malaria evaluations.

Proposed FY11 USG Component: (Costs covered in other sections)

Strong and effective leadership by the PNCM will be critical to the success of the Mozambique's malaria control efforts. To reach the PNCM targets, continued support will be needed to strengthen its capacity and that of other collaborating departments at the central, provincial, and district levels to plan, conduct, supervise, monitor, and evaluate malaria prevention and control activities.

In 2011, PMI will continue to provide long-term technical assistance in entomology, M&E, and diagnostics in support of the PNCM and DNAM at the national level.

## **INTEGRATION OF HEALTH ACTIVITIES, HIV/AIDS, AND MALARIA**

### Current Status, Challenges, and Needs

Both USG and the Government of Mozambique have recently come out in strong favor of integration of different health programs. Under the GHI, USG funding follows a model that strongly emphasizes strategic coordination, host country ownership, and programmatic integration. The Government of Mozambique, in its Integrated Plan to Reach the Millennium Development Challenge, Goals 4 and 5 (2009–2012), has clearly outlined MCH services as a key component of this plan. Improving quality of MCH care and services, as well as care and services across other health sectors along with strengthening the health system in general, is a top priority for the Government of Mozambique.

The USAID Mozambique Health Team, in response to the interest in integration, has recently combined its two distinct health teams (HIV and Health) to form the Integrated Health Office. This change is anticipated to increase administrative and technical efficiencies and avoid duplication of efforts. It will also allow for planning integration and facilitate the move from a vertical approach, such as PMI and PEPFAR, to a broader health systems approach across all USG programs including maternal and child health, reproductive health/family planning, tuberculosis, HIV, malaria, and nutrition.

Examples of integration of USAID health's projects include two projects PMI is supporting jointly with funds from MCH, RH/FP and PEPFAR: one for integrated MCH services and the other for integrated community strengthening. The first project will strengthen antenatal care services across the country and improve quality of care, and the second project will focus on strengthening community linkages with health facilities for cross-cutting health issues and has specific support to the APEs (see the sections on Malaria in Pregnancy and Capacity Building).

Moreover, another USAID PEPFAR-funded project aimed at strengthening HIV-related services, linkages, and systems also has a broader mandate, which includes strengthening services for malaria. Although PMI does not contribute funding to this project, the project is expected to impact government and community capacity to deliver and manage all clinical services, including malaria, at the district level.

PMI also recognizes opportunities for strategic integration in the area of laboratory strengthening. To this effect, FY10 funds have been allocated for laboratory support, these include support for laboratory infrastructure, finalizing diagnostic guidelines, and supervision activities, which are, for the most part, complementary to supervision activities for already on-going tuberculosis and HIV.

#### Progress to date

In the areas of integrated antenatal care services, performance measurement standards have been developed to assess and guide selected facilities in a variety of aspects of maternal and newborn care, including IPTp. These standards are to be expanded nationally. Also, antenatal care norms, which include MIP elements, have been revised and HCWs were trained in promotion of quality maternal and newborn care using performance standards as reference. The training includes appropriate prevention of MIP.

Other integrated projects are too early in their establishment to report progress, mostly because funding was recently reallocated through FY10 reprogramming.

#### Proposed FY11 USG Component: (no cost under this area)

The proposed activities for PMI Year 5 are already covered in other areas.

## **BEHAVIOR CHANGE AND COMMUNICATIONS**

### Current Status, Challenges, and Needs

Although progress has been made in some areas, BCC related to malaria prevention and control continues to be a significant gap in the malaria control in Mozambique. The PNCM Health Communication Strategy developed in October 2006 was never approved; it has been in the process of being updated but this process has yet to achieve the outcome of a finalized document.

The PNCM has included a section on Health Promotion and Mobilization with Community Involvement in its National Malaria Prevention and Control Plan 2010–2014, which to date remains in draft format as well. Although the PNCM has a communications officer who is

responsible for coordinating communications activities for malaria, his role is limited as is the funding for this area. Broadly, the National Malaria Prevention and Control Plan outlines the following key components for Health Promotion: country-wide saturation of key, simple, and consistent messages based on local evidence; innovative methods of positive messaging; and use of community radios to disseminate messages.

MISAU has seen turn over in the Health Promotion Department (DEPROS), having lost the Director appointed in early 2009. A newly appointed director is attempting to pick up the revitalization of the health communication activities on all public health issues. The DEPROS director is focusing on a broad national Health Communications Strategy, which will coordinate all BCC activities within MISAU. Each MISAU program, like PNCM, will continue to have personnel dedicated to BCC but the coordination of activities is to be led by DEPROS.

At the provincial level, a health education and communication coordinator is responsible for educating communities about malaria interventions and other health-related topics. It is not clear that all provinces have such a coordinator and, if they do, what their capacity for BCC activities is. In addition, as is the case at the central level, funding for BCC activities and personnel is limited.

Communications activities carried out by PNCM have focused on radio spots and material to be distributed at health facilities. Each year, the PNCM organizes Malaria Day activities, which are usually near or in Maputo City. At the provincial level the DPSs also organize celebrations, which mostly consist of athletic activities, musical numbers, some demonstrations of LLINs, and IRS. Partners usually support these activities, but there is little planning or coordination.

In areas where IRS is conducted, the PNCM Communications Officer and other PNCM staff, with little or no training in the area, visit the area to be sprayed to sensitize the community prior to the initiation of spray activities. This usually involves discussions with local community leaders, community gatherings and accompanying sprayers to homes to interact directly with community members. Similarly, in areas where ITN campaigns are planned, community sensitization activities are carried out; this is done with the support of the partner involved in the campaign. For IRS and ITN activities, neither PNCM nor DEPROS have the lead for the BCC efforts nor is there consistent “branding” of the messages related to these activities. Rather, the partner supporting the specific activity conducts the BCC related to the activity, although the content of the messages require approval from PNCM and DEPROS. The messages are, therefore, generally consistent, but the delivery of them is not.

Little has been achieved for malaria in pregnancy BCC, although messages were developed with PMI support and were approved by MISAU. Partners produce material, which, after PNCM and DEPROS content approval, is distributed in their respective geographical areas of influence.

In addition to the challenge of a weak MISAU in the area of BCC, PMI’s agreement with Bassopa Malaria!, PMI’s partner tasked with BCC activities, ended early. This left BCC activities unfinished. This support was focused mainly on capacity building at the PNCM level, although this direction was shifting towards the DEPROS.

In April of 2009, PMI core funds were used to hire a consultant to assess BCC activities being conducted by TAM with the PIRCOMs and to assess more broadly MISAU's BCC needs as well provide recommendations on how best to assist NCMP in coordinating activities.

Recommendations consisted of the following:

- Establish a National Malaria Communication Technical Group to coordinate and plan the implementation of the country's malaria communication strategy;
- Implement a national malaria branding strategy;
- Develop a standardized training curriculum for the broadcast media;
- Improve coordination among malaria partners;
- Conduct quantitative and qualitative outcome and impact evaluations more routinely;
- Train District Level Health Officers in community outreach and mobilization methodologies to reduce community resistance to IRS;
- Enhance the TAM-PIRCOM training curriculum;
- Introduce coordination between TAM-PIRCOM and DPS;
- Establish a PIRCOM administrative structure to assure sustainability; and
- Support training to enlarge the pool of communication specialists.

As the recommendations were well received by both MISAU, PMI reprogrammed FY10 funding to carry forward the above recommendations with a focus on enhancing the organizational, managerial, and technical capacity of PIRCOM to operate as an independent FBO; strengthen PIRCOM's BCC capacity; build BCC capacity of DEPROS and PNCM; and establish a malaria control brand. The branding activity for PNCM started in 2010.

Progress to date:

The PMI support for BCC activities has largely been through TAM-PIRCOM, which has now expanded its activities to Zambézia, Nampula, Sofala, and Inhambane provinces. Training on key malaria messages has been provided to almost 21,169 religious leaders, who in turn have reached 1,575,752 people in 35 districts: nine in Zambézia, ten in Nampula, 11 in Sofala, and five in Inhambane. The national PIRCOM is close to finalizing the necessary steps to register as an NGO in Mozambique. TAM-PIRCOM also has a small grants program to support activities carried out by the District PIRCOMs.

PMI provided technical assistance to the Health Education Unit to support the revitalization of MISAU health communications and promotions activities, including the development of a health communications strategy for MISAU. PMI also has supported mass media campaigns in conjunction with LLIN distribution and supported dissemination of printed materials to health facilities that promote LLIN ownership and use. Community mobilization activities also have been carried out each year prior to the launch of PMI-supported IRS activities in Zambézia Province.

Proposed FY11 USG Component: (\$2,150,000)

In FY11, PMI will continue FY10 BCC activities in addition to contributing to an integrated health BCC project which is expected to be launched in 2011. PMI will work closely with BCC



implementing partners on the M&E component of all of these BCC projects to follow and evaluate the results. In addition, PMI Mozambique will ensure that the BCC M&E activities are linked closely with the PMI BCC team at PMI headquarters.

The proposed activities for PMI Year 5 are as follows:

- **Coordinate and scale up BCC activities:** PMI will continue support for a malaria control branding strategy and a communication strategy for malaria within the broad DEPROS communication scheme (\$500,000);
- **Community mobilization activities by faith leaders and institutional capacity building of PIRCOM:** PMI will continue to support community mobilization activities around malaria throughout four provinces as well as assist PIRCOM in developing its management, financial, and administrative capacity (\$500,000);
- **Dissemination of prevention and treatment messages related to malaria for pregnant women:** Using messages previously developed and already approved by MISAU, promote malaria prevention and treatment activities for pregnant women nationally through the most appropriate channels (\$400,000);
- **Promote ITN ownership and use:** Strengthen BCC activities for promotion of ITN ownership and use (\$250,000); and
- **Support for broad health BCC activities:** Support an integrated USAID Health Office project to maintain BCC support for community and mass malaria communication activities, within a broad health communication approach (\$500,000).

## MONITORING AND EVALUATION OF MALARIA CONTROL ACTIVITIES

### Current Status, Challenges, and Needs

Strengthening M&E capabilities, within the context of other M&E systems in MISAU, is a priority for MISAU, PNCM, and its partners as this is a weak area within MISAU. This weakness is due in part to high personnel turnover in the directorates responsible for M&E and poor coordination among MISAU M&E stakeholders from the various health programs. PNCM has drafted the 2010–2014 PNCM M&E Plan, which is currently under review for MISAU approval. This plan is in line with the MISAU M&E unified system, which is aimed at integrating the various M&E needs of the priority health programs. This unified M&E system is being lead by the Directorate of Planning and Cooperation. These efforts should result in more efficient use of data and resources, and will ensure that indicators are comparable over time and that duplication of efforts is reduced.

For routine surveillance, clinical and laboratory-confirmed malaria cases are included in the reporting system of notifiable diseases, BES, which is managed by the Departamento de Epidemiologia. All public health facilities are expected to report on the number of malaria cases, clinical and laboratory-confirmed, on a weekly basis. These data are transmitted to the provincial and then national level, although this does not always occur regularly. In addition,

monthly and quarterly data on malaria morbidity and mortality are aggregated separately by each health facility. These data are transmitted to the district level, collated, and transmitted to the provincial and national level. While considered to be the best functioning health information system in the country, there are concerns about the accuracy, completeness, and timeliness of the data.

UNICEF has historically maintained maps with the coverage of malaria control interventions nationwide (particularly ITNs and IRS), which is based solely on input data (i.e. number of LLINs distributed, number of houses sprayed). The PNCM received training from UNICEF to update these maps. There is a need for this update to be done regularly, particularly with the rapid scale-up of malaria interventions in Mozambique.

### Progress to date

**Entomologic monitoring:** The 2009 PMI-supported entomologic monitoring in Zambézia Province, under the RTI/LATH subcontract, was carried out in a total of 23 sentinel entomology sites, 21 of which are in the IRS regions. Two sentinel sites from an adjoining non-IRS district were used for comparison. Mosquitoes were collected from window exit traps installed in six houses per sentinel site. All specimens were collected by a trained household member on a monthly basis, and preliminary species identification was made at the newly established PMI-supported entomology laboratory in Quelimane. The material was sent to the University of Durban, South Africa for PCR species identification and for ELISA determination of infection rates.

During the same time period, insecticide resistance testing for lambda-cyhalothrin, DDT, permethrin, and bendiocarb was carried out in two IRS districts (Mocuba and Milange). In the unsprayed area of Maganja da Costa, resistance testing was done for lambda-cyhalothrin and DDT. Eggs from adult gravid mosquitoes (from indoor resting collections) were reared in to adults in the Quelimane entomology laboratory. These were then used to conduct WHO resistance tests. In Mocuba, 100% mortality was observed in *An. gambiae* for lambda-cyhalothrin, DDT, and permethrin. *An. funestus* was 100% susceptible to DDT and permethrin, with a reduced mortality to lambda-cyhalothrin (82.9%) and bendiocarb 90.3(%). In Milange, testing was carried out only with *An. funestus*. The results were similar to Mocuba with 100% mortality to DDT and permethrin, and reduced mortality to lambda-cyhalothrin (85.1%) and bendiocarb (84.5%). In Maganja da Costa, results from *An. gambiae* testing indicates 100% mortality to lambda-cyhalothrin and DDT.

The PMI supported insecticide susceptibility testing in three provinces (Tete, Cabo Delgado, and Inhambane), outside of Zambézia Province (where PMI supports IRS) in April 2010. The results show that *Anopheles gambiae* was susceptible to DDT, lambda-cyhalothrin, bendiocarb, deltamethrin, and propoxur in all the provinces tested except in Ancuabe (Pemba, Cabo Delgado Province), where it was observed that there is a possibility of resistance of *An. gambiae* to DDT (93% mortality). However, it is necessary to conduct further tests to confirm this hypothesis. Pyrethroids were found to have maximum efficacy, the mortality was 100% at all sites tested. The anti-vectorial effect of insecticides in the study intervention area was manifested by the decrease of *Anopheles* population density. This work has shown that bioassay tests can be

conducted in locations far from insectaries or where there are no laboratory conditions. Evaluations such as this one are important to assist the PNCM in decision making.

In 2010, PMI will again support a three-month entomology survey in four provinces: Gaza, Manica, Nampula and Tete. The evaluations are similar to those carried out in 2009 to assess the impact of the national IRS program and will consist of pyrethrum spray catches for monitoring mosquito species, density, and infection rates, and subsequent WHO resistance evaluations. In addition, cone wall bioassays for insecticide efficacy will be carried out.

***Environmental monitoring:*** In accordance with USG regulatory requirements, a Supplemental Environmental Assessment (SEA) was conducted in late 2006 and early 2007 and approved in early 2008 by USAID and Mozambican MICOA. Subsequently, an Environmental Mitigation and Monitoring Plan was developed. In September 2008, PMI supported a baseline environmental monitoring in Mozambique to characterize the concentrations of DDT in the environment in the preparation of the 2009 SEA before the beginning of the spray season. Despite the label of baseline it must be noted that these samples were obtained after two rounds of spraying with DDT. Soil and crop samples were collected from farming homesteads that were sprayed with DDT in Namacurra, Nicoadala, and Quelimane Districts from September through November 2008. Analysis for the crops indicated that detectable DDT levels were widespread across the monitored area with 82% of the crop samples taken from IRS sprayed homes showing some detectable levels after three rounds of IRS. The mean concentration was 0.036 mg/kg, which is lower than the CODEX standard of 0.05 mg/kg used by the European Union for crops destined for export. However, the 90<sup>th</sup> percentile result, at 0.98 mg/kg, was an order of magnitude higher. A second round of DDT environmental monitoring was carried out from July–October 2009. Samples from various sources such as soil, crops, sediments, and air were collected and sent to Kenya for DDT trace analysis. Results are pending as of October 2010.

***Antimalarials monitoring:*** The End-Use Verification Tool is planned for 2010 in a sample of health facilities, and distinct and provincial warehouses. Health facilities will be visited, together with the warehouses that supply them. The objectives of this exercise are to ensure that PMI-supported malaria medicines and other commodities are reaching the people for whom they are intended and monitor supply chain management of PMI-supported malaria medicines and other commodities, so that problems can be identified and corrective action taken. This will contribute to the establishment of an effective supply chain monitoring system in Mozambique.

***Antimalarial efficacy monitoring:*** Between 1998 and 2001, a series of 28-day *in vivo* drug efficacy studies of chloroquine, AQ, and SP monotherapies were conducted in Manhiça, using the WHO standardized protocol. Researchers reported clinical and parasitological failure rates of 80% for chloroquine, 26% for AQ, and 21% for SP. Studies from 2003 at two sites in the LSDI Project area showed failure rates of 9% and 12% with SP monotherapy, and 2% and 4% with AS–SP. Drug efficacy studies were conducted by INS in six sites in 2006, although results from these studies have never been released. Two large multi-center studies assessing AL efficacy included a site in Mozambique (Manhiça) through the collaboration with CISM. One study compared AL to dihydroartemisinin–piperaquine in a non-inferiority trial and the other compared crushed AL to dispersible AL. Neither study found significant differences between the two groups.

**Miscellaneous M&E activities:** In 2010, PMI plans to support an evaluation of the performance of HCWs use and interpretation of RDTs as well as logistic factors related to RDTs, as very limited information is available on the quality of RDTs use at the health facility level or community level. The distribution of RDTs for malaria across the country, with little or no pre-service training, raises questions about the quality of their use and what impact this will have on case reports.

Two LLIN evaluations are on-going in Mozambique, one to assess the durability of LLINs and another to assess the effectiveness of the LLIN universal coverage distribution model developed in Mozambique. Both of these evaluations are instrumental to PNCM and PMI for policy and programmatic decision making.

PMI will support the establishment of a laboratory information database and system in 2010 to assist the Laboratory Section of MISAU in evidence-based decision making and planning for equipment, supply, and human resources needs in the laboratory section. PMI will support the hiring of personnel for laboratory technical support in 2010 to establish and maintain this database.

PMI supported two sentinel sites in 2010 to provide continuous quality data that other sources like population-based surveys (e.g., MIS), health facility surveys, and the Health Management Information System cannot provide. However, given the poor quality of the data reported, PMI will no longer support this activity.

Proposed FY11 USG Component: (\$593,400)

Well-functioning malaria surveillance and health information systems are crucial for monitoring trends particularly as malaria interventions scale up and data is needed to guide the PNCM on the implementation of control measures. The existing surveillance system continues to be weak and does not meet all the needs of the MISAU or the PNCM. USG is putting great effort to improve surveillance and M&E in Mozambique for malaria, HIV/AIDS, and tuberculosis by strengthening the MISAU notifiable disease system.

The proposed activities for PMI Year 5 are as follows:

- **Long-term technical assistance for M&E:** PMI will continue to support an M&E staff within the PNCM, who will coordinate PNCM M&E activities. His terms of reference were updated by the new PNCM director and FY11 is his last year of PMI support for this position (\$100,000);
- **Entomology TDY and supplies from CDC Atlanta:** CDC Atlanta staff to provide technical support to entomologic training and monitoring activities, including support for a limited pool of specific reagents and other laboratory diagnostic materials (\$46,300);

- **Environmental monitoring:** Support the routine monitoring of IRS field activities to ensure the safe and judicious use of insecticide and to ensure that environmental and human health mitigation measures are adequately addressed (\$50,000);
- **Support for End-Use Verification Tool implementation:** PMI will support the implementation of the End-Use Verification Tool in a sample of health facilities and medical stores (\$100,000);
- **Monitoring laboratory commodity/infrastructure:** Sustain the information system to monitor laboratory commodities and infrastructure nationally (\$100,000);
- **Support of the Field Epidemiology & Laboratory Training Program:** Support the FELTP program and possibly the participation of one or more PNCM staff in the FELTP program (\$150,000);
- **LLIN longevity monitoring:** Continue to support the monitoring of the durability of LLINs distributed in the 2008 campaign in Nampula (\$35,000); and
- **TDYs from CDC Atlanta:** CDC Atlanta staff to provide technical assistance to M&E strengthening activities (\$12,100).

## IN-COUNTRY STAFFING AND MANAGEMENT

Two senior technical advisors on malaria oversee PMI in Mozambique, one representing CDC and one representing USAID. Both PMI advisors are part of a single inter-agency team led by the USAID Mission Director and work with the USAID Mozambique Health Team to oversee all technical and managerial aspects of PMI in Mozambique. This includes finalizing details of the project design, implementing malaria prevention and treatment activities, M&E of outcomes and impact, and reporting of results. PMI staff members report to the USAID Team Leader for Health; the CDC staff will be supervised by CDC, both technically and administratively. PMI advisors collaborate closely with the PNCM to support policy development, planning, and coordination of activities. All technical activities will be undertaken in close coordination with the MISAU/PNCM and other partners, including WHO, UNICEF, the Global Fund, World Bank, and the private sector.

With the scaling-up of existing PMI activities and the infusion of significantly greater funding for PMI provided in this operational plan, additional administrative support is needed. PMI, with the approval of the USAID Mission Director, plans to hire a project manager to support its mission in Mozambique. The process of hiring a Foreign Service National (FSN) Activity Manager is on-going and is expected to be hired by late 2010. This staff will provide support in the management of PMI activities in Mozambique.

Because of the need to adhere to specific country policies and USAID accounting regulations, any transfer of PMI funds directly to Ministries or host governments will need to be approved by the USAID Mission Director and Controller.

Proposed FY11 USG Component: (\$1,950,000)

The proposed activities for PMI Year 5 are as follows:

- **Management of PMI:** Support two senior technical PMI staff (one USAID and one CDC) based at the USAID Mission in Maputo and one mid-level FSN project manager, including all work-related expenses (e.g., travel, supplies, etc.), and mission-based expenditures, including USAID mission expenses incurred in the direct implementation of PMI activities (\$1,950,000).

**ANNEXES**

**Tables**

**President's Malaria Initiative — Mozambique  
Planned Obligations for FY11 (\$)**

<b>Proposed Activity</b>	<b>Mechanism</b>	<b>Budget (commodities)</b>	<b>Geographical area</b>	<b>Description</b>
<b>ITNs</b>				
Procure LLINs	DELIVER	7,000,000 <i>(7,000,000)</i>	Nationwide	Procurement of 1.2 million LLINs
Support LLIN distribution through ANCs	Social Marketing RFA	1,500,000	Nationwide	Support for ANC LLIN distribution
Support LLIN distribution through universal coverage campaigns	Social Marketing RFA	750,000	Nationwide	Support universal campaign efforts including post-coverage surveys
<b>SUBTOTAL ITNs</b>		<b>9,250,000</b> <i>(7,000,000)</i>		
<b>IRS</b>				
Support IRS in eight districts of Zambézia province	IRS2 IQC Global Task Order	5,000,000	Zambézia	IRS campaign in eight districts of Zambézia covering 646,698 houses (2,640,929 residents)
Support a process to develop a rational IRS strategy	IRS2 IQC Global Task Order	75,000	PNCM	Support a process (meeting, reporting, etc) for IRS stakeholders to discuss IRS strategies
Procure IRS commodities	IRS2 IQC Global Task Order	1,500,000 <i>(1,500,000)</i>	Zambézia	Procurement of PPEs, spares, and insecticide
<b>SUBTOTAL IRS</b>		<b>6,575,000</b> <i>(1,500,000)</i>		
<b>Malaria in Pregnancy</b>				
Support training and supervision of ANC staff in MIP	JHPIEGO	300,000	Nationwide	Integrated training/supervision of ANC HCWs in prevention of malaria in pregnancy



<b>SUBTOTAL MIP</b>		<b>300,000</b>		
---------------------	--	----------------	--	--

Proposed Activity	Mechanism	Budget ( <i>commodities</i> )	Geographical area	Description
<b>Case Management: Diagnosis</b>				
Procure diagnostic supplies	DELIVER	3,000,000 (3,000,000)	Nationwide	Purchase of RDTs, microscopy kits, reagents, and additional microscopes
Support for National reference laboratory for blood parasites	TB CARE	50,000	INS	Provide supplies for National Reference Laboratory for Blood Parasites
Support training and supervision of laboratory diagnosis of malaria	TB CARE	500,000	Nationwide	Provide in-service training/supervision in malaria laboratory diagnosis at provincial level including quality control
Provide technical assistance for laboratory strengthening	CDC	17,100	Nationwide	TDY for support of laboratory strengthening activities and Quality Control system support.
<b>SUBTOTAL Diagnosis</b>		<b>3,567,100</b> (3,000,000)		
<b>Case Management: Treatment</b>				
Procure AL	DELIVER	6,401,400 (6,401,400)	Nationwide	Procurement and shipment of AL, including distribution to Provinces
Strengthen MISAU antimalarial drug management system	DELIVER	500,000	Nationwide	Strengthen CMAM's capacity and support distribution of ACTs
Support warehousing and drug management at regional/provincial/district level	DELIVER	500,000	Nationwide	Support warehousing management at regional/provincial/district level
Support refresher training and supervision of clinical staff	JHPIEGO	500,000	Nationwide	Support training/supervision of HCW at all levels in malaria case management
Provide technical assistance for case management	CDC	12,100	Nationwide	TDY for support of case management
<b>SUBTOTAL Case Mgmt</b>		<b>7,913,500</b> (6,401,400)		

<b>Proposed Activity</b>	<b>Mechanism</b>	<b>Budget (commodities)</b>	<b>Geographical area</b>	<b>Description</b>
<b>Communications and Behavior Change</b>				
Support MISAU's malaria BCC activities	C-Change	500,000	MISAU	Coordination of malaria BCC activities, PNCM branding strategy and DEPROS capacity building activities
Support community mobilization activities	C-Change	500,000	Nationwide	Support PIRCOM to mobilize communities and continue PIRCOM institutional capacity building
Disseminate malaria case management messages and malaria in pregnancy prevention	C-Change	400,000	Nationwide	Support dissemination of malaria prevention and treatment messages
Promote and disseminate ITN ownership and use messages	Social Marketing RFA	250,000	Nationwide	Promote ITN ownership and use via mass media and community-based approaches
Support for Broad Health Behavior Change and Communication activities	New BCC award	500,000	Nationwide	Follow on community and mass malaria communication activities, within a broad health communication approach
<b>SUBTOTAL BCC</b>		<b>2,150,000</b>		
<b>Monitoring and Evaluation</b>				
Provide long-term technical assistance for monitoring and evaluation	TB CARE	100,000	PNCM	Support for one full-time staff to supervise monitoring and evaluation activities at NMCP
Support for entomologic activities	CDC	46,300	Nationwide	TDY support for entomology activities and support for procurement of laboratory supplies
Support environmental monitoring of IRS activities	TBD	50,000	Zambézia	Support the routine monitoring to ensure safe use of insecticides

End-use verification	DELIVER	100,000	Nationwide	
----------------------	---------	---------	------------	--

<b>Proposed Activity</b>	<b>Mechanism</b>	<b>Budget (commodities)</b>	<b>Geographical area</b>	<b>Description</b>
<b>Monitoring and Evaluation</b>				
Laboratory commodity/ infrastructure information system	TB CARE	100,000	Nationwide	Sustain the information system to monitor laboratory commodity and infrastructure
Field Epidemiology & Laboratory Training Program (FELTP)	CDC	150,000	MISAU	Support FELTP program
Monitor LLIN durability	CDC	35,000	Nampula	Continue monitoring of LLIN durability
Provide technical assistance on monitoring and evaluation	CDC	12,100	MISAU	TDY for support of monitoring and evaluation activities
<b>SUBTOTAL M&amp;E</b>		<b>593,400</b>		
<b>In-country Staffing and Administration</b>				
Support in-country administrative expenses	CDC/USAID	\$1,950,000	Nationwide	Staffing and general administrative support for PMI
<b>SUBTOTAL Staff &amp; Admin</b>		<b>\$1,950,000</b>		
<b>TOTAL</b>		<b>\$32,299,000 (\$17,901,400)</b>		

**President's Malaria Initiative — Mozambique  
Year 5 (FY11) Budget Breakdown by Partner (\$)**

<b>Partner Organization</b>	<b>Geographic area</b>	<b>Activity</b>	<b>Budget*</b>
IRS2 IQC Global Task Order	Zambézia Province	Procurement of IRS equipment; support to IRS activities; strengthen entomologic capabilities of PNCM	6,575,000
TBD	Zambézia Province	Support environmental monitoring of IRS activities	50,000
Social Marketing RFA	Nationwide	Distribution of LLINs through ANCs, support for universal coverage, post-campaign surveys and promote LLIN use and ownership	2,500,000
DELIVER	Nationwide	Strengthen pharmaceutical management system, procure antimalarial drugs, RDTs, end use verification, and LLINs	17,501,400
JHPIEGO	Nationwide	Training and supervision in MIP and in case management	800,000
TB CARE	Nationwide	Reference lab support, lab training/supervision, lab information system support, and M&E support	750,000
C-Change	Nationwide	Support to PIRCOM for social mobilization and institutional capacity building, dissemination of case management and MIP messages, and capacity building of DEPROS and PNCM	1,400,000
TBD	New BCC Award	Support for broad BCC activities	500,000
CDC	Nampula Province	Support to conduct LLIN durability evaluation	35,000
CDC/FELTP	Central	Support for the implementation of FELTP-related courses	150,000

\*\*Does not include budget for staffing/administration of \$1,950,000 or \$87,600 for CDC technical assistance trips.