

This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2017 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



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## U.S. PRESIDENT'S MALARIA INITIATIVE



**PRESIDENT'S MALARIA INITIATIVE**

**MALI**

**Malaria Operational Plan FY 2017**

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## ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
ASC	<i>Agent de Santé Communautaire</i>
CDC	Centers for Disease Control and Prevention
CSCOM	<i>Centre de Santé Communautaire</i>
CSREF	<i>Centres de Santé de Référence</i>
DHS	Demographic and Health Survey
DHSP	Division of Public Health, MoH
FELTP	Field Epidemiology and Laboratory Training Program
FY	Fiscal year
GHSA	Global Health Security Agenda
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GoM	Government of Mali
GPIRM	Global Plan for Insecticide Resistance Management
IEC	Information, education, communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LBMA	Laboratory for Bio-molecular Analysis, University of Bamako
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
MRTC	Malaria Research and Training Center
NGenIRS	Next Generational Indoor Residual Spraying
NMCP	National Malaria Control Program
PPM	<i>Pharmacie populaire du Mali</i>
PMI	President's Malaria Initiative
RDT	Rapid diagnostic test
SBCC	Social and behavior change communication
SLIS	<i>Système Local d'Information Sanitaire</i>
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
UNICEF	United Nations Children's Fund
UNITAID	An EU-based NGO financed by a levy on airline tickets
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme

## I. EXECUTIVE SUMMARY

When it was launched in 2005, the goal of the President's Malaria Initiative (PMI) was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

In 2015, PMI launched the next six-year strategy, setting forth a bold and ambitious goal and objectives. The PMI Strategy for 2015-2020 takes into account the progress over the past decade and the new challenges that have arisen. Malaria prevention and control remains a major U.S. foreign assistance objective and PMI's Strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the RBM Partnership's second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and WHO's updated *Global Technical Strategy: 2016-2030*. Under the PMI Strategy 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination.

Mali was selected as a PMI focus country in FY 2007.

This FY 2017 Malaria Operational Plan presents a detailed implementation plan for Mali, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Mali, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2017 funding.

The proposed FY 2017 PMI budget for Mali is \$25 million. PMI will support the following intervention areas with these funds:

### **Entomologic monitoring and insecticide resistance management:**

The main objective of the NMCP is to conduct quality entomological monitoring to manage the development of resistance and inform program planning. PMI supports strengthening the MoH's

capacity to plan and supervise entomological monitoring activities within the context of its integrated vector management strategy, including insecticide monitoring, insecticide resistance testing, and overall implementation of the entomological monitoring plan.

The results of Mali's entomological monitoring activities have led to rapid changes in the class of insecticide used for IRS activities. From 2008-2013, pyrethroids and later carbamates were used for spraying. As the entomological monitoring data showed failure of carbamates, they were replaced in 2014 with organophosphates. Mali will continue to conduct entomological surveillance in IRS sites and in all the national surveillance sites with FY 2017 funds.

### **Insecticide-treated nets (ITNs):**

The Malaria Strategic Plan promotes universal ITN coverage for all age groups (defined as one ITN for every two people). The MoH supports the provision of free ITNs distributed to target populations through two main delivery channels: mass distribution to households as part of universal coverage campaigns and routine distribution through antenatal care (ANC) and Expanded Program for Immunization clinics targeting pregnant women and infants. The NMCP has recently made significant progress toward achieving its initial goal of 80% use of ITNs among children under five and pregnant women. According to the 2015 MIS conducted during the peak transmission season, 93% of households owned an ITN and 71% of children under five years of age and 78% of pregnant women slept under an ITN the previous night. In 2015, PMI and the Global Fund supported mass distribution campaigns in the district of Bamako for the first round of the universal coverage campaign and the regions of Sikasso and Ségou for their second round to replace nets distributed in 2011 and 2012, respectively. PMI also continued to support the routine distribution in collaboration with the Global Fund.

With FY 2017 funding, PMI will procure 1.3 million nets that will be used for routine distribution to children and pregnant women in 2018. It is anticipated that the Global Fund will procure the needed nets for the mass campaigns to replace nets distributed in 2013 and 2014. PMI will continue to support SBCC to maintain or increase the level of net use and educate people on net maintenance.

### **Indoor residual spraying (IRS):**

PMI supports the NMCP's strategy to reduce malaria transmission through targeted IRS in select high-risk areas. Starting in 2008, PMI supported three IRS campaigns in the districts of Bla and Koulikoro, adding a third district (Baraoueli) in 2011. Support in 2015 included initial and refresher training of supervisors and spray operators as well as community health volunteers (*relais*); purchase of all commodities and personal protective equipment; and communication, supervision, monitoring, and environmental compliance activities. In FY 2015, PMI reduced the IRS sites to two districts because of the added cost of moving to a new class of insecticides (organophosphates). The 2015 IRS campaign covered approximately 133,527 houses, and protected approximately 494,205 residents. The district where IRS was withdrawn benefited from the full package of malaria control interventions, including seasonal malaria chemoprevention (SMC). In 2016, Mali benefited from the UNITAID-funded Next Generation Indoor Residual Spraying (NGenIRS) project, which includes a short term co-payment on long-lasting IRS insecticides. This allowed Mali to expand geographic coverage of IRS back to three districts, targeting 242,684 structures and 778,884 people in total. The 2017 IRS plan recommends continuation of IRS coverage at the 2016 level.

### **Malaria in pregnancy (MIP):**

Mali's MIP strategy is based on WHO's three-armed strategy, which includes distribution of ITNs to all pregnant women via ANC, the promotion and delivery of at least three doses of sulfadoxine-pyrimethamine (SP) for the intermittent preventive treatment in pregnancy (IPTp), and strengthening malaria case management for pregnant women. Thanks to relatively high rates of ANC utilization (74%,

DHS 2012), the proportion of pregnant women receiving two or more doses of SP during routine antenatal care visits continues to increase (38% according to the MIS 2015 survey; an increase from 20% in DHS 2012). However, only 18% of women who receive at least two doses of SP also receive three or more doses (MIS 2015). PMI continues to support the national strategy to achieve universal coverage of at least three doses of SP for IPTp. To this end, FY 2017 funds will support the procurement of an adequate supply of SP and ITNs to cover all eligible pregnant women; training for clinical staff on the importance of and delivery of IPTp, and; SBCC to raise awareness and build demand for IPTp-SP among pregnant women.

**Case management:** Poor geographic and economic access to care is a major challenge for malaria diagnosis and treatment in Mali. In 2010, due to advocacy efforts of PMI and other partners, the MoH adopted significant policy changes including a community case management policy and updated severe malaria treatment and pre-referral guidelines. As a result, routine health information systems data reports 99% of all suspected malaria cases were tested by microscopy or RDT in 2015, a significant improvement from 18% in 2010. PMI continued its support of the integrated community case management strategy in 2016 in four out of eleven regions. This support included training and deploying community health workers (*Agents de Santé Communautaire*), procuring RDTs and ACTs for community-based diagnosis and treatment, and ensuring sufficient supplies of RDTs and ACTs for children under five years of age in health facilities. PMI has also procured drugs for the management of severe malaria as well as supported in-service training and supportive supervision of health workers and community health workers. In the 2013-2017 Malaria Strategic Plan, Mali introduced SMC in selected districts targeting all children under five with four monthly rounds of a preventive treatment with SP and amodiaquine. In 2014, 21 of Mali's 64 districts were covered with SMC, including one in which PMI conducted an OR study to collect data on the feasibility and effectiveness of SMC under routine programmatic conditions. Due to a 3-year grant from UNITAID, SMC have been implemented in 42 districts during the 2015 and with new funding from World Bank, Global fund and PMI during the 2016 transmission seasons, SMC will be scaled-up national wide , PMI will support the implementation in 10 districts in the focus regions of Kayes, Koulikoro, Sikasso, and Bamako.

With FY 2017 funding, PMI will continue to support and strengthen efforts to ensure prompt and effective case management of malaria at health facilities and support the scale-up of the integrated community case management policy nationwide. At the health facility level, PMI will concentrate on strengthening capacity in laboratory diagnostics (including quality assurance and quality control), and supply chain management. PMI will procure 3.5 million RDTs and 2.3 million ACTs to contribute to filling gaps in annual malaria commodity needs for health facilities, integrated community case management, and SMC sites. PMI will strengthen quality assurance/quality control systems at national and district levels for accurate malaria diagnosis, and will support the NMCP to monitor and reinforce the correct use of ACTs at health facilities and in communities.

**Health systems strengthening and capacity building:**

Since its first year, PMI has contributed substantially to building capacity of the NMCP and other Government of Mali (GoM) entities. This support has allowed the government's partners to improve training, supervision, and quality assurance and quality control for diagnostics; to oversee implementation of SBCC activities related to malaria; and to improve partner coordination. With the *coup* in 2012, PMI suspended direct funding for NMCP capacity-building efforts and focused on strengthening the health system at the community level. In 2013, the restrictions were lifted but direct funding to the NMCP is capped. With FY 2017 funding, PMI will support day-to-day operations of the NMCP through its implementing partners. These activities will include support for training, supervision, and infrastructure needed for optimal functioning. Collaboration will continue with other partners to

support NMCP structure and staff, specifically to increase capacity at all levels for program management, including training, supervision, and facilitating forecasting and quantification for malaria commodities and training in logistic management information systems.

**Social and behavior change communication (SBCC):**

SBCC interventions in Mali are currently guided by the PMI-supported 2014-2018 SBCC strategy. This strategy encourages partners to focus malaria prevention, treatment and control messages to key populations, including pregnant women and children under five; other family members (e.g., fathers) and caretakers of children; community health workers, and *relais* (community health volunteers). The national strategy supports multiple delivery channels for messages, including mass media and interpersonal communications, however, the majority of SBCC activities supported by PMI focus on interpersonal approaches. In FY 2016, PMI continued to contribute malaria funding to a Mission-managed bilateral agreement that promotes SBCC across the entire health portfolio. PMI will support this integrated approach again in FY 2017. SBCC activities will continue to focus on the promotion of prompt diagnosis and treatment; the correct and consistent use of long-lasting ITNs, especially by vulnerable groups, and; mobilization of pregnant women and a cross-section of healthcare providers (e.g., clinicians, community health workers, traditional healers, midwives) to promote IPTp. Lastly, PMI will continue to support coordination and harmonization among implementing partners, the Malian Ministry of Health, and other donors (e.g., Global Fund, World Bank) to ensure that SBCC messages and interventions are based on the national strategy and on current evidence and best practices.

**Surveillance, monitoring and evaluation (SM&E):**

The NMCP, with support from PMI and other partners, has developed a comprehensive national malaria monitoring and evaluation plan for 2013-2017, including capacity building, improvement of data collection, and provision of equipment to collect and analyze data. The quality of routine data collection, analysis and reporting through the health information system is variable and feedback is not delivered in a timely manner for program management.

In FY 2015-16, PMI expanded its work to support the national health information system to strengthen the SLIS (*Système Local d'Information Sanitaire*) through training and supervision, with a focus on the community health center level (*Centres de Santé Communautaire*). Activities focused on broadening the reach of the system to new health districts, including SMC and IRS districts, and will expanding the use of SMS technology to transfer data. PMI also supported local and regional health system staff to report and utilize surveillance data for epidemic detection and responding to epidemics in Mopti and the Northern Regions. In late 2015, PMI supported an MIS to collect data on coverage and impact of malaria-interventions (data provided in the Strategy Section below). By 2017, the nascent DHIS2 system will be rolling out nationwide, and PMI will support the merging of the malaria information system into the DHIS2, including assuring the appropriate malaria indicators are included and that the NMCP has timely access to the data for program management.

**Operational research (OR):**

Since 2008, OR has been conducted in Mali to answer specific questions regarding the implementation and effectiveness of critical malaria interventions. PMI has funded various studies such as: an evaluation of the expanded program on immunization to monitor bednet usage and treatment of childhood illnesses; the entomological impact of combining larviciding with IRS; and a cost analysis of removing user fees for children under five. With FY 2014 and FY 2015 funds, PMI supported two OR activities: (1) a study to evaluate the impact of ITNs treated with two insecticides to inform PMI about the potential ability of this new ITN variety to affect malaria transmission in areas with high pyrethroid resistance; and (2) an evaluation of the SMC intervention to determine its relative usefulness as part of the malaria control



strategy in Mali. Using FY 2016 funding, PMI will evaluate an enhanced intervention package to improve uptake of IPTp. The plans with FY 2017 funding will again focus on SMC and the potential added benefits of extending SMC services to children up to the age of ten.

## II. STRATEGY

### 1. Introduction

When it was launched in 2005, the goal of PMI was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

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### 2. Malaria situation in Mali

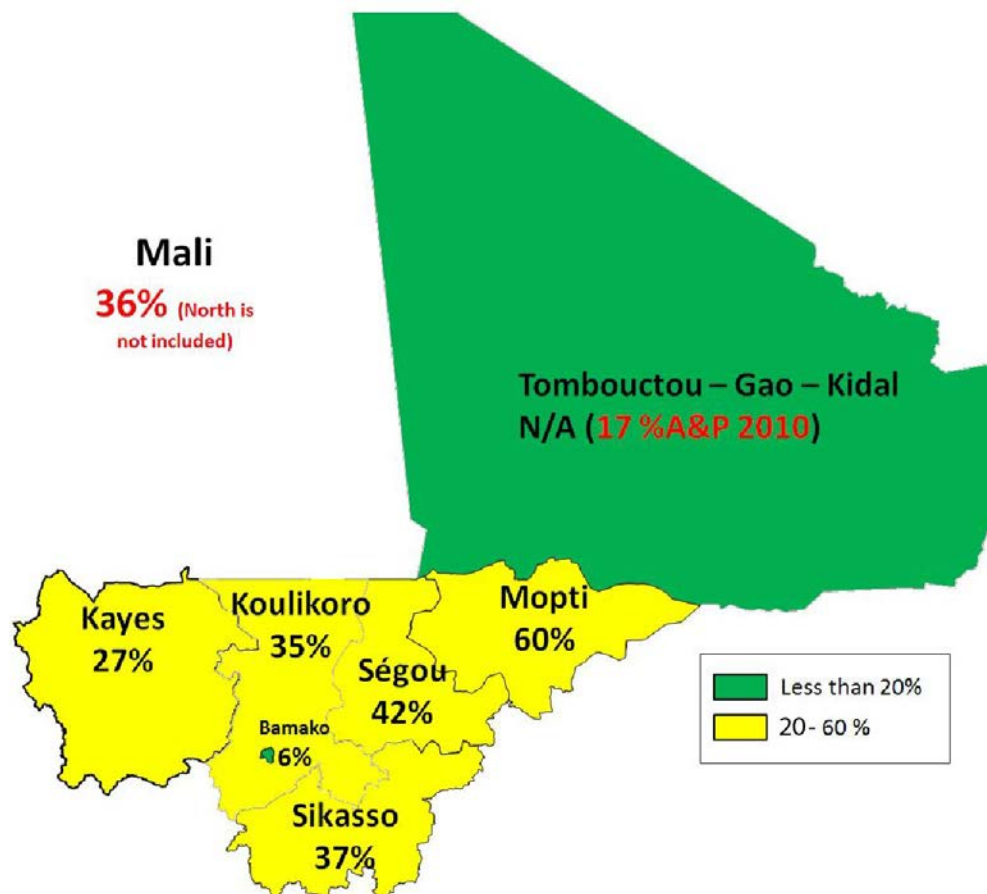
Malaria is the primary cause of morbidity and mortality in Mali, particularly for children less than five years old. In 2015, the national health information system (*Système Local d'Information Sanitaire* or

[SLIS]) reported 2.37 million clinical cases of malaria in health facilities, accounting for 34% of all outpatient visits for all age groups. A total of 1,978 fatal malaria cases were reported. However, SLIS data should be viewed with caution due to its variable quality. According to the 2015 Malaria Indicator Survey (MIS), the prevalence of malaria among children under five years of age was 36% based on microscopy and 32% based on rapid diagnostic tests (RDTs).

Data from the recent MIS 2015 indicates that *Plasmodium falciparum* accounts for 91.8% of all malaria infections, while *P. malariae*, *P. vivax* and *P. ovale* together account for 9.2%. A 2004 study conducted by the Malaria Research and Training Center (MRTC) in Menaka, an epidemic-prone region in the north, indicated a prevalence of *P. vivax* of 8%, which was confirmed by polymerase chain reaction.

Malaria is endemic to the central and southern regions, where about 90% of Mali’s population lives and it is epidemic in the north due to the limited viability of *Anopheles* species in the desert climate. Malaria transmission varies in Mali’s five geo-climatic zones. It occurs year-round in the Sudano-Guinean zone in the south, with a seasonal peak between June and November. The transmission season is shorter in the northern Sahelian zone, lasting approximately three to four months (July/August to October). Malaria transmission is endemic in the Niger River Delta and areas around dams with rice cultivation, and is endemic with low transmission in urban areas including Bamako and Mopti. Epidemics occur in the north (Tombouctou, Gao, and Kidal Regions) and in the northern districts of Kayes, Koulikoro, Ségou, and Mopti Regions; recently, there was a recrudescence of malaria cases in Kidal, Northern Mali in October, 2015.

**Figure 1. Under-five malaria prevalence with microscopy (MIS 2015)**



### 3. Country health system delivery structure and Ministry of Health (MoH) organization

At the national level, Mali's MoH is composed of the cabinet of the Minister of Health and National Directorates reporting directly to the Secretary General of the MoH. The NMCP was established in 1993 under the oversight of the Disease Control Division of the National Health Directorate. In July 2007, the Government of Mali (GoM) elevated the NMCP to a directorate level in the MoH organizational structure. The NMCP is composed of four technical divisions and one administrative and finance division, and the director reports directly to the secretary general of the MoH. Due to its higher profile in the MoH, the NMCP can participate in and influence decision-making about malaria control more effectively, including development of MoH work plans and budgets.

In January 2016, the GoM created two (2) new regions in the north to accompany the peace agreement process and the National reconciliation signed in Algeria. Thus the country is divided into ten administrative regions (previously eight) (Kayes, Koulikoro, Sikasso, Ségou, Mopti, Gao, Tombouctou, Kidal, Taoudeni, and Menaka) plus the capital, Bamako. Each region represents a regional health directorate except for the new regions. Following the creation of the new regions, eight new “*cercles*” have been created bringing the total to 58 administrative “*cercles*.” The regions are made up of 59 health districts, and Bamako is divided into six administrative communes that correspond to six health districts; thus the country has a total of 65 health districts. Governance is decentralized into 703 communes (19 rural and 684 urban), each one administered by an elected local council headed by a mayor. The organization of the health system is based upon the principles of decentralization of health services and community participation to extend health service coverage and to ensure access to essential and effective medicines. PMI supports the National Malaria Control Program's national strategy, but its support for the regions of the north (including the two new regions) is limited to supplying necessary commodities due to insecurity in that area of the country.

The health delivery system is composed of three levels:

- The local level with 65 referral health centers (*Centres de Santé de Référence* [CSREF]) constitutes the first reference level
- The intermediate level with eight regional hospitals (Kayes, Kati, Sikasso, Ségou, Mopti, Tombouctou, Gao, and the maternal and child hospital of Bamako) constitutes the second reference level
- The central level with five national reference hospitals constitutes the third reference level

As of December 2015, a total of 1,204 functional community health centers (*Centres de Santé Communautaire* [CSCOM]) as well as parastatal, faith-based, military, and other private health centers, make up the community health services level. The CSCOMs are established and managed by community health associations.

The MoH has a critical staff shortage at all levels of the public health system, especially for service provision below the national level. In addition, health workers are not distributed proportionally to population throughout the country. In 2014, the national ratio of doctors to the population was 1/8,528, (WHO recommends 1/10,000) but rural regions have less than one doctor for every 24,000 inhabitants. Regional directors oversee health teams that implement integrated health interventions; currently all regional teams have malaria focal persons. The CSREF (at the district level) is the first referral structure for CSCOMs; the district health team is headed by a medical chief responsible for technical supervision

of CSCOMs and has a malaria focal person as well. The community health associations manage CSCOM staff and operations; collect proceeds from drug sales, consultations, and user fees; and pay salaries and other expenses. As is the case at the central level, distribution of staff is uneven. Since 2009, the percentage of CSCOMs headed by a certified head nurse was close to the World Health Organization (WHO) norms and ranged from 100% in five regions to 95% in Kayes. According to the strategic plan for health and social development (2014-2023), in 2014, 32% of CSCOMs were headed by a medical doctor. The number of staff employed depends on the level of community resources to pay them (SLIS 2014). In 2011, the MoH started the “medicalization” of CSCOMs, meaning the appointment of qualified medical doctors in CSCOMs.

In 2010, Mali approved an integrated community case management (iCCM) package offered by community health workers (*Agents de Santé Communautaires* [ASCs]) to provide health services at the village and household levels. The ASCs, who receive a financial incentive or salaries from the local government and different partners for their services, provide free treatment for uncomplicated malaria and malnutrition, with payment for treatment of acute respiratory infections and diarrhea. The ASCs also provide primary care to newborns and some family planning methods for eligible families. Based on national iCCM directives, the iCCM package and ASC model has been introduced in villages located 5 km or more from a health facility and covers 2-3 villages in a radius of 3 km with a catchment area of approximately 1,500 people. This iCCM approach and ASC efforts are supported by an additional cadre of community health volunteers, the *relais*, whose role is to carry out social and behavior change communication activities (SBCC) and health education to promote key health messages to complement iCCM activities. Support for the GoM scale-up plan for nationwide implementation of the iCCM package including supervision, commodity management, RDT confirmation, and quality assurance/quality control (QA/QC) were incorporated into the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) consolidated grant. As of March 2016, a total of 2,377 ASCs had been trained and are fully functional; an estimated 4,876 ASCs are needed to achieve full coverage of iCCM activities. The iCCM *ad hoc* group has developed a plan where each donor partner indicated the number of ASCs to be supported by the partner and in which geographic area – USAID is supporting the implementation of iCCM in the regions of Kayes with 275 ASC sites, Koulikoro 576 sites, Sikasso 686 sites and support to Gao will start in 2016 with 64 ASC sites.

Mali has a strong cost recovery system that is based on the Bamako Initiative. At the district level, communities can establish CSCOMs based on the following criteria: the establishment of a community health association; raising a minimum of 10% of the cost of construction or renovation of the health facility; and the hiring and support of health personnel. All CSCOMs are required to deliver the national minimum package of services comprising curative, preventive, and promotional health activities. Once authorized by the district medical officer, the MoH provides an initial stock of medicines, consumables, and equipment. In principle, communes are expected to allocate 15% of their budget for social services including water, education, and health.

CSCOMs have three forms of revenue generation that are managed by the community health association: membership fees, sales of essential drugs, and fees for services. Service fees vary by health area and are set by the community health association (“*Association de Santé Communautaire*” - ASACO) after consultation with the population. Membership fees allow for reduced service charges at some CSCOMs. Funds derived from the sale of medications are kept in a separate account to prevent providers from overprescribing to generate revenue and to prevent decapitalization of pharmacy stock. The community health association management committee purchases replacement drugs for the CSCOM through the national pharmacy system or from approved private sector companies based on availability. Selected drugs (e.g., antimalarials for children under five and pregnant women, vitamin A,

and immunization services) are provided free by the government or donors. The CSCOMs must finance the transportation of their drugs from CSREFs. However, due to small profit margins and the loss of or use of revenues for non-pharmaceutical purposes, CSCOM drug stores often lack available funds to cover these costs.

#### **National financial planning for malaria and health/social development**

The NMCP receives annual budget support from the National Health and Social Development Program. Its Evaluation Committee manages and approves the annual operating budget plan. Several partners (including the governments of the Netherlands, Sweden, and Canada) provide direct budget support on an annual basis. Other donors, including the United States Government (USG), target their funding to sub-sectors and specific programs. The GoM contributes mostly to salaries, office space, and other operating costs in the program's annual budget, but also procures malaria commodities such as artemisinin-based combination therapy (ACTs), rapid diagnostic tests (RDTs), severe malaria drugs, seasonal malaria chemoprevention (SMC) drugs, and insecticide-treated mosquito nets (ITNs). The GoM, local governments, community health associations, and other donor partners, such as the Global Alliance for Vaccines and Immunizations (GAVI) are supporting the salaries of CSCOM staff, including qualified medical doctors. While the GoM increased its annual investment in malaria control from about \$1 million in FY 2007 to \$6.7 million in FY 2008 and \$9 million in FY 2009, this support decreased to approximately \$4 million in FY 2010 and \$3 million in FY 2011. The GoM budget for malaria remained \$2.5 million per year from 2012 to 2014. In 2015 the GoM invested around \$6 million (3 billion CFA) and most of these funds contributed to procure malaria commodities - mainly SMC drugs and long-lasting ITNs.

#### **4. National malaria control strategy**

The NMCP establishes strategies for all malaria interventions; coordinates research; proposes policies, norms, and guidelines; and coordinates partner work plans. The NMCP also supports decentralized regional and district health teams through training and supervision. In 2013, a five-year strategic plan (2013–2017) was developed and published by the NMCP and partners. Its goal is to “reduce the burden of malaria to a level that will not constitute a major cause of morbidity and mortality nor a barrier to economic and social development.”

The NMCP Strategic Plan aims to achieve the following targets by 2017:

- Reduce malaria mortality to near zero
- Reduce malaria morbidity by at least 75% as compared to 2000 levels
- Reinforce/strengthen the NMCP coordination and management capacity

Expected results to be achieved by the 2013-2017 strategic plan are as follows:

- At least 80% of the population at risk of malaria is using ITNs, including pregnant women and children under five years old;
- At least 80% of pregnant women have received three sulfadoxine-pyrimethamine (SP) doses as intermittent preventive treatment for pregnant women (IPTp) during their pregnancy;
- At least 80% of children under five received the four full courses of SMC in selected zones;
- At least 90% of suspected malaria cases are confirmed using microscopy or RDTs before treatment, at all levels of the health system including the ASC level;
- At least 90% of confirmed malaria cases receive appropriate malaria treatment both for severe and uncomplicated cases as indicated in the national guidelines;

- At least 80% of the population is protected by indoor residual spraying (IRS) in IRS target zones;
- At least 80% of the general population knows what interventions are recommended to prevent malaria;
- At least 90% of emergency cases and malaria epidemics are detected within two weeks and receive an appropriate response.

Due to the diversity of malaria transmission in Mali (largely endemic in the south and epidemic-prone in the north), the strategic plan emphasizes nationwide universal coverage of key malaria interventions for prevention and control of malaria, as well as specific interventions such as epidemic and entomological surveillance and targeted operational research in areas with unstable malaria transmission. Below are the main intervention areas with their strategic approach:

- Access to and use of ITNs through 1) routine distribution to pregnant women at their first antenatal care (ANC) visit and to children under one year of age at their measles vaccination visit through the expanded program on immunization (EPI), and 2) through phased mass distribution campaigns (region-by-region) defined as one net for every two persons;
- IPTp for pregnant women with SP given as directly observed treatment monthly following the first trimester to achieve three doses or more of SP during pregnancy;
- SMC using sulfadoxine-pyrimethamine/amodiaquine (SP/AQ) in children aged 3-59 months during the peak transmission period (August – November);
- Indoor residual spraying in targeted, high burden areas using organophosphate insecticides during the raining season;
- Case management by diagnosing suspect malaria cases through microscopy or RDT, and treatment of confirmed positive cases using artemisinin-based combination therapy (ACT). The first-line treatment for uncomplicated malaria is artemether-lumefantrine (AL) and artesunate-amodiaquine (AS/AQ) as second-line. Injectable artesunate is used for severe malaria cases. To ensure correct case management, the GoM decided that RDTs should be free for everybody and treatment with ACTs is free for pregnant women and children under five years old at all levels of the health pyramid including the community level;
- Strengthen the sentinel surveillance systems (epidemiological and entomological) in areas with unstable malaria transmission;
- Strengthen the integrated disease surveillance system in all districts and hospitals to collect weekly malaria data for prompt decision making;
- Strengthen social and behavior change communication (SBCC) in order to increase the appropriate use of ITNs and promote early care-seeking for patients with fever and encourage early ANC attendance by pregnant women;
- Revitalize monitoring and evaluation (M&E) and surveillance interventions by strengthening the routine surveillance system at all levels of the health system;
- Strengthen operational research through studies and surveys on malaria;
- Revitalize and strengthen the national Roll Back Malaria (RBM) partnership to leverage sustainable funds for malaria activities;
- Reinforce regional malaria coordination and collaboration; and
- Reinforce managerial capacity of the NMCP and coordination mechanisms at all levels of the health pyramid.

In January 2016 the NMCP with the support from WHO, PMI, the Global Fund, and other partners undertook a mid-term review of the 2013-2017 National strategic plan to evaluate progress against objectives and targets from 2013 to 2015 and to appropriately update the plan to accelerate control

through 2018. The preliminary results have shown an adjusted average physical performance of 42% while the resource mobilization has reached 66%.

The NMCP also has National Malaria guidance (*“Politique Nationale de lutte contre le paludisme”*) and, a National Malaria Communication Plan 2014-2018 and a National Malaria Monitoring and Evaluation Plan 2013 – 2017.

## **5. Updates in the strategy section**

- A Malaria Indicator Survey (MIS) was conducted in 2015 which provides new data on coverage and impact indicators (used throughout the MOP)
- Expansion of targeted IRS strategy from two to three districts based on support by NGenIRS project for subsidized purchase of IRS insecticide to support GPIRM.

## **6. Integration, collaboration, and coordination**

Communications among malaria control partners in Mali are coordinated through the NMCP monthly partners’ meetings. Malaria control is part of the national sector-wide approach, based on a strategic Ten-Year Plan for Social and Health Development and operationalized through the five-year National Health and Social Development Program. The plan is supported by the Financial and Technical Partners’ Forum, which meets monthly to share information on ongoing programs, new initiatives, strategies, and policies; to coordinate interventions; and to help leverage resources. The NMCP is responsible for overseeing all malaria control activities conducted in Mali, but donor coordination needs to be strengthened.

### ***Funding***

Key funding and technical partners to the NCMP include PMI, the Global Fund, WHO, UNICEF, the World Bank, UNITAID, and the USG. The U.S. National Institutes of Health also supports the MRTC within the Faculty of Medicine at the University of Bamako. At the implementation level, partners include numerous non-governmental and private voluntary organizations including *Groupe Pivot Santé*, the National Federation of Community Health Associations (*Fédération Nationale des Associations de Santé Communautaire*), Doctors without Borders (*Médecins Sans Frontières*), World Vision, and Plan International. Partner funding activities include the following:

- In 2016 UNICEF will procure 1 million RDTs and implement SMC in 11 districts and support iCCM in 30 health districts.
- WHO will provide technical assistance in malaria for the development of new NMCP and MoH policy and strategy documents.
- Catholic Relief Services (CRS) will be expanding SMC in Mali with UNITAID funds. An average of more than 866,000 children under five years of age will be covered with SMC in 2015.
- The World Bank will support the NMCP to scale up SMC in 19 districts.

The approved Global Fund Round 10 malaria grant and the Round 6 Phase 2 grant have been consolidated into one malaria grant, which was signed in May 2013. The consolidated malaria grant supports scaling up iCCM implementation, procurement of ACTs and RDTs, and support for a universal ITN coverage campaign in 2015 in Bamako. The total budget amount under this grant is approximately \$60 million for the first three years.



In April 2015, Mali submitted a malaria concept note to the Global Fund which was approved and signed in February 2016, this grant of approximately 55 million Euros will cover malaria prevention interventions from January 2016 to December 2018. Activities outlined in this grant will continue the scale-up of SMC, iCCM, procurement of ACTs and RDTs, and more than 3 million ITNs will be procured and distributed to support a universal ITN coverage campaign in Mopti and Kayes Regions.

### *Other USG programs*

Malaria prevention and control is a major foreign assistance objective of the USG. The U.S. Agency for International Development (USAID)/Mali supports a number of programs of the MoH including family planning, maternal and child health, nutrition, and water/sanitation programs. Through this diverse array of programs, USAID has contributed considerably to the strengthening of the Malian health system.

As a USG Feed the Future country (2011–2016), Mali is implementing a coordinated government strategy to address food security and nutrition issues. Anemia, due to iron deficiency, malaria, and helminth infections, affects over 80% of children under five nationwide and exceeds 90% in some regions (e.g., Sikasso). The GoM is committed to developing multi-sectorial programs that address access to health care to improve overall dietary intake and disease status of Malians. PMI is working in collaboration with Feed the Future and the Global Health Initiative to improve maternal and child health services and coordinate on relevant malaria and nutrition SBCC messages.

The Ebola epidemic in West Africa highlights the urgency for immediate action to establish global capacity to prevent, detect, and rapidly respond to biological threats like Ebola. The Global Health Security Agenda (GHS) was launched in February 2014 to advance a world safe and secure from infectious disease threats and to bring together nations from all over the world to make new, concrete commitments, and to elevate global health security as a national leaders-level priority. The USG committed to assist at least 30 countries, including Mali, over five years to strengthen the health system to prevent outbreaks, detect threats in real time, and rapidly respond to infectious diseases.

PMI and GHS remain in constant contact in coordinating efforts towards health system strengthening. PMI/Mali has been involved in participating in GHS planning to ensure complementary activities, and to share PMI practices, lessons learned, and strengths in prevention, detection, and response efforts. Specifically, there are currently three priority areas that PMI has been involved in with regards to Mali's 18-month operational plan. The first priority is to develop a plan to incrementally strengthen capacity from national to regional to district levels on policies and strategies related to HMIS, rapid response, surveillance, and laboratory systems. The second priority is to strengthen workforce development through training cohorts of health district staff in basic and intermediate epidemiology short courses through the Field Epidemiology and Laboratory Training Program (FELTP). The third priority is to use the Hajj pilgrimage infrastructure, and expand the Ebola incident management system to implement and evaluate surveillance and laboratory capacity, and data management systems to address GHS activities related to the three selected syndromes (AHF, SARS, watery diarrhea, and dehydration). PMI is investing in HMIS and surveillance, and will continue to leverage GHS for additional funding. PMI will also benefit from a well trained workforce such as FELTP staff to conduct some malaria surveillance activities.

CDC Mali will use the \$26 million funds for GHS to strengthen surveillance, the Emergency Operation Center, FELTP, and laboratory services.

USAID has provided funding for health systems strengthening, immunization, HMIS, the Emergency Operation Center Zoonotic diseases, and anti-microbial resistance activities at a total cost of \$18 million.

## ***Private sector partnerships***

The NMCP and PMI maintain working relationships with several members of the private sector, including the recent partnership with the Association of Employers and Business Owners (*Patronat du Mali*) and the bank sector. With the country's well-established net culture, mosquito net vendors in Mali enjoy a large market in both urban and rural areas. The NMCP has a long-established collaboration with mosquito net vendors in Mali. Private clinics, pharmacies, and laboratories are becoming more prevalent with a larger presence in urban areas. The NMCP, with support from PMI, conducted an assessment of the private pharmacies' performance in malaria treatment and the NMCP has developed an action plan to improve case management at this level including the testing of suspected cases before prescribing an ACT. To date, the NMCP, with support from PMI and the Global Fund, have provided training to private sector personnel on malaria case management using country guidelines as well as supervision to ensure that national directives related to malaria diagnosis and treatment are understood and applied. The mining industry is growing in Mali. Currently, at least five mining companies are supporting IRS activities in their employees' residence sites and neighboring villages. In 2016, through PMI's public private partnership, the AIRS project conducted a monitoring of the RandGold mining IRS program and recommended a shift from carbamate to organophosphate insecticides. PMI will continue to facilitate a dialogue between the NMCP and the mining companies to ensure that they adhere to national and international IRS standards and to promote best practices.

### **7. PMI goal, objectives, strategic areas, and key indicators**

Under the PMI Strategy for 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination. Building upon the progress to date in PMI-supported countries, PMI will work with NMCPs and partners to accomplish the following objectives by 2020:

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80% reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40% from 2015 levels.
3. Assist at least five PMI-supported countries to meet the World Health Organization's (WHO) criteria for national or sub-national pre-elimination.<sup>1</sup>

These objectives will be accomplished by emphasizing five core areas of strategic focus:

1. Achieving and sustaining scale of proven interventions
2. Adapting to changing epidemiology and incorporating new tools
3. Improving countries' capacity to collect and use information
4. Mitigating risk against the current malaria control gains
5. Building capacity and health systems towards full country ownership

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key indicators recommended by the Roll Back Malaria Monitoring and Evaluation Reference Group (RBM MERG) as listed below:

- Proportion of households with at least one ITN
- Proportion of households with at least one ITN for every two people

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<sup>1</sup> [http://whqlibdoc.who.int/publications/2007/9789241596084\\_eng.pdf](http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf)

- Proportion of children under five years old who slept under an ITN the previous night
- Proportion of pregnant women who slept under an ITN the previous night
- Proportion of households in targeted districts protected by IRS
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs
- Proportion of women who received two or more doses of IPTp for malaria during ANC visits during their last pregnancy

## 8. Progress on coverage/impact indicators to date

**Table 1: Evolution of Key Malaria Indicators in Mali from 2006 to 2015**

Indicator	2006 DHS	2010 AP Survey	2012-2013 DHS	2015 MIS	Other data sources
% Households with at least one ITN	50%	85%	84%	93%	NA
% Households with at least one ITN for every two people	NA	NA	42%	39% <sup>1</sup>	NA
% Children under five who slept under an ITN the previous night	27%	70%	69%	71%	NA
% Pregnant women who slept under an ITN the previous night	29%	NA	73%	78%	55% (MICS 2010)
% Households in targeted districts protected by IRS	NA	NA	NA	NA	98% (2015 Abt EOSR)
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	NA	8%	32%	49%	NA
% Children under five with fever in the last two weeks who had a finger or heel stick	NA	NA	12%	14%	NA
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	NA	8%	19%	33%	NA
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	4%	NA	20%	38%	42% (HMIS 2014)
Any anemia (<11g/dL)	81%	85%	82%	NA	NA
Severe anemia (<8g/dL)	10%	26%	20%	20%	NA

Indicator	2006 DHS	2010 AP Survey	2012-2013 DHS	2015 MIS	Other data sources
Parasite prevalence (microscopy/RDT)	NA	38%/43%	52%/47%	36%/32%	NA

<sup>1</sup>The decline in this indicator is due to a change in the calculation of the household figure in the denominator and does not reflect an actual decline in access to ITN.

## 9. Other relevant evidence on progress

### Vector Control

ITN interventions have contributed to a significant decline in malaria morbidity / mortality in several countries. However, increased exposure to pyrethroid insecticides, a result of pyrethroid-based ITN distribution and agricultural use, has led to the spread and intensification of pyrethroid resistance among mosquito vectors across Africa. Two ITN products, PermaNet 3.0® and Olyset Plus®, are designed to manage the pyrethroid resistance threat by means of a ‘combination’ of pyrethroid insecticide and the synergist piperonyl butoxide (PBO). Resistance to pyrethroids in *Anopheles* mosquitoes is associated with two resistance mechanisms: insecticide - target site insensitivity (*kdr*) and upregulated mixed function oxidases (MFOs). PBO is thought to increase susceptibility by inhibiting the MFO mechanism. Field evaluation of these products, recommended by WHOPEs, led PMI to design and implement operational research (village scale randomized cluster design studies) to assess the added benefit of combination long-lasting ITNs over their conventional pyrethroid ‘analogues’ (PermaNet 2.0® and Olyset® ITN) in areas with vector resistance to pyrethroids, associated with MFO-mediated metabolic mechanisms.

Villages for the field evaluation in Mali were selected based on the phenotypic frequency of pyrethroid resistance among vectors as well as evidence for the involvement of elevated MFOs. Results, including indoor mosquito resting densities, host preference, longevity (parity status), and sporozoite rates indicate that ITN products differ in terms of their durability. For example, 75-80% of Olyset® and Olyset Plus® nets had holes after 24 months compared to only 20-40% of PermaNet® 2.0 and 3.0 nets. As a result, survivorship was approximately 50% for Olyset® and Olyset Plus® nets and 70-76% for PermaNet 2.0® and 3.0® after 24 months; and vector sporozoite rates in the PermaNet 3.0® arm were significantly lower than the PermaNet 2.0® arm. However, PermaNet 3.0® did not reduce vector density compared to PermaNet 2.0®, which makes it more difficult to define impact. The evaluation continues in 2016 on a limited basis (ITN durability and sporozoite rate determination).

### Seasonal Malaria Chemoprevention

In 2014, PMI funded an OR study to evaluate the effectiveness of delivering SMC as compared to standard malaria case management through existing community health workers. A non-randomized pre-post design was used, where the intervention district (Kita) received four rounds of SMC with SP+AQ, while the comparison district (Bafoulabé) received standard care. Children aged 3-59 months were included in the study. In addition to a pre-post survey, blood smears were collected to measure parasitemia and hemoglobin. Difference-in-differences regression models were used to assess and compare changes in malaria and anemia in the intervention and comparison districts.

During round one, 84% of targeted children received at least the first SMC dose, but coverage declined to 67% by round four. Across the four treatment rounds, 54% of children received four complete SMC courses. Prevalence of parasitemia and malaria disease (fever + parasitemia) was similar in intervention (23.4%) and control (29.5%) districts prior to SMC ( $p=0.34$ ). After SMC, parasitemia prevalence fell to 18% in the intervention district and increased to 46% in the control district (Difference-in-differences

(DD) OR=0.35; 95% CI: 0.20-0.60). SMC also significantly reduced the odds of malaria disease (DD OR=0.20; 95% CI: 0.04-0.94) and moderate anemia (Hb<8 g/dL) (DD OR=0.26, 95% CI: 0.11-0.65). The 2015 SMC, which is the year two of the above study, showed similar results in terms of parasitemia and anemia reductions. The final report will be available in July 2016. Routine implementation of SMC in Mali substantially reduced malaria and anemia, with reductions of similar magnitude to those seen in in clinical pilots of the intervention. Improving coverage could further strengthen SMC impact.

Mali conducted an impact evaluation in 2015, following the RBM and PMI impact evaluation format. The evaluation examined the scale up of malaria control interventions over the period 2000-2012, and the concurrent decline in all-cause child mortality. The methodology examined changes in morbidity over the time period as measured by biomarkers for anemia and parasitemia. In addition, the study controlled for external factors such as rainfall and other potential determinants of child mortality such as vaccination rates and care-seeking for childhood illness. During the period 2000-2015, Mali significantly scaled up interventions, especially ITNs, to reach a coverage level of 93% of households owning at least one net. At the same time, all-cause child mortality declined 58% from 225 to 95 deaths/1,000 live births. Other child health interventions did not scale up at the same rate over this period. Climate factors, such as rainfall, actually increased and would have favored a higher malaria mortality rate, but such an increase did not occur. The report uses the evidence to make the case that malaria control over the past decade has been a significant contributor to reductions in all-cause child mortality.

### III. OPERATIONAL PLAN

PMI will support the NMCP and its key objective of reducing the burden of malaria by filling commodity gaps and ensuring the availability of ITNs, RDTs, ACTs, and SP at the local level and bolstering the supply chain system to avoid future stockouts. PMI will continue to support the implementation of IRS in three districts and iCCM and SMC in USAID/Mali's four intervention regions (Kayes, Koulikoro, Sikasso, and the district of Bamako). PMI funds will be used to update and develop skills in diagnostics and case management among providers, principally at the community levels, but also throughout the health system. The overall health system will be strengthened through improved approaches to monitoring and evaluation, including enhancements to the routine HMIS and training of health care providers and managers on use of data for decision-making. Operational research activities will be undertaken to fine tune program implementation for the Malian context. Finally, all the service provision improvements will be supported through a strong SBCC program to improve knowledge about malaria control in the communities.

#### 1. Vector monitoring and control

##### NMCP/PMI objectives

The current Malaria Strategic Plan promotes universal ITN coverage and blanket IRS coverage in targeted high-risk districts. With PMI support, the NMCP developed a national vector control strategy in 2015 to guide the use of entomological monitoring data for strategic decisions regarding the deployment of IRS and other vector control interventions. The vector control plan includes entomological monitoring at 13 sites throughout the country including IRS and non-IRS areas. PMI also supports the NMCP to build national capacity to plan and supervise vector control activities within the context of the WHO integrated vector management strategy.

##### a. Entomologic monitoring and insecticide resistance management

##### Progress since PMI was launched

Mali has a long history of entomological monitoring and the use of monitoring data to guide its vector control strategy. The methods and timeframe for collection of entomological data were codified in the National Vector Control Strategy, completed in 2015. Historically, Mali relied on the pyrethroid class of insecticides. However, evidence of resistance was first detected in 2010, causing the country to shift to carbamate insecticides for IRS. When the half-life for carbamates (following IRS) was monitored, it was shown to be insufficient to protect treated households for the duration of the transmission season and the IRS insecticide was changed to organophosphates beginning in 2014. A PMI Mali vector control workplan (updated annually since 2012), includes the indicators, methodologies and mosquito collection schedules to operationalize monitoring of IRS. Insecticide resistance management decisions, such as rotation to a new IRS insecticide class, are based on vector-insecticide resistance data. The workplan includes the collection of data at 13 sites (Table 2).

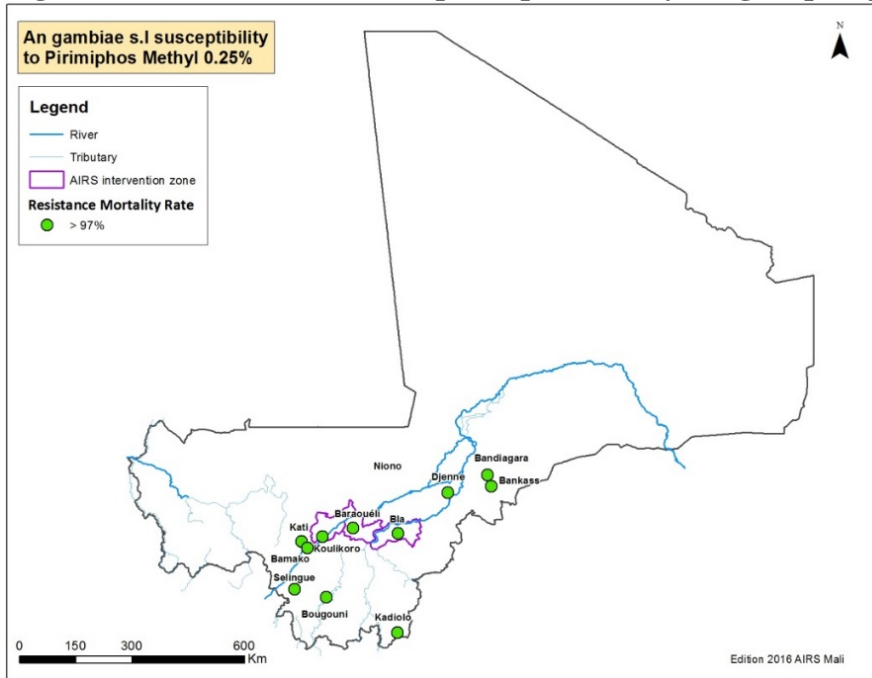
##### Progress during the last 12-18 months

IRS impact data is collected at five of the same sites in current and former IRS areas (four sites plus one non-IRS comparison area). Figure 2 shows recent (2015) resistance results for pirimiphos-methyl (an organophosphate), which is the insecticide currently in use. Table 2 provides a summary of the entomological monitoring sites and the relevant data that are collected at each site.

**Table 2. Vector-monitoring and evaluation sites (2016) and their relevant characteristics**

<b>Region</b>	<b>Site (District)</b> <b>* resistance + IRS</b>	<b>Reason for Selection</b>	<b>Resistance monitoring Activity</b>
Kayes	1. Kita	-Agricultural insecticide use - ITN	All sites: vector-insecticide resistance profiling  5 sites (*) IRS/entomology monitoring - Density - Behavior - Longevity - Infection rate - Blood meal origin  + resistance profiling
Koulikoro	2. Koulikoro *	-IRS -ITN	
	3. Kati *	-ITN -Black fly control -Irrigation	
Ségou	4. Niono	- Irrigation	
	5. Bla *	Traditional agriculture (limited use of herbicides only) IRS (2008 – 2014)	
	6. Barouéli *	-IRS -ITN distribution	
	7. Fana *	-IRS -ITN distribution	
Sikasso	8. Bougouni	-Agricultural insecticide use -ITN distribution	
	9. Selingue	-Irrigation -ITN distribution	
	10. Kadiolo	-Agricultural insecticide use -ITN distribution	
Mopti	11. Badiangara	-Traditional agriculture (limited use of herbicides only)	
	12. Bankass		
	13. Djenne		

**Figure 2. Resistance results for pirimiphos-methyl (organophosphate-class insecticide), 2015**



Data collected during the 2015 season continue to support a picture of widespread pyrethroid class insecticide resistance in vector populations across South Mali. There is also evidence of widespread resistance to DDT at the same sites, suggesting cross-resistance to DDT and pyrethroids. High frequencies of the *kdr* mutation, as well as increasing evidence of the involvement of mixed function oxidases, was associated with resistance to pyrethroids in 10 sites. There is also evidence of ongoing susceptibility to carbamates, however, the problem with this insecticide class is a short-term residual effect of only two-three months (as shown in IRS entomology data presented in earlier 2012- 2013 MOPs), which is not long enough to provide impact throughout the transmission season. Finally, current evidence supports the assumption of ongoing susceptibility to organophosphate class insecticides (Figure 2) that are currently used for IRS.

The presence of high intensity resistance to pyrethroids, measured to be as much as 10 times the diagnostic concentration needed to kill susceptible vectors, was observed at all sites (intensity of resistance was higher to permethrin than to deltamethrin). Beginning in 2016, Mali will participate in the Next Generation IRS (NGenIRS) project with UNITAID, which includes a short-term co-payment to accelerate the reduction in price of long-lasting IRS insecticides. Through the NGenIRS program, spray operations will extend to a third district (Fana) and entomological monitoring activities will likewise cover this new district and an additional control district. These data will inform any decisions regarding which insecticides to use for future rounds of spraying.

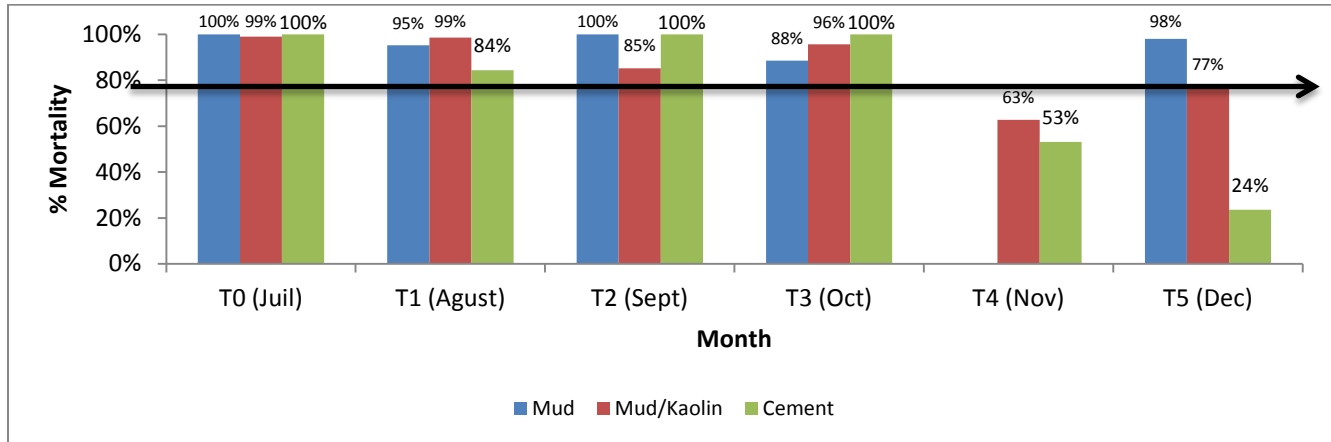
PMI continues to support IRS entomological monitoring including estimation of: malaria vector density, species (taxonomy) composition, age structure, infectivity, blood meal origin, vector biting time and location (indoor / outdoor), quality of insecticide application, IRS insecticide decay rate (Figure 3), vector susceptibility to insecticides approved for IRS (Figure 2) as well as pyrethroid - resistance intensity.



Selected results for 2015 entomology monitoring and evaluation include:

- The residual life of the IRS insecticide (organophosphate) covers the main malaria transmission season.

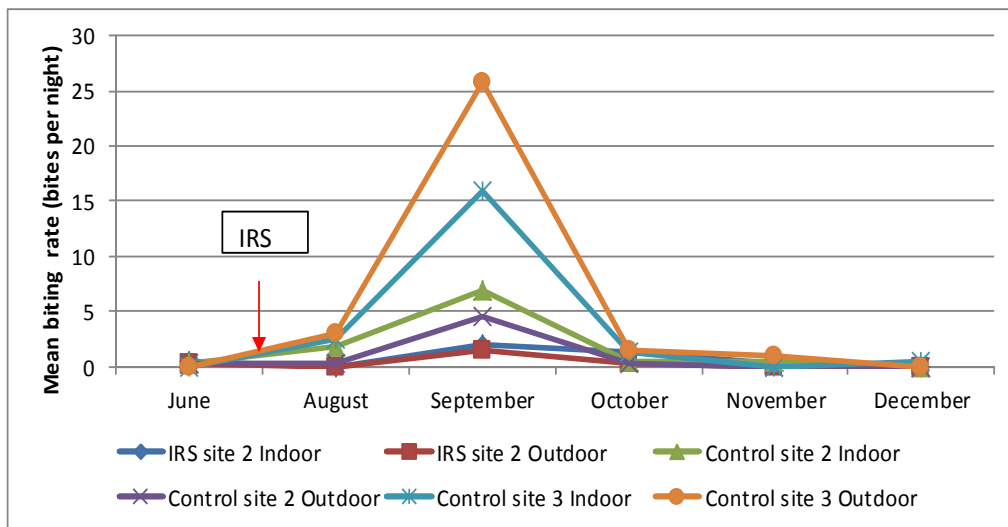
**Figure 3. Duration of organophosphate insecticidal effect\* following IRS (July 2015)**



\* WHO cone test to monitor insecticide decay following IRS. Black line shows minimum % mortality to confirm adequate insecticidal effect

- A significant reduction in vector biting rates occurs following IRS.

**Figure 4. Mean number of vector bites / human/ night in IRS versus comparison (control) areas with no IRS**



- A reduction in entomological measure of malaria transmission (entomological inoculation rate) occurs following IRS.

**Table 3. Entomological Inoculation Rate (EIR) for vector populations from IRS and comparison sites before and after IRS (2015)**

Site	IRS site Koulikoro 2015			Comparison (no IRS) site Kati 2015		
	Biting Rate	Sporozoite Rate	Nightly EIR	Biting Rate	Sporozoite Rate	Nightly EIR
<b>Pre IRS</b>	15	0.05	<b>0.75</b>	12.12	0.07	<b>0.84</b>
<b>Post IRS</b>	29.75	0.03	<b>0.89</b>	44.22	0.08	<b>3.53</b>

Plans and justification

Beginning in 2016, PMI will participate in the UNITAID-funded NGenIRS Project, which will allow PMI to spray an additional district (Fana). Baseline entomological monitoring data in this new district will be collected prior to the 2016 spray campaign. Existing IRS entomological monitoring plans have also been adjusted and refinanced to address the last of the NGenIRS elements: *creating and disseminating the evidence base on impact and cost-effectiveness*. Approved PMI IRS entomology monitoring and evaluation methods can be used to provide in depth technical information on vector-insecticide resistance, cross resistance, selection pressure related to the use of insecticides, and detection and estimation of the impact of insecticide resistance on malaria control.

In 2016, PMI will continue to support IRS in two districts, (Barouéli and Koulikoro) and will begin operations in Fana, using a long-lasting organophosphate product. IRS occurs at the start of the seasonal rains (July), being timed to provide maximum impact during the peak transmission period of the year (IRS operations precede the most intense rainy period, when access by IRS teams is hampered). In addition to baseline, (pre-IRS) assessment, entomology monitoring and evaluation activities will occur in ‘similar’, non-IRS districts to better inform the evidence base on the impact of IRS.

In addition to the three existing IRS entomology monitoring and evaluation districts (Barouéli, Koulikoro, and Bla [IRS withdrawn / entomology monitoring continues]), PMI will support entomology monitoring activities in Fana and one non-IRS comparison district (to be selected). Baseline (2016) data collection will be comprehensive in order to properly evaluate the impact of subsequent IRS rounds. In addition to the entomological indicators in Table 4, epidemiological data, from existing HMIS reporting system in the three IRS target districts, will be used by NGenIRS staff to address questions of impact and cost-effectiveness. The PMI M&E partner in country will work closely with the NGenIRS project staff to ensure the quality of the HMIS data from the monitoring sites.

In addition, PMI will continue to support routine entomological monitoring at the 13 sites as shown in Table 2 above.

**Table 4. IRS/entomology and epidemiology monitoring: indicators, methods, and frequency of vector collections**

<b>Indicator</b>	<b>Testing and collection methods</b>	<b>Frequency</b>
Species composition /seasonality	Morphological and molecular taxonomy of malaria vectors ( <i>Anopheles gambiae</i> s.l complex + other relevant species (e.g. <i>An. funestus</i> ) in IRS + comparison districts.  Collection: human landing capture (HLC), indoor resting collection, light traps, pyrethrum spray collections, larval collections. Analysis by standard molecular identification techniques.	Monthly until vector (dry season) abundance is too low to provide meaningful data.
Vector feeding time and location (in/out)	HLC with subsequent ELISA testing to estimate extent of outdoor transmission.	As above
Vector-insecticide susceptibility	CDC bottle assay, resistance intensity assessment for all approved (WHO) IRS insecticide classes + multiple pyrethroid insecticides  Collection: larval	As above
Mechanism of resistance	Molecular analysis for metabolic mechanisms (esterases; mono- oxygenases (P450s) and glutathione S-transferases) Physiological resistance: target site insensitivity/kdr allele Behavioral resistance: feeding pattern (in/out) as described above  Collection: larval	As above
Vector infectivity and blood meal source	ELISA (CSP and blood meal)	HLC
Malaria cases	Routine information system at health facility level (SLIS)	Monthly

*Proposed activities with FY 2017 funding: (\$329,000)*

- **Entomological monitoring:** Routine entomological monitoring activities in five sites (IRS and comparison sites), including density, behavior, longevity, infection rate, and blood meal origin. Insecticide resistance monitoring in 13 sites (inclusive of five routine monitoring sites). Support for the Division of Public Health within the MoH (DHPS) to participate in IRS / entomology monitoring activities, and coordination with NMCP. (*\$300,000*)

- **Two CDC TDYs:** Technical assistance from CDC entomologist for entomological monitoring supervision and support. (\$29,000)

## **b. Insecticide-treated nets**

### Progress since PMI was launched

In Mali, the MoH supports the provision of free ITNs distributed to target populations through two main delivery channels: mass distribution to households as part of universal coverage campaigns and routine distribution through antenatal care (ANC) and child immunization clinics. Mali defines achievement of universal coverage as one ITN for every two people. Since 2007, the MoH has provided free ITNs to children under five years of age via routine distributions and through a phased national universal coverage campaign for all vulnerable populations. To sustain coverage, the MoH provides free nets to pregnant women at their first ANC visit and to infants when they complete their national immunization series.

### Progress during the last 12-18 months

Traditionally Mali has had a strong culture of net ownership and use as shown by the 2013 “Culture of Net Use Survey”; both ownership of at least one net per household and the use of nets among vulnerable populations are even higher. According to the 2015 Malaria Indicators Survey (MIS) conducted during the peak transmission season, 93% of households owned at least one ITN; currently Mali has the highest level of ITN ownership of all the PMI focus countries. Seventy-one percent (71%) of children under five and 78% of pregnant women slept under an ITN the night before the survey. These findings suggest that Mali has not only maintained high net ownership since December 2007, but has increased coverage and use among vulnerable populations. Beginning in April 2011, following its adoption of universal coverage, Mali launched a rolling, phased campaign to achieve 100% ownership and 80% use of ITNs in the general population. The NMCP and partners opted for a phased approach to the campaign, starting with the region of Sikasso in 2011, and then covering the regions of Ségou, Mopti, Kayes, and Koulikoro between 2012 and 2014. In 2015, three regions were covered with nets by mass distribution campaigns: the district of Bamako in the first round and the regions of Sikasso and Ségou in second mass campaigns. The Ministry of Health announced a mass distribution campaign in the three regions of the north (Gao, Tombouctou, and Kidal) in 2016 where the security situation is improving, however the quantification of the number of ITNs required must be undertaken and distribution costs need to be budgeted. To date, more than 12 million ITNs were distributed through mass distribution campaigns in all the southern regions, including second rounds in Sikasso and Ségou where PMI contributed around 8.5 million ITNs.

During the last 12 to 18 months, PMI and the Global Fund jointly conducted the second round of the mass campaign in the region of Sikasso to replace nets distributed there in 2011. Around 1.7 million nets were procured in total, of which PMI contributed 900,000 and Global Fund 800,000 ITNs. PMI supported distribution costs for all 1.7 million nets. In Ségou Region, the Global Fund contributed 1.2 million of the 1.7 million ITNs distributed while PMI contributed 500,000 ITNs and funded the distribution costs.

During the last 12-18 months, PMI and the Global Fund have distributed 2,143,000 ITNs through ANC and immunization services of which PMI contributed 833,000 and the Global Fund contributed

1,060,000. The GoM also typically contributes between 200,000 and 300,000 nets for distribution through routine channels.

With FY 2015 funds, PMI procured 1.4 million nets that arrived in March 2016. These nets are intended for distribution to pregnant women and infants via routine channels in 2016/2017. However, depending on the MoH's request and availability of funding for distribution, a portion of these nets may be used to complete the universal coverage mass distribution campaign in the northern regions of Gao, Tombouctou, and Kidal. As per the approved concept note, the Global Fund will fully support the 2017 mass campaign in Kayes and Mopti, procuring and distributing 3.2 million ITNs to replace those distributed in 2013 and 2014, and procuring an additional 500,000 ITNs to contribute to the campaign planned for Koulikoro in 2018.

**Table 5. ITN Gap Analysis**

<b>Calendar Year</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Total targeted population <sup>1</sup>	18,341,245	18,874,286	19,553,760
<b>Continuous Distribution Needs<sup>2</sup></b>			
Channel #1: ANC <sup>3</sup>	917,062	420,000	450,000
Channel #2: EPI <sup>4</sup>	526,226	537,100	548,132
<i>Estimated Total Need for Continuous</i>	1,443,288	957,100	998,132
<b>Mass Distribution Needs</b>			
[2016/2017/2018] mass distribution campaigns	912,895	3,297,000	1,800,000
<i>Estimated Total Need for Campaigns</i>	912,895	3,297,000	1,800,000
<b>Total ITN Need: Routine and Campaign</b>	2,356,183	4,254,100	2,798,132
<b>Partner Contributions</b>			
ITNs carried over from previous year	1,038,626	1,295,338	1,691,238
ITNs from MoH	300,000	200,000	200,000
ITNs from Global Fund	912,895	3,200,000	500,000
ITNs planned with PMI funding	1,400,000	1,250,000	1,300,000
<b>Total ITNs Available</b>	<b>3,651,521</b>	<b>5,945,338</b>	<b>3,691,238</b>
<b>Total ITN Surplus (Gap)</b>	<b>1,295,338</b>	<b>1,691,238</b>	<b>893,106</b>

1. Population estimates are obtained based on the 2009 census with an estimated 3.6% population growth.

2. Routine nets are given at the first ANC visit for pregnant women and at EPI visits for infants receiving the first dose of the pentavalent measles-containing vaccine.

3. Estimates for ANC are based on population estimates for all women aged 15-49. Eligibility criteria were derived from the estimated proportion of pregnant women at any point in a given year (DHS 2013) and the proportion of pregnant women who attended at least one ANC visit during their pregnancy. For the purpose of this exercise, two ANC visit estimates were used: 75% based on the 2012/13 DHS and 78% based on current SNIS estimates. This exercise corrected for less rigorous estimations in the past and will result in more accurate procurements going forward.

4. Estimates for children receiving bed nets through EPI were based on the total population for children aged 0-4 years. The estimated number of children aged 9-12 months was derived based on the proportion of children in this age group described in the 2009 national census (~19.7%). The total number of children aged 9-12 months who received the first dose of measles-containing vaccine (MCV) via the EPI program was estimated based on

### Plans and justification

PMI will continue to support the nationwide routine distribution of ITNs through ANC and EPI services while the Global Fund will support the implementation of the phased rolling campaign in the five southern regions plus the capital city Bamako. As part of this campaign, PMI will conduct a bed net durability study following the recommendations of the PMI Vector Control Working Group. PMI will support routine SBCC activities to reinforce the correct and consistent use of ITNs throughout the year. Specific contributions will include support for messaging on correct hanging, use, and maintenance of nets, as well as information about how individuals' use of ITNs year-round contributes to local and national malaria control objectives (see SBCC section for full description and budget). SBCC activities will continue to support correct hanging, use, and maintenance of nets, as well as information about how individuals' use of ITNs year-round contributes to local and national malaria control objectives.

### Proposed activities with FY 2017 funding: (\$4,780,200)

- **ITN procurement:** PMI will procure approximately 1,300,000 ITNs to support the routine distribution to children under one year of age and pregnant women through routine services nationwide. The routine distribution channels, which represent 40% of the overall need in country, will be covered entirely through PMI's procurement plus a portion of the MoH procurement. The remaining nets will complement the nets procured by the Global Fund for the mass campaign in Koulikoro. (\$3,821,200)
- **ITN durability study:** PMI will support an ITN durability study as part of the mass campaign in 2018, following the recommendations of the PMI Vector Control Working Group. (\$150,000)
- **Distribution of ITNs:** PMI will support the distribution of free ITNs through routine ANC and immunization services at the CSCOM level for infants and pregnant women. PMI will also support steps to ensure that ITNs reach the targeted populations (ensure that health workers are distributing ITNs according to national guidance, verifying stocks, and comparing data for nets distributed versus physical stock). (\$809,000)

### **c. Indoor residual spraying**

#### Progress since PMI was launched

Since the launch of the IRS program in Mali, the program has evolved through different classes of insecticide to respond to the development of resistance. In 2008, the program began with a pyrethroid class insecticide in Bla and Koulikoro districts and later (2011) in Barouéli District. By 2012, resistance was evident causing a switch to a carbamate class insecticide in all target districts. Starting in 2014, resistance to carbamates was detected and the program began to switch to an organophosphate class insecticide. This shift necessitated a reduction in the program size from three districts to two in 2015.

In 2016, a long-lasting organophosphate class insecticide will be used for all target IRS districts. Mali has been confirmed as a country for the UNITAID-funded NGenIRS Project in 2016. This market intervention project includes a short term co-payment to accelerate price reductions for long-lasting IRS insecticides. The price reduction will enable Mali to expand from two districts (2015 level) to three districts (Barouéli, Koulikoro, and Fana) in 2016. The new district, Fana, was selected due to its proximity to the existing spray districts, and malaria burden. The goal will be to cover up to 242,684 eligible structures in Barouéli, Koulikoro, and Fana Districts (73,528; 66,927; and 79,314 respectively).

**Table 6: PMI-supported IRS activities 2014-2018**

Calendar Year	Number of Districts Sprayed	Insecticide Used	Number of Structures Sprayed	Coverage Rate	Population Protected
2014	3	carbamate organophosphate	61,234 166,889	98%	223,012 613,556
2015	2	organophosphate	133,527	98%	494,205
2016*	3	organophosphate	242,684*	98%*	778,884*
2017*	3	organophosphate	232,988	95%	778,884
2018*	3	organophosphate	232,988	95%	778,884

\*Represents targets based on the 2016 IRS work plan and future plans

#### Progress during the last 12-18 months

During the 2015 season, 582 people were trained in IRS implementation, and 133,527 structures were sprayed, achieving a 98% coverage rate. The Mali team continued to use innovative technologies to reduce costs and improve productivity. These included the use of ‘taxinis’ (modified motorbikes) to reduce transportation costs and an e-management system to keep accurate records of equipment and insecticides. To ensure communities were adequately sensitized prior to the campaign, PMI used radio broadcasts, community mobilizers, and informational materials to reach the targeted communities with key IRS-related information. In addition, PMI organized a workshop in 2015 with representatives from the NMCP, MoH, Ministry of Environment, and National Directorate for Sanitation and Pollution Control to continue building skills and knowledge among central-level personnel in the different IRS components (planning, environmental compliance, training, and implementation).

#### Plans and justification

With FY 2017 funds, PMI proposes the continuation of IRS (2018 campaign) in the three districts. PMI will procure organophosphate insecticides (or other appropriate insecticides if new products are available) through the NGenIRS subsidy for this spray season. Final decisions on IRS budget and coverage will be made in collaboration with the NMCP and the PMI Vector Control Team.

#### Proposed activities with FY 2017 funding: (\$5,000,000)

- **Indoor residual spraying operations:** Procurement of IRS equipment and insecticides, training, implementation of spray operations, data collection, protocols, guidelines, SBCC, logistics assessments, and technical assistance. (\$5,000,000)

## **2. Malaria in pregnancy**

#### NMCP/PMI objectives

Mali’s malaria in pregnancy (MIP) strategy is based on WHO’s three-pronged recommendations: Three doses of IPTp with SP, free distribution of ITNs during the first ANC visit and the promotion of their correct and consistent use, and effective case management of malarial illness. Current national guidelines (updated in 2014) and the National Strategic Plan call for 100% of pregnant women living in stable transmission zones to receive at least three doses of SP for IPTp at ANC services. IPTp should be given at every ANC visit starting at 13 weeks gestation and may be given up to delivery. In addition to

ITN distribution via ANC, the NMCP complements free ITN distribution via ANC with supplementary ITN distribution to mothers and children at immunization clinics and via mass distribution campaigns. ITN distribution channels are further supported by SBCC activities to encourage pregnant women, mothers, and other family members to access ANC and immunization clinics. SP for IPTp has been provided free of charge since 2006 (women still pay a small service fee for an ANC card), however financial barriers to access remain an issue in some rural districts. Mali has updated its guidelines for iron and folic acid supplementation. These guidelines require 0.4 mg or 400 µg (daily) and 60 mg of iron (daily). For treatment of a case of anemia, 120 mg of iron need to be given until recovery. Once these guidelines are printed they will be distributed to the districts.

For case management in pregnancy, the national policy is to use quinine in the first trimester and the first-line ACT (artemether-lumefantrine) (AL) in the second and third trimesters. Treatment of severe malaria follows the same protocols as with non-pregnant adults: injectable artesunate (preferred) and if not available, quinine. Details on PMI's support to the overall case management program, including drug procurement and supply chain management, are available in the case management section.

Integration and coordination between the NMCP and the MoH's Reproductive Health Division is a core component of PMI's contributions to USAID bilateral projects in the health sector. The NMCP and the Reproductive Health Division jointly support the dissemination and use of a revised in-service training module for focused antenatal care (FANC), which includes MIP and IPTp. A MIP working group co-chaired by the NMCP and the Reproductive Health Division meets regularly to coordinate activities among all stakeholders, including participation by PMI Resident Advisors and USAID Health Team staff.

The National Center for Information, Education, and Communication for Health (*Centre National d'Information Education et Communication pour la Santé* - CНИЕCS), which is tasked with creating SBCC materials and strategies, works with PMI-funded implementing partners to identify barriers to ANC access and IPTp delivery, and to develop relevant SBCC materials to address these barriers. In addition to community-based communications, CНИЕCS and PMI partners also work to develop SBCC tools and messages to improve healthcare providers' use of IPTp during ANC visits.

#### *Progress since PMI was launched*

IPTp coverage in Mali is closely linked to ANC utilization, which is aligned with WHO's recommendation that SP doses be directly observed by a healthcare worker. According to the 2015 MIS, the proportion of women who reported receiving two or more SP treatments during ANC was 38%. Utilization of ANC services by pregnant women has increased substantially since 2001. By 2012, approximately 74% of women attended ANC at least once during their most recent pregnancy, with 41% making 4+ visits. Urban women tend to access care more frequently than rural women. Two-thirds (67%) of urban women attend ANC four or more times during their pregnancies, as compared to 35% of rural women. Still, nearly a quarter of all pregnant women do not attend ANC at all (2012/13 DHS), and women who do attend ANC generally start seeking care later in their pregnancies (first ANC visit at 4.2 months on average). Health facilities collect and report data on ANC and post-natal visits quarterly through the national HMIS. These reports include information on the number of SP doses administered and ITNs distributed (data points captured on ANC visit cards). A new (PMI-supported) pharmaceutical stock management system (*OSP-Santé*) is also used to track SP availability, use, and expiries. The use of bed nets in general is very high in Mali. Data from the 2015 MIS indicate that 78% of women interviewed reported sleeping under an ITN the night before the survey – an increase from 73% reported in the 2012/13 DHS.



As noted above, PMI has supported in-service training and supervision of health providers, in collaboration with the Reproductive Health Division, NMCP, and Midwives Association to facilitate the implementation of the MIP guidelines. This training has been conducted alongside SBCC campaigns aimed at reminding healthcare workers to follow national IPTp guidelines. Targeted training of healthcare workers is informed by a PMI-supported assessment of barriers to IPTp uptake. Current training curricula are designed to address key barriers identified by the assessment, e.g., pervasive beliefs that SP cannot be taken on an empty stomach, or after the seventh or eighth month of pregnancy. Guidelines and policies have similarly been updated based on these findings. Technical training based on current IPTp recommendations has accelerated in recent years (most notably following the launch of a new PMI-funded service delivery implementing partner) to ensure that all new providers are trained, and that existing providers receive refresher training every two years. The addition of an IPTp3 variable in the DHIS2 system has contributed to improvements in routine program monitoring.

Other PMI-supported partners have promoted the provision of free ITNs to pregnant women at their first ANC visit; in practice, ITNs are often not given until the third or fourth month of pregnancy due to late initiation of ANC. As noted above, PMI has and continues to support a multi-channel SBCC strategy targeting pregnant women, women of childbearing age, and men. The SBCC campaigns (also described in the SBCC section) focus on women's knowledge and awareness of the risks of malaria during pregnancy, the importance of early and frequent ANC attendance and the associated demand for and use of at least three SP treatments for IPTp and ITNs.

#### *Progress during the last 12-18 months*

In the past, Mali had a history of SP stockouts, which negatively affected the program's ability to deliver services. Over the last 12-18 months, PMI and its supply chain partners have worked to ensure sufficient quantities of SP were ordered and delivered down to the CSCOM level in a timely manner (see details in the pharmaceutical management section). An end-use verification (EUV) survey conducted in February 2015 found health facility stockouts had declined from 85% in 2011 to 28%. In April 2016, national stock levels indicated a 5.5 month stock of SP available in Mali, with a projected increase to over 20 months of stock anticipated by July 2016. Supply chain issues will remain a concern for the coming years as PMI transitions from one supply chain technical assistance provider to another and as Mali's government takes over management of the *OSP-Santé* stock management system. Plans to continue strengthening pharmaceutical and data management are described in detail in the pharmaceutical management section of this MOP.

Progress this past year was slowed by the several bilateral projects coming to an end while the new projects had not yet been awarded. Nonetheless, a 'bridge' mechanism allowed some activities to continue and MIP was included in the basic training and service delivery package of activities. A PMI-commissioned study on the national policy documents highlighted several differences in MIP-related guidance between NMCP reference documents and those produced by the Reproductive Health Division. Acting on these findings, PMI and partners produced updated materials to harmonize the guidance documents and bring them in line with new WHO recommendations around IPTp. In addition, during the past year, PMI partners trained 376 health workers on FANC and MIP activities, including the revised IPTp guidelines. All health care workers receive refresher training and supportive supervision and exposure to SBCC materials as part of regular MoH policy.

**Table 7. Status of IPTp policy in Mali**

WHO policy updated to reflect 2012 guidance	2015
Status of training on updated IPTp policy	In process
Number of health care workers trained on new policy in the last year*	376
Are the revised guidelines available at the facility level?	Yes
ANC registers updated to capture three doses of IPTp-SP?	Yes
HMIS/DHIS2 updated to capture three doses of IPTp-SP?	Yes

\*This finalizes basic training on MIP for health care workers who had not previously been trained on the new MIP policy. Refresher training and supportive supervision continue for all health care workers as part of normal MoH policy

### Commodity gap analysis

PMI remains committed to supporting the procurement of an adequate stock of SP to achieve the NMCP's objective of 100% IPTp3 coverage for pregnant women. As noted in the gap analysis table (Table 8), PMI-supported SP procurements will be coordinated with Global Fund-financed SP procurements by the GoM. For FY 2017, the procurement calculations were adjusted to more accurately reflect the national need. The gap analysis was conducted using age-based population estimates to more effectively target women of childbearing age (15-49). This population was further adjusted to reflect the proportion of women who may become pregnant during a given year (according to the last DHS), and the proportion of women who reported having received one, two or three IPTp treatments in the 2015 MIS. Due to the more refined estimation methods, the number of SP treatments proposed for purchase for Mali is substantially lower than in previous years. Over the course of the coming year, the PMI country team will work closely with the NMCP and the PMI-supported pharmaceutical management implementing partner to ensure that the reduced number of treatments procured reflects actual consumption data.

**Table 8. SP Gap Analysis for Malaria in Pregnancy**

Calendar Year	2016	2017	2018
Total population	18,341,245	18,874,286	19,553,760
<b>SP Needs</b>			
Total number of pregnant women attending ANC	687,797	707,786	425,000*
<b>Total SP Need (in treatments)</b>	<b>2,063,390</b>	<b>2,123,357</b>	<b>1,000,000</b>
<b>Partner Contributions</b>			
SP carried over from previous year	0	168,032	189,761
SP from MoH	231,422	145,086	0
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding	2,000,000	2,000,000	810,239
<b>Total SP Available</b>	<b>2,231,422</b>	<b>2,313,118</b>	<b>1,000,000</b>
<b>Total SP Surplus (Gap)</b>	<b>168,032</b>	<b>189,761</b>	<b>0</b>

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\*Previous SP procurements and gap analyses have been based on population estimates that include all women, not just women of childbearing age. For this MOP, we have attempted to generate a more accurate estimate of the actual number of women who may be eligible for SP for IPTp during a given year. To this end we have applied the following assumptions: A) 51% of Mali's population is female (source: 2009 Malian census); B) 47.6% of the overall female population are women between the ages of 15-49 years (source: UN Population Division estimate); C) World Bank estimates the crude birth rate in Mali is 37 births per 1,000 population (total population, both sexes); D) National ANC estimates project 90% of pregnant women will receive at least one dose of IPTp-SP; 80% of women who received at least one dose will also receive a second dose, and; at least 70% of women who received at least two doses will also receive a third dose.

**NB: The country team will monitor actual ANC/IPTp-SP consumption data and match to these assumptions over the course of the next year. Reprogramming will be used if these rationalized estimates prove too low.**

### Plans and justification

PMI will continue to support the NMCP's MIP activities as the country's major supplier of SP for IPTp. Other continuing activities will include ongoing support for ITN procurement and distribution via ANC, as well as technical assistance to strengthen FANC services at the facility level. Linkages will be maintained between MIP and SBCC activities to continue raising awareness about IPTp and ITN use during pregnancy, as well as the importance of early and frequent use of ANC services. SBCC activities related to MIP will target healthcare workers and pregnant women with relevant messages. Supply chain and pharmaceutical activities will focus on stock management, prediction and forecasting to ensure the SP is always available and always distributed to pregnant women free of charge.

### Proposed activities with FY 2017 funding: (\$820,000)

- **SP procurement:** Procurement of 1,000,000 doses of SP for IPTp treatments. (\$120,000)
- **Strengthen focused antenatal care (FANC) and MIP services:** Strengthen services delivered to pregnant women during antenatal care visits in the USAID focus regions of Koulikoro, Sikasso, Bamako, and Kayes (Gao will also be covered if/as security allows). (\$450,000)
- **Provide FANC services in Mopti and Ségou:** Provide FANC and MIP services to women in the regions of Mopti and Ségou (non-USAID focus regions). Together with the above allocation, FANC and MIP strengthening will occur in regions covering >90% of Mali's population. (\$250,000)

## **3. Case management**

### **a. Diagnosis and treatment**

### NMCP/PMI objectives

Mali's case management policy is in line with WHO guidelines requiring that every malaria case should be laboratory confirmed before administering ACTs and that RDTs should be used to confirm the diagnosis where microscopy is not available. Microscopic diagnosis is performed in 4 national, 6 regional and 64 district hospitals at a cost ranging from \$0.75-\$5 per blood smear. In addition to hospitals providing microscopy, some privately operated CSCOMs staffed with physicians and/or laboratory technicians also perform malaria microscopy. However, most CSCOMs do not have the capacity to do microscopy and rely on RDTs for malaria diagnosis. The RDTs initially were free for children under five years of age and pregnant women and highly subsidized for other groups. However, following PMI-supported advocacy by the NMCP, the MoH signed a new policy in mid-2014 to make RDTs free for patients of all ages to encourage RDT use.

The National Institute of Public Health Research (*Institut National de Recherche en Santé Publique* [INRSP]) is responsible for quality control (QC) of all diagnostic services. With PMI funding, the institute has developed and finalized a quality assurance/quality control (QA/QC) plan for malaria microscopy and RDTs. Implementation of the plan was suspended after the military *coup* in March 2012, but restarted in 2015, with technical assistance from PMI.

In 2010, the MoH revised the national policy for the treatment of uncomplicated malaria to make artemether-lumefantrine (AL) the first-line drug and artesunate-amodiaquine (AS/AQ) as an alternative. As per national directive, ACTs are free to children under five years of age and pregnant women in the second and third trimester. Mali's malaria case management guidelines were recently updated to specify injectable artesunate as the first-line treatment for severe malaria, with intravenous quinine and injectable artemether as alternatives. Severe cases identified in the community are referred to the CSCOM, where they can receive appropriate treatment. In practice, health centers typically use whatever severe malaria medication is available in a severe malaria emergency. In addition, the People's Pharmacy of Mali (PPM) has a significant stock of injectable quinine, so a plan is in place to gradually draw down the stock of quinine, while simultaneously scaling up the availability and use of injectable artesunate through 2015 and 2016.

#### *Progress since PMI was launched*

Since 2008, PMI has contributed to the improvement of malaria diagnosis and clinical case management in Mali by providing support to local NGOs and partners to conduct a combination of various strengthening activities for health workers, laboratory technicians, and community health workers. These activities include trainings of trainers, refresher training courses and supervision of malaria microscopy and RDTs, adherence to test results when prescribing ACTs and improvement of care for patients with severe febrile disease.

The NMCP and MRTC initiated supervision of diagnosis and treatment for malaria cases in 2010 starting with Bamako and transitioning to other regions. These visits covered district referral health centers (CSREFs), where the team provided training of trainers to district health leads to provide supervisory support in their specific district. The team used supervisory tools developed in collaboration with NMCP, PMI, MRTC, and malaria partners to focus on the proportion of suspected malaria cases tested, adherence to malaria diagnostic test results, and improving case management of severe febrile disease. Malaria supervision guidelines were updated in February 2012 and include supervision of outpatient consultations at health facilities, antenatal consultations, and ASC visits.

Diagnostic confirmation of all suspected malaria cases has increased substantially in the last five years: routine data show that 18% of suspected malaria cases were tested by microscopy or RDT in 2010, increasing to 32% in 2011, 52% in 2012, and 80% in 2013. According to the 2014 annual NMCP report, health workers diagnostically tested 90% of suspected malaria cases prior to treatment.

Poor access to care due to geographic and economic constraints is a major challenge for malaria treatment in Mali. With approximately 1,246 CSCOMs in the country in 2015, about 90% of the population has geographic access to public health services according to WHO standards (living within 15 km of a first-line health facility) but only 57% live within 5 km of a health facility. All patients must pay consultation fees, however diagnosis by RDT is free for all as of 2014, and ACTs are free for children under five. Older patients must pay fees for malaria drugs, though these are subsidized. A health financing task force has been set up to examine issues related to user fees for primary care in Mali, a complex issue with a long history dating back to the Bamako Initiative in 1987 that set up

revolving drug funds at CSCOMs. An updated national health financing policy and strategy was adopted in February 2014, which outlines a strategy to increase the proportion of the population covered by insurance from 6% in 2011 to 45% in 2013, primarily through expanding *mutuelle* insurance for the informal sector.

To overcome geographic barriers to health services, the MoH adopted an integrated community case management (iCCM) package in February 2010 that includes treatment for malaria, diarrhea, pneumonia, and malnutrition; essential newborn care; and family planning. Free malaria treatment for children under five is provided by trained ASCs (though patients must pay a consultation fee) and includes malaria diagnosis with RDTs and treatment with ACTs, although diarrhea and pneumonia medications are not free. Severe cases are referred to CSCOMs which are equipped to provide appropriate treatment. ASCs receive refresher training every three months and supportive supervision on a regular basis. ASCs are paid a salary of approximately \$100 per month, with various donors currently supporting ASC salaries in different regions. One of the NMCP's major concerns is securing continued funding for ASC salaries. From 2016 – 2018, the Global Fund committed to paying approximately 60% (1,500 ASCs out of 2,337 currently trained) of the salary costs of the iCCM program through its agreement with the GoM. In addition, the GoM is also revising its community strategy (called 'SEC' locally), to reduce donor costs and to incorporate cost recovery into the program with a goal of sustainability over the long term. PMI and other USAID health funds (MCH, Nutrition/WASH, FP) will support the implementation of iCCM in all 20 districts of the regions of Kayes and Sikasso. The Global Fund, UNICEF, World Vision, and other partners will support iCCM activities in the regions of Koulikoro, Ségou, and Mopti, where an iCCM technical group coordinates all partners' interventions.

Mali currently has 2,337 trained ASCs who are functional in five of the eight regions of the country in the south, where more than 90% of the population lives. However, there is a need for additional ASCs and roughly 2,600 ASC posts are currently unfilled. According to the MoH minutes of the ASC review meeting which took place in Koulikoro in February 2016, where ASC malaria activities from 2015 were presented, ASCs provided diagnosis (with RDTs) and treatment for 165,168 malaria cases while health workers in the same six regions provided diagnosis and treatment for 992,426 malaria cases. This shows that 17% of all malaria cases in these six regions were diagnosed and treated by ASCs. The ASCs work in collaboration with volunteer *relais*, community members who assist in community mobilization and behavior change communication. An external evaluation completed in May 2014 found that iCCM was well integrated into the health system of Mali and effectively coordinated by partners, although utilization was still low, due in part to financial barriers and health worker attrition. PMI is working with other stakeholders to coordinate and expand iCCM/SEC activities. These activities are under discussion at a high level with the GoM to identify sustainable financing options for the program and negotiations with the Global Fund to cover a portion of the CHW salaries.

The total population of PMI's target regions for iCCM (Koulikoro, Sikasso, Bamako, and Kayes) in 2017 is projected to be 6,526,298, of which 2,055,493 will be children under five (the targeted group for iCCM). In 2017, PMI will contribute to the scale-up to cover all districts in USAID-targeted regions through the Mission's integrated program with financial support from other health programs including Maternal and Child Health, Family Planning, and Nutrition/Water, Sanitation, and Hygiene. However, due to security concerns, the three regions of the North are still not accessible.

In the 2013–2017 Malaria Strategic Plan, Mali introduced SMC (providing four rounds of SP and AS/AQ for children under five years of age) as a key malaria control intervention. SMC is implemented by the district health team, which distributes the medications at a fixed point (often near the CSCOM each month). Participation of the ASCs varies by district including conducting SBCC activities, and

going door-to-door to recruit families who do not come to the central distribution point. ASCs and health center teams receive refresher training at the start of each SMC season. Following a successful pilot of SMC in Koutiala District (in the Sikasso Region) by MSF in 2012, which showed a 42% reduction in malaria cases, the NMCP developed a plan to implement SMC in all districts of Mali, with scale-up dependent upon donor funds. In 2013, five of Mali's 64 districts were covered by SMC and this increased to 21 districts during the 2014 transmission season, including one supported by PMI. Due to a three-year grant awarded to CRS from UNITAID, SMC was implemented in at least 42 districts during the 2015 transmission season and in 2016 SMC will be implemented in all 64 districts including the north of Mali. PMI currently supports the implementation SMC in four districts in the regions of Kayes and Sikasso. To the existing PMI-supported districts, six new districts (to be selected in 2016) from the regions of Sikasso and Kayes will be added. SMC will be implemented in the iCCM districts and by 2017 all the districts will be covered with both interventions. The iCCM is implemented by the ASCs and SMC by both ASCs and community volunteers (*relais*). The same ASCs involved in the year-round iCCM implementation will handle SMC drug distribution during SMC implementation.

#### Progress during the last 12-18 months

A new implementing partner began in December 2014, and has contributed to the improvement of the quality of malaria diagnostics and clinical case management. The PMI partner is working in partnership with the *Institut National de Recherche en Santé Publique* (INRSP) to build and strengthen capacity of a cohort of staff with known competencies to train, supervise, and mentor laboratory technicians in accurate diagnosis of malaria. The primary goal is to have the cohort of INRSP staff support the NMCP to train, supervise, and mentor diagnostics experts in all regions, creating synergies with Global Fund interventions. With the widespread use of RDTs in both health facilities and the community, PMI continued support of training and supervision of health facility providers and ASCs on RDT use and interpretation. Additionally, plans are underway to reinvigorate Outreach Training and Support Supervision (OTSS), which is a quality assurance mechanism proven to be effective, to ensure that training directly contributes to improved quality of malaria diagnostics in the field.

With reprogrammed FY 2015 funding, PMI procured 3,000,000 RDTs for use at health facilities and for ASCs who test febrile children under five in the community. PMI supported 140 health workers to receive training in malaria diagnosis refresher training (MDRT) and outreach training and support supervision (OTSS). The most recent end-use verification (EUV) survey conducted at 79 facilities in five regions throughout Mali in August-September 2015 found that 96% of health workers were trained in RDTs and 88% of laboratory technicians had been trained in microscopy. At the time of the survey, 77% of health facilities had RDTs in stock. With the removal of fees for RDTs in 2014 for all age groups, the percent of malaria cases that are diagnostically confirmed has improved from 10% in 2008 to 87% in 2015 according to an NMCP report.

During the last 12–18 months, PMI procured 1.5 million AL for health facilities, iCCM, and pregnant women. Based on requests from the NMCP and estimates from the HMIS of 600,000 severe malaria cases per year, PMI procured 125,000 treatments of injectable artesunate. PMI has been supporting iCCM implementation, including initial and refresher trainings and regular supervision, in all districts of Kayes, Koulikoro, Sikasso, and Bamako Regions. In 2014 and 2015, PMI funded the implementation and evaluation of the effectiveness of SMC (which included coverage, adherence, cost implications, and impact on parasitemia, morbidity, and drug resistance) in the district of Kita in the Kayes Region, in approximately 100,000 eligible children ages 3–59 months. Preliminary results for year one are outlined in the operational research section. In 2016, PMI will support SMC in ten districts in the regions of Kayes, Koulikoro, and Sikasso.

During the 2015 transmission season, PMI supported a therapeutic efficacy study (TES) of first (AL) and second-line (AS/AQ) ACTs in the high malaria burden rural communes of Kolokani (region of Koulikoro) and Selingue (region of Sikasso). This study will be finished in 2016. Children six months to five years of age with uncomplicated *Plasmodium falciparum* malaria have been randomized to receive either treatment. A total of 120 children have been selected for each study arm. In addition to RDT confirmation and randomized ACT treatment, thick and thin blood smears will be prepared for each participant on days 0, 2, 3, 7, 14, 21, 28, 35, and 42 to assess asexual parasitemia and response to treatment. Parasite positive samples will be preserved on filter paper for subsequent genotyping to discriminate between new infection and recurrent parasites using molecular K13 markers at the Centers for Disease Control and Prevention.

#### Commodity gap analysis

All procurement activities, quantification and consumption data were reviewed to determine PMI's commodity contribution for FY 2016. As part of the MOP process, quantification data for FY 2017 were re-examined to address any immediate gaps. In 2015, the Global Fund procured RDTs of a different brand than currently used in Mali. To avoid the need for nationwide retraining, the NMCP and partners have agreed that Global Fund RDTs will be used to cover the needs for the Sikasso Region only, the most populated region of Mali. PMI will cover gaps in the rest of the country. To meet this challenge, PMI reprogrammed FY 2015 funds to procure an additional 1,000,000 RDTs.

There are no anticipated RDT gaps for FY 2017. PMI has committed to procuring all of the RDTs, while the Global Fund will contribute ITNs for the mass campaign in Mopti and Kayes. The Global Fund will also buy a limited quantity of ACTs. PMI will monitor donor contributions throughout the year, factoring in consumption data, and make any necessary adjustments to ensure commodity gaps are filled.

The gap analysis does not include quantification of drugs for severe malaria or SMC. The number of cases of severe malaria reported in the SLIS in 2015 was 686,017. However, these cases were not systematically confirmed with malaria diagnostics and likely represent an overestimate of the true number of cases of severe malaria.

**Table 9: RDT Gap Analysis**

<b>Calendar Year</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>RDT Needs</b>			
Total country population	18,341,245	18,874,286	19,553,760
Population at risk for malaria <sup>1</sup>	18,341,245	18,874,286	19,553,760
PMI-targeted at risk population	18,341,245	18,874,286	19,553,760
Total number projected fever cases <sup>2</sup>	11,362,234	11,692,448	12,123,331
Percent of fever cases confirmed with RDT	82%	82%	82%
<b>Total RDT Needs<sup>3</sup></b>	<b>3,138,880</b>	<b>3,570,669</b>	<b>4,378,677</b>
<b>Partner Contributions</b>			
RDTs carried over from previous year	366,926	1,228,046	657,377
RDTs from MoH	0	0	0
RDTs from Global Fund	0	0	0
RDTs from other donors/UNICEF	1,000,000	0	250,000
RDTs planned with PMI funding	3,000,000	3,000,000	3,500,000
<b>Total RDTs Available</b>	<b>4,366,926</b>	<b>4,228,046</b>	<b>4,407,377</b>
<b>Total RDT Surplus (Gap)<sup>4</sup></b>	<b>1,228,046</b>	<b>657,377</b>	<b>28,700</b>

<sup>1</sup>100% of the population is the target population at risk for malaria. <sup>2</sup>Total number of projected fever cases at the health facility and community level according to the number of fever cases per person, per year. These figures are derived from the March 2015 SIAPS quantification exercise. <sup>3</sup>Total RDT needs for health facilities and iCCM are based on gap analysis exercise led by NMCP for the development of the Global Fund concept note..

<sup>4</sup>Surplus will vary depending on usage in SMC sites. Procurements may be modified as actual usage figures are known.



**Table 10: ACT Gap Analysis**

Calendar Year	2016	2017	2018
<b>ACT Needs</b>			
Total country population	18,341,245	18,874,286	19,553,760
Population at risk for malaria <sup>1</sup>	18,341,245	18,874,286	19,553,760
PMI-targeted at risk population	18,341,245	18,874,286	19,553,760
Total projected number of malaria cases <sup>2</sup>	2,600,000	2,600,000	2,500,000
<b>Total ACT Needs<sup>3</sup></b>	<b>2,134,439</b>	<b>2,428,055</b>	<b>2,500,000</b>
<b>Partner Contributions</b>			
ACTs carried over from previous year	0	546,573	118,518
ACTs from Government	0	0	0
ACTs from Global Fund	1,181,012	500,000	0
ACTs from other donors	0	0	TBD
ACTs planned with PMI funding	1,500,000	1,500,000	2,300,000
<b>Total ACTs Available</b>	<b>2,681,012</b>	<b>2,546,573</b>	<b>2,418,518</b>

<sup>1</sup>100% of the population is the target population at risk for malaria. <sup>2</sup>Total projected number of malaria cases is estimated from 2014 routine malaria data as listed in the gap analysis exercise led by NMCP for the development of the Global Fund concept note. <sup>3</sup>Total ACT needs for health facilities and iCCM are based on gap analysis exercise led by NMCP for the development of the Global Fund concept note. Estimates are adjusted to account for population growth and 100% coverage. <sup>4</sup>Surplus will vary depending on usage in SMC sites. Procurements may be modified as actual usage figures are known.

#### Plans and justification

To support the NMCP and sustain the trend of increasing malaria diagnostic confirmation, PMI will procure, 3.5 million RDTs, complementing procurements from UNICEF and a smaller procurement from the World Bank (not shown) to fill the entire commodity gap in FY 2017. The RDTs will contribute to the needs at the health facility level and iCCM during the 2017-2018 calendar year periods. PMI also plans to procure 2.3 million treatments of ACTs to meet national needs. Other donors such as UNICEF and the World Bank have committed to procuring ACTs but the exact quantities are not known at this time.

It is important to note that USAID/Mali has identified four priority regions (Koulikoro, Sikasso, Bamako, Kayes) for interventions, however, the PMI program has a national scope so commodities purchased through PMI can be used in any region of Mali where there is need. PMI will also contribute

to the procurement of 3,200,000 treatments of SP-AQ co-blister to meet the needs of the SMC campaign to cover 800,000 children under five for four rounds in ten districts.

Mali is transitioning from using quinine to injectable artesunate for severe malaria. For 2017, there are estimated to be 2.6 million malaria cases, of which approximately 10% could become severe. Given the existing large supply of injectable artesunate currently at the central medical warehouse, and the concurrent use of existing injectable quinine until supplies are used up, PMI will cover roughly 6% of the national need and procure enough doses to cover 96,000 severe malaria cases. PMI will continue to provide support for refresher training and supervision on malaria case management at the health facility level, continuing support initiated with FY 2015 funds.

PMI will continue to support implementation of SMC in 10 districts in four focus regions, covering an estimated 800,000 children with four rounds of treatment with SP-AQ during the high-transmission season. PMI funding will cover the purchase of SMC drugs as well as implementation. Additional funding has been set aside in the M&E section for the expansion of resistance monitoring of SP. PMI will continue to support implementation of the full package of iCCM in the four focus regions of Koulikoro, Sikasso, Bamako, and Kayes.

PMI will continue to support the dissemination of SBCC messages related to the importance of early diagnosis and treatment (for the general public), as well as appropriate clinical case management for healthcare providers. SBCC targeting community health workers will focus on prompt identification of severe malaria and referral for appropriate treatment.

Proposed activities with FY 2017 funding: (\$9,430,000)

- **Procurement of RDTs:** PMI will procure 3,500,000 RDTs to contribute to the RDT needs at CSCOMs and to supply ASCs as part of the national iCCM strategy. *(\$1,850,000)*
- **Procurement of ACTs:** PMI will procure 2,000,000 treatments of AL for the public sector. *(\$2,000,000)*
- **Treatment for severe malaria:** PMI will procure 96,000 treatments of injectable artesunate for treatment of patients with severe malaria at CSREF (and selected CSCOM) levels. The estimated annual need is more than 700,000 cases, according to routine reporting, but this is likely a large overestimate given over-diagnosis of severe malaria in Mali. *(\$420,000)*
- **Procurement of SMC treatments:** PMI will support the cost of covering 800,000 children under five years of age with four rounds of SP-AQ co-blister for SMC. *(\$1,560,000)*
- **Implementation of SMC:** PMI will support the implementation of SMC in 10 districts. Implementation will include the costs of training, supervision, community mobilization, and distribution of drugs. *(\$1,700,000)*
- **Implementation of iCCM:** PMI will support iCCM implementation in the districts of Sikasso, Kayes, Koulikoro, and Bamako, while other donors, including UNICEF, the Global Fund, World Bank and the GoM will provide support for iCCM activities in the other target regions. PMI support for iCCM includes continued support to the malaria/fever component of the iCCM package, with new and refresher trainings at district levels, supportive supervision, training in appropriate RDT use, evaluating ASC performance with RDTs, monitoring and evaluation, and provision of ASC materials and supplies. PMI will support ASCs to provide appropriate health communications and SBCC messages to encourage understanding and adherence to current treatment algorithms. PMI will continue to support the NMCP to coordinate all community health implementing partners to ensure that community health materials (e.g., training modules, job aids, supervision protocols, and key messages) are reviewed and standardized across partners. *(\$600,000)*

- **Training and supervision for malaria case management in four regions:** After training health personnel at all levels in case management, PMI will continue to support the NMCP to conduct quarterly supervisory visits in order to maintain and strengthen the quality of services at multiple levels of the health delivery system. Particular emphasis will be placed on training and supervision for severe malaria case management. PMI will support improved and increased malaria diagnosis and case management in collaboration with the NMCP at national, regional, district, and community levels. This activity will focus on the four USAID priority regions (Koulikoro, Sikasso, Bamako, Kayes). (\$600,000)
- **Training and supervision for malaria case management in Mopti, Ségou, and Northern Region :** PMI will support training on diagnostics, case management for uncomplicated and severe malaria, and supervision on all aspects of case management in northern regions and two high burden areas not covered by USAID bilateral activities. (\$700,000)

#### **b. Pharmaceutical management**

The Mali supply chain system is a combination of push and pull as the central level pushes down to the regions, the community health center staff pulls health commodities from the district pharmacies, and ASCs obtain their health commodities from the community health centers (CSCOMs). Although the districts are responsible for collecting commodities from the regional level, PMI has asked PPM, with PMI support, to deliver directly to the districts for immediate supply at lower levels. The regions order monthly from the central level, whereas hospitals are on an automatic system of quarterly ordering. The district pharmacies purchase drugs from regional depots based upon monthly orders from health facilities (CSREFs and CSCOMs) and on the average number of drugs expected to be distributed within the district's catchment area. The PPM distributes malaria commodities per the distribution plan developed by the NMCP with the assistance of partners.

If a drug is unavailable in the regional PPM stores, private pharmaceutical warehouses can fill orders. Ideally, the CSCOMs keep at least one month of stock and the district drug depot (*dépôt répartiteur des cercles*) keeps a minimum of two months and maximum four months of stock. However, there are problems with drug storage at district depots related to storage capacity, temperature control, humidity, security, and drug classification in warehouses. While CSCOMs must collect all required drugs from the district pharmaceutical depots, there is no central funding to support the transportation and logistics at the lower levels and often the districts are stocked out or waiting for their request to be filled. The pull portion of the system still proves to be a hurdle, and commodities often do not reach the lowest levels of the health system. However, there have been noticeable improvements around following proper warehousing standard operating procedures and more timely distribution from the central level.

Although there is progress, some problems still hamper the Malian supply chain system and the ability to maintain adequate supply. Interaction among the different levels (national, region, district, and community) has improved, yet there is still a need for better data, forecasting and communication. There are still some gaps around donor coordination and communication, which impacts building a smooth flow of commodities. At the CSCOM level, there is limited funding to pay and capacity for transportation to pick up needed commodities, leading to stockouts, even when there is available stock in country. A new health commodity data platform (*OSP-Santé*) is bringing greater visibility and allows for data-based decision-making.

Finally, understanding the various effects of the Bamako Initiative such as potential disincentives around free commodities (pregnant women and children under five receive ACTs for free, now all populations receive free RDTs) needs to be further understood.

*Regulation and drug quality:* Several ministerial decrees provide guidelines for the management of pharmaceuticals in Mali. These include the formation of a national committee to oversee pharmacy retailers responsible for QC, inspection, and licensure and ensuring a basic package of pharmaceutical products. Adherence to standard operating procedures for pharmaceutical management is still a weakness, particularly at the lower levels of the health system. The National Essential Drug List is reviewed biannually. Laws are in place to ensure QC for imported drugs. The Directorate of Drugs and Pharmacies (*Direction de la Pharmacie et du Médicament* [DPM]) issues visas and imports licenses only after the exporter meets certification and other requirements. The National Health Laboratory (*Laboratoire National de la Santé* [LNS]) samples drugs, verifies quality, and has regulatory authority to monitor pre- and post-market quality of drugs and other products, including insecticides and bed nets. The LNS checks the quality of all commodities that arrive at the PPM. Expired or poor quality medicines are destroyed at the national level, however there is no adequate incinerator and medicines are still burned out in the open, but far from populations. The DPM, the National Health Laboratory, and customs officials meet quarterly to discuss regulations and importation or donation of medicines.

*Pharmacovigilance:* Pharmacovigilance remains a priority of the NMCP and the MoH. The Pharmacovigilance Department at the DPM continues to work to implement their action plan, and report adverse events however there are still challenges to enforcing the plan.

#### *NMCP/PMI objectives*

A main component of the National Malaria Strategy (2013-2017) is to reach universal coverage of key malaria commodities, which cannot be achieved without consistent access and availability of essential malaria commodities through a functioning supply chain system. The NMCP and PMI plan to increase the availability of malaria commodities through a strengthened supply chain system and improved understanding and implementation of logistics and pharmaceutical management tools.

#### *Progress since PMI was launched*

The People's Pharmacy of Mali (*Pharmacie Populaire du Mali* [PPM]) manages, procures, and distributes medicines for Mali's primary health care system. The PPM stores and distributes commodities procured by the GoM and key donors like PMI and the Global Fund. PPM delivers all commodities from the central level to the regional level, but lacks the capacity to ensure reliable transportation of commodities to the community level. The PPM has five regional warehouses in the regions of Kayes, Koulikoro, Sikasso, Ségou, and Mopti and three offices in Koutiala, Tombouctou, and Gao. Warehousing for the multitude of commodities is inadequate but plans are now underway to move to a new larger warehousing space to improve meeting the country's health commodity needs. The GoM has approved the land for the new warehouse construction and the PPM is organizing its stock to facilitate the transition to the new warehouse. This new modern warehouse has been supported by the USG, Global Fund, Netherlands Cooperation, and the GoM/PPM. In preparation for the move many warehousing operation procedure improvements have been implemented to support a smooth transition.

With USAID's support the PPM developed its first strategic plan (2015-2019), which has fed into the mentioned PPM relocation, improved operating procedures and a smoother functioning PPM. Despite a *coup* and disruptions in funding availability from the Global Fund the pharmaceutical management, logistics and quality assurance system has shown improvement since PMI began supporting Mali in 2008. Due to an agreement with the PPM and increased trainings and supervision, commodities now flow past the regional level. There are fewer stockouts as forecasting and distribution plans, logistics

management skills, and communications have improved. Availability and use of RDTs and SP for IPTp have also increased as new policy has rolled out. The national laboratory is able to test and report on the quality of malaria pharmaceuticals. Regular coordination meetings now occur among malaria partners regarding commodities and policies in order to make informed commodity and supply chain decisions.

#### *Progress during the last 12-18 months*

During the past year PMI continued to provide a significant portion of malaria commodities in concert with some Global Fund commodities (*please refer to quantities listed above in case management section*). PMI continues to support the PPM to improve distribution of malaria commodities to the district level. Due to a USAID-supported assessment of the PPM and development of a long term improvement plan, with the majority of activities supported by UNFPA, donors are now underway to ensure better warehousing at the central and regional level (racks, temperature control, classifying systems, cleanliness, training of staff, etc.). The national technical coordination committee continues to meet quarterly to make supply chain decisions. The last EUV survey conducted in March of 2015 highlighted progress but also some continued weaknesses in the supply chain system and pharmaceutical management capacity: stockouts as well as overstocks were noted, only 47% reported in a timely manner, and a need for refresher training in pharmaceutical management was evident. Only a maximum of 26% of facilities were properly stocked according to minimum/maximum guidelines, although 95% did have at least one presentation of AL. The EUV triggered additional technical support to reinforce supportive supervision, supply planning efforts, and commodity management. Previously an issue, distribution plans are now developed more efficiently between the PPM and NMCP resulting in smoother distribution of commodities once they are received and cleared through the PPM. Efforts to improve logistics reporting, commodity management, data analysis, and pharmaceutical management continues at the regional and district level through quarterly visits, supervision, and trainings. PMI and other USAID health elements supported an assessment of the private sector pharmacies in Mali to have a better understanding of the availability and use of ACTs and RDTs and develop recommendations for any potential interventions in the private sector. One recommendation included a request that the MoH provide ACTs and RDTs to the private sector.

Although data availability is improving, quality and analysis remain weak. While storage guidelines are available, they are still not regularly followed, and proper storage amenities or capacity is lacking at most levels. Distribution beyond the regional level is still a challenge due to limited support for transportation, limited data from the lower levels, and communication.

USAID supported the development of a national strategy, drafted 20 SOPs, conducted trainings to improve staff capacity and provided assistance towards meeting international laboratory standards. The national laboratory still faces challenges such as limited resources (even the ability to have enough reagents to do proper testing) and trained staff and particularly high staff turnover, currently one of the greater challenges. The national laboratory is making efforts to implement its national strategy but is struggling to meet basic demands. The GoM held a meeting on April 23, 2016 to address issues around health staff salaries and retention. The ability to find poor quality medicines is growing through the seven sentinel sites (Kayes, Koulikoro, Sikasso, Ségou, Mopti, Gao, and Bamako) and the work of the national laboratory. Through the sentinel sites there is evidence that poor quality medicines are spreading (mostly in the informal and public sector) in West Africa. This is raising concerns at the level of the DPM and LNS, but is difficult to address due to Mali's many borders and weak governance systems. In 2015, 643 samples were tested with 19 (3%) showing irregularities. The results from the sentinel sites are shared regularly with the relevant partners, departments, and authorities; however, the ability for concrete regulatory actions and enforcement is lacking or delayed when poor quality

medicines are found. Through support from PMI, the NMCP continues to participate in supervision visits and leads the quarterly malaria commodity quantification and forecasting meetings.

#### Plans and justification

PMI will continue to strengthen supply chain, logistics, and pharmaceutical management including forecasting, quantification, training, supervision, and monitoring stocks and malaria commodity needs/gaps. PMI will work with the NMCP, MoH, the PPM, and appropriate partners to finalize and implement the new strategic plans of the PPM and LBMA. Support to the PPM in delivering malaria drugs and commodities to the regional and district depots will continue. USAID will review the distribution needs and finalize warehouse improvement needs. PMI will continue to support the coordinating committee led by the DPM with the participation of the NMCP, PPM, and supply chain partners to improve the quantification and distribution of malaria commodities. PMI will also contribute to strengthening the LMIS system for better data availability and use for decision-making and improve warehousing at the district level. PMI will continue to support the MiniLab® (MQM) sites as part of a longer term strategy for drug quality assurance.

PMI will continue support to the national laboratory in concert with the DPM to implement drug quality assurance and develop strategies to retain staff and make more efficient use of limited resources. PMI will also be a key member and leader of the reinstated committee on counterfeit drugs and advocate for action on substandard and counterfeit medicines found as a result of post-marketing surveillance activities. PMI and its in-country partners will work to ensure that results from the surveillance work are communicated to the regulatory authorities in a timely fashion and PMI will work to support the investigation and response efforts of the DPM. In parallel, PMI will provide support to the Drug Regulatory Commission to strengthen the functionality of the DPM in addition to strengthening the National Commission Against Illicit Sales of Counterfeit Medicines.

#### Proposed activities with FY 2017 funding: (\$1,050,000)

- **Supply chain and logistics strengthening:** PMI will continue to provide technical assistance for pharmaceutical management, including forecasting commodity needs; and improved coordination between the NMCP, PPM, and relevant partners such as the Global Fund, through organizations such as the national medicines body. Pharmaceutical and supply chain strengthening activities will include training and supervision in pharmaceutical management, national guidelines, standard operating procedures, quantification and monitoring availability of key antimalarial commodities at the national, district, facility, and community levels. PMI will provide assistance to ensure commodity distribution to the district level, improve warehousing and potentially collaborate with the PPM on a community level distribution pilot. PMI will also continue to support two end-use verification exercises annually in order to track the availability of essential malaria commodities at the health facility level. (*\$1,050,000*)
- **Quality assurance and quality control of antimalarials:** Strengthen capacity in quality assurance and quality control of antimalarials via increased training at the National Laboratory of Health, support for the finalization, validation and implementation of the five-year strategic plan, repairing of equipment, and continued supervision of MQM sites. The Drug Regulatory Direction of the MoH will continue to receive support to improve the alert and response system around counterfeit and substandard medicines. (budgeted under HSS section)

#### **4. Health system strengthening and capacity building**

PMI supports a broad array of health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management and health information systems strengthening, drug quality monitoring, and NCMP capacity building.

##### *NMCP/PMI objectives*

The NMCP objectives for health system strengthening include expanding their ability to train and supervise providers in the field, improving the quality of information available to the NMCP for program management and reporting, and improving the physical working conditions at the NMCP office in Bamako.

##### *Progress since PMI was launched*

Through its partners, PMI has worked to strengthen the health surveillance system, the supply chain and pharmaceutical management system, and the capacity of the national laboratory. PMI and partners have also worked to improve the ability of health workers to manage and treat malaria at all levels with a particular focus at the community level. The coordination of malaria program activities across multiple partners has improved in the last few years as evidenced by the successful implementation and scale-up of the complex SMC intervention, improved warehousing and distribution procedures at the central medical store, improved laboratory capacity and improved data use.

PMI supported the evaluation of the HMIS at the national and community levels and continues to work with the HMIS Division of the MoH and other donors to scale up the new DHIS 2 platform. Since its launch in Mali, PMI is working with the MoH and partners to improve the coverage of health interventions through the development and implementation of new strategies including iCCM and SMC. Mali is now regularly using the USAID-developed health commodity dashboard to support evidence-based decision-making.

##### *Progress during the last 12-18 months*

During the past 12-18 months, PMI has been working on strengthening medicines quality monitoring (MQM) by focusing on improved laboratory management, medicines analysis, sampling and testing at the national laboratory, and reinforcing the alert process when counterfeit or substandard medicines are found. After some previous stalls, clear improvements have been made. Although some work was disrupted due to the political situation, including implementation of MQM in Tombouctou and Kidal, activities are currently underway in the southern part of the country. Current surveillance activities involve collecting samples from seven sentinel sites, two times per year, and rely entirely on local capacity with no external technical assistance. In 2016, 643 samples were tested as part of the surveillance work, the first year for which surveillance data has been available.

The national laboratory still faces challenges such as limited resources and trained staff, high staff turnover, and weak capacity in the quality assurance unit. Regulatory actions are lacking or delayed when poor quality medicines are found. Through support from PMI, the NMCP continues to participate in supervision visits and leads the quarterly malaria commodity quantification and forecasting meetings. PMI will also work with other funding organizations to help the laboratory achieve ISO accreditation. The current target for certification is 2018, with pre-certification milestones to be reached in the intervening years.

PMI supported the strengthening of the supply chain system and case management through continued training and supervision of staff and use of tools such as the EUV and the procurement planning and monitoring report for malaria (PPMRm).

PMI also further developed and validated a dashboard (*OSP-Santé*) to capture, track, aggregate, and disseminate information about malaria, family planning, and maternal and child health commodities to support evidence-based decision-making. Training of decision makers and data managers at national, regional, and district levels started in May 2015.

*Plans and justification*

PMI will focus on building technical and managerial capacity at all levels of the health care system, both through implementing partners and support to the NMCP. Most inputs in training, supervision, and operational support are described elsewhere in the MOP.

*Proposed activities with FY 2017 funding: (\$700,000)*

- **Quality assurance and quality control of antimalarials:** Strengthen capacity in quality assurance and quality control of antimalarials via increased training at the National Laboratory of Health, supporting the finalization, validation and implementation of the five-year strategic plan, repairs of equipment, and continued supervision of MQM sites including the training and fieldwork for the sample collection. The Drug Regulatory Direction of the MoH will receive support to develop a timely alert and response system around counterfeit and substandard medicines, including improved communications mechanisms, and links with law enforcement. (\$500,000)
- **NMCP capacity building:** Assist the NMCP for operations and strengthen functions. Assist NMCP's day-to-day operations and ability to work closely with PMI and implementing partners by funding travel for supervision visits, attendance at conferences, and participation in trainings. Also support ensuring functionality of the new NMCP office, now under construction, such as providing needed office equipment, internet connection, power generator, computers, and other office supplies. (\$200,000)



**Table 11: Health Systems Strengthening Activities**

<b>HSS Building Block</b>	<b>Technical Area</b>	<b>Description of Activity</b>
<b>Health Services</b>	Case Management	PMI will improve, through training supervision, QA/QC systems to monitor the quality of laboratory and diagnostic services.
<b>Health Workforce</b>	Health Systems Strengthening	PMI will strengthen knowledge and capacity of the health workforce in the areas of pharmaceutical management, laboratories and diagnostics, treatment, communications, and monitoring and evaluation through the various activities implemented by PMI and USAID partners. PMI will continue to support the functioning of the pharmaceutical coordination committee meetings, the MIP working group, and the national RBM meetings.
<b>Health Information</b>	Monitoring and Evaluation	PMI will strengthen disease surveillance systems to improve decision-making, planning, forecasting, and program management.
<b>Essential Medical Products, Vaccines, and Technologies</b>	Case Management	PMI will support improved forecasting, procurement, quality control, storage and distribution of malaria commodities, such as insecticide-treated nets, artemisinin-based combination therapies, and rapid diagnostic tests.
<b>Leadership and Governance</b>	Health Systems Strengthening	PMI will build NMCP technical and managerial capacity through training and technical assistance, as well through supervision and support from implementing partners. PMI will also provide support, through the NMCP and partners, to strengthen coordination of malaria interventions, pharmaceutical regulation, development of guidelines and policies, and improve quality of services.

## 5. Social and behavior change communication

### NMCP/PMI objectives

PMI supports the development, dissemination, and practical implementation of Mali’s national SBCC strategy (published with PMI support in 2015). The current strategy, which expires in 2018, focuses on expanding public and healthcare provider awareness of key malaria control interventions, with a specific focus on IPTp and ITN use for pregnant women, SMC for children aged 0-59 months, early diagnosis and treatment, year-round ITN use, and quality control for diagnostics. The strategy is divided into five communication approaches: interpersonal/counseling, community mobilization, media outlets, advocacy, and social mobilization. Different channels such as radio and television, brochures/pamphlets, job aids, skits/songs and “champions” to promote desired behaviors, skills, and practices. Donor-supported SBCC activities are coordinated (with PMI support) by the NMCP and the National Center for Information, Education, and Communication for Health. Looking ahead to the implementation

period for this FY 2017 MOP, PMI's implementing partner will begin to prepare the groundwork for a revised national strategy in addition to continuing to support routine SBCC activities. Other donors with whom PMI will continue to collaborate on SBCC issues include the Global Fund's principal recipient (PSI), the World Bank, and UNICEF.

#### Progress since PMI was launched

Thanks to successful advocacy, there is now a malaria-specific line item in the GoM's health budget. PMI partners developed subcontracts with different radio stations and teachers' training centers, and have trained more than 7,500 youth ambassadors against malaria. A policy dialogue tool on malaria, pregnancy, and Islam, developed with PMI support, has been used with the Islamic Network for Child Survival, the Islamic Network for Population Development, and the National Union of Muslim Women. The tool is based on passages from the Koran that encourage dialogue among couples about malaria and pregnancy. Through advocacy efforts, PMI supported the development of messages on malaria-specific topics to be used by imams during Friday prayers.

In addition to the *relais*, PMI has supported the introduction of *Agents de Santé Communautaires* (Community Health Workers), a trained and paid cadre of health care workers, throughout the country. Networks of traditional healers have also been set up and supported for the detection and early referral of severe malaria cases to the health facilities. PMI SBCC efforts have contributed to maintaining high ITN use among the population, increasing IPTp use (at least two doses) from 4% in 2006 to 38% in 2015, and increasing RDT use from 47% in 2012 to >90% in 2015. It remains important to note that more advocacy work is needed to increase the proportion of women who receive three or more doses of SP for IPTp. According to the 2015 MIS, only 18% of women who had received at least two doses returned to receive a third or fourth dose.

#### Progress during the last 12-18 months

PMI supports SBCC activities in five regions (Koulikoro, Kayes, Bamako, Sikasso, and Gao). These five regions represent approximately 78% of Mali's national population. All SBCC activities are implemented through an integrated USAID health promotion mechanism. SBCC activities have focused on four primary technical areas: Malaria in Pregnancy, malaria case management, SMC, and operational research. Specific SBCC activities have focused on promoting the distribution and use of ITN (especially among pregnant women); expanding demand for and use of SP for IPTp; mobilizing families to enroll children aged 0-59 months in SMC, and strengthening health care providers' capacity to diagnose malaria and correctly prescribe treatments. Additional assistance is provided at the national level to support the development and revision of national guidelines and policies, and to support the coordination and harmonization of SBCC activities by various donors and implementing partners.

Over the last 12-18 months, PMI support has contributed to the development of SMC job aids for healthcare workers, parents and supply chain managers and SMC training for nearly 5,000 healthcare workers at various levels (e.g., clinicians, community health workers, logisticians, community mobilizers). Seventy health care workers also received SBCC-focused training on mobilizing community demand for malaria testing and quality control for rapid diagnostic tests. Three hundred and seventy-six healthcare workers at 148 facilities received SBCC-linked training and supervision on the rationale for and delivery of MIP services; additional trainings were held for traditional healers to promote early diagnosis and treatment for suspected malaria cases. Mass media campaigns were supported across a range of malaria-related issues, from basic malaria awareness to specific announcements about SMC. Mass media interventions included education and training for journalists (46 trained in two workshops); the development of a memorandum of understanding with a large consortium of public radio stations, and the development, testing, and broadcast of public service announcements for radio and television (e.g., 2,547 radio spots were broadcast to promote the 2015

SMC campaign). At the national level, PMI's implementing partner also provided direct technical assistance to the NMCP's SBCC team. This included support for routine operations (e.g., revision and dissemination of national guidelines) and specialized assistance to expose NMCP staff to international SBCC meetings (e.g., NMCP staff attended the October 2015 RBM Communications Community of Practice (CCoP) meeting in Uganda).

#### Plans and justification

PMI's SBCC strategy in Mali will continue to focus on the promotion of SP for IPTp, correct and consistent ITN use by pregnant women and children under five, SMC for children 0-59 months, and the importance of rapid diagnosis (by RDT) and treatment (with ACT). The integrated approach to SBCC with other health interventions will continue, with messages tailored to specific issues and audiences (e.g., pregnant women or caregivers of children less than five years old). Proven approaches (e.g., job aids and supportive supervision) and channels (e.g., radio) will continue to anchor PMI-supported SBCC activities. SBCC activities will be closely linked with access to services activities in specific technical areas (e.g., MIP, SMC, ITNs). Lastly, PMI will continue to support and participate in World Malaria Day activities.

#### Proposed activities with FY 2017 funding: (\$300,000)

The following activities will be continued with FY 2017 funding:

- **SBCC for ITNs:** Support for routine SBCC activities will continue to reinforce the correct and consistent use of ITNs throughout the year. These activities will contribute to addressing reduced ITN use during low transmission seasons. Specific contributions will include support for messaging on correct hanging, use, and maintenance of nets, as well as information about how individuals' use of ITNs year-round contributes to local and national malaria control objectives. Messages will continue to be disseminated via a variety of validated channels, including door-to-door messages disseminated by ASCs and *relais* in their communities, radio, professional job aids, and community theater. PMI will also maintain support for SBCC activities before, during and after rolling ITN distribution campaigns to increase the use of newly distributed nets by all age groups. (\$100,000)
- **SBCC for MIP:** PMI will continue to support a multichannel strategy targeting pregnant women, women of child bearing age, and men, to increase the uptake of three or more doses of SP for IPTp, one at each ANC visit after the first trimester. Additional SBCC interventions will focus on raising awareness among women about the risks of malaria during pregnancy, the importance of early and frequent ANC attendance, the benefits of three or more doses of IPTp at every ANC visit, and the role of ITNs in the prevention of malaria. Other SBCC messages will focus on ensuring that healthcare workers understand the importance of completing the recommended course of SP for IPTp (including direct observation of each dose), and do not charge pregnant women for ITNs or SP for IPTp (both of which are free under the national policy). Demand creation activities will also be continued to increase ANC attendance and other health-seeking behaviors. PMI will continue to link SBCC activities with other health sector messaging, where appropriate. (\$100,000)
- **SBCC for case management:** PMI will continue to support the dissemination of SBCC messages related to the importance of early diagnosis and treatment (for the general public), as well as appropriate clinical case management for healthcare providers. Mass media and interpersonal communication, and community mobilization strategies will be applied as appropriate. Community health workers (ASCs and *relais*) will also continue to receive capacity-building support to educate caregivers on signs of severe malaria that require prompt referral. (\$100,000)

At the national level (funds will be drawn for this activity from all three technical areas broken out above), PMI will support the revision of the national SBCC strategic plan, which expires in 2018. PMI will also continue to support the NMCP to coordinate SBCC activities and ensure harmonization of activities by all external and domestic stakeholders.

## **6. Surveillance, monitoring, and evaluation**

### NMCP/PMI objectives

Monitoring and evaluation is a key component of Mali's national malaria strategy, and the NMCP is focused on ensuring there is a coordinated plan for malaria data capture to inform programmatic interventions and measure outcomes and impact. A national malaria M&E plan covering the years 2007-2011 was developed, costed, and adopted in 2008, and an updated M&E plan for 2013-2017 was later put into place. The current plan includes routine data collection and analysis through the national health information system, or SLIS; a system for epidemic surveillance and response (ESR) in the North, and periodic national surveys to evaluate malaria prevention and treatment activities. PMI supports the NMCP's M&E strategy through its continued support for routine system strengthening, ESR, cross-sectional surveys, and internal M&E capacity building. While the general strategy itself has not changed, with the recent political events there is an increased emphasis on improving epidemic surveillance in the northern regions of the country and improving the quality and timeliness of routine data across the country.

The NMCP's Planning and Statistical Unit oversees all M&E activities, in close collaboration with health training and research institutions. Within the NMCP, the Division of Planning and Monitoring & Evaluation is tasked with developing operational plans and monitoring and evaluating program implementation. A second NMCP unit, the Division of Epidemiological Surveillance and Research, is in charge of promoting research on malaria, establishing an early warning system to detect and respond to malaria epidemics, and supporting operational units in epidemic response.

### Progress since PMI was launched

*Routine System Strengthening:* Mali's M&E system relies on malaria data collected routinely through the SLIS, but the quality of these data is variable and feedback is not delivered in a timely manner to assist program planning and management. SLIS data are compiled every three months and reported annually. These data theoretically included both confirmed and unconfirmed cases, but diagnostics were not systematically implemented. In the last few years, Mali has made a concerted effort to roll out RDTs and to capture diagnosis in the routine reporting system, with strong results. The 2015 data from the SLIS shows that, on average, 90% of suspected malaria cases are tested in Mali, and 72% are confirmed to be malaria. The NMCP hopes to increase the health system's capacity to collect, analyze, report, and use these data for programmatic decision-making.

PMI has supported enhancements to the malaria portion of the routine information system for several years to increase the timeliness and quality of the malaria component of the SLIS. These enhancements included revisions to the reporting forms for the malaria sections, conducting training and supervisory activities, improving the technology infrastructure, and implementing an SMS reporting system in selected districts. The system started in 2011 with Ségou and Bamako Districts (Commune 1V), expanded to the Mopti District in 2013 (26 CSCOMs/1 CSREF) and to the rest of Mopti Region in 2014 (142 CSCOMs/CSREFs). A mobile data transmission system (using SMS) was implemented in selected districts. The system allows the NMCP to have access, via a website, to monthly data on epidemiologic indicators for each of the implementation districts covering around 6 million people. In FY 2015, the

system was expanded to PMI IRS and SMC sites. PMI has also supported NMCP staff to participate in regional workshops on the monitoring and evaluation of malaria programs.

*Household surveys:* Population-based surveys currently provide the most accurate data on malaria intervention coverage and malaria biomarkers (i.e., anemia and parasitemia). Following a DHS in 2006, a national anemia and parasitemia (A&P) survey conducted with PMI support in 2010 during the peak transmission period (September-October) provided the first parasitemia measures in Mali (see below for national estimates of anemia and parasitemia). A DHS including parasitemia biomarkers was conducted in 2012, and a health facility survey, which provided data on the quality of malaria case management and antenatal care, was also conducted in the high transmission season in 2012. The 2012-2013 DHS showed greatly increased levels of coverage for key interventions, and a corresponding decline in child mortality rates. However, the survey results for biomarkers of malaria continued to be high as well. Results reflect high transmission season estimates and showed that 52% of children 6-59 months of age were parasitemic by microscopy. These high levels of parasitemia were likely due in part to the population displacements during the 2012 crisis, when large numbers of people from the low-transmission areas of the North migrated to the endemic regions of the South. An MIS was conducted in 2015 confirms that prevalence of malaria has decreased substantially in the intervening years showing that 36% of children under five were parasitemic (data shown in Strategy section, under *Progress on coverage/impact indicators to date*).

#### *Progress during the last 12-18 months*

PMI supported the expansion of the enhanced routine reporting system since 2011. This activity has included the establishment of a national steering committee to guide the development and roll out of the project. In each district targeted for enhancement, the site is equipped with necessary technology (computer, SMS, or paper-based) and the district and health facility teams are trained on data quality, reporting, and information use. District teams are also trained on M&E supervisory procedures. To date, 18 of the 63 health districts in Mali are covered, representing 18 CSREFs and 378 CSCOMs. Of the CSCOMs, 193 are using the pilot SMS data transmission system (42 CSCOMs in Ségou and 161 in Mopti; all CSCOMs in the Mopti Region have being SMS since 2014). Using FY 2015 funds, the system is expanding to two additional districts focused on PMI's IRS and SMC sites (two districts for IRS and ten districts for SMC). A quality assessment of this enhanced reporting system conducted in 2014 showed that 95% of targeted facilities reported each month, and facilities using tally sheets decreased their compilation time from 15 hours to 4 hours per month. PMI also provides support to the NMCP for quarterly malaria data reviews and reporting. In addition, the USAID Mission and other donors are investing in the development of a DHIS2 system for the HMIS, addressing needs that were identified in a large national assessment in 2015. As this activity has been rolling out, PMI and its partners have been working with the DHIS2 implementers to ensure that the malaria indicators are fully captured in the new system and that the SMS data transfer is compatible with the DHIS2 system. The full DHIS2 rollout is expected to be completed by the end of 2016, after which the parallel malaria reporting system will be phased out. PMI will continue to support routine data collection through the DHIS2 through funding for training, supervision, and quality control activities. PMI will also continue to support the expansion of the SMS-based data transmission activities.

Mali began a new round of therapeutic efficacy surveillance in late 2015. This study will look at *in vivo* efficacy of the first- and second-line malaria medications (AL and ASAQ). Data collection is ongoing as of this writing, and a full report will be available in August 2016.

Mali also completed an impact evaluation of its malaria program from 2000-2012 during this past year. The results of the impact evaluation show that increasingly high levels of coverage of key malaria interventions corresponded with a decline in all-cause child mortality during the same period. Most of the improvements in other child health interventions during this time period were fairly inconsequential with the exception of improvements in ORS. Similarly, climatic factors such as rainfall actually favored an increase in malaria transmission. The report concluded that improvements in malaria control over the time period likely significantly contributed to the observed decline in child mortality.

The table below shows the main sources of data and sequence of surveys for malaria program monitoring and impact evaluations.

**Table 12. Surveillance, Monitoring, and Evaluation Data Sources**

Data Source	Survey Activities	Year								
		2010	2011	2012	2013	2014	2015	2016	2017	2018
Household surveys	Demographic Health Survey (DHS)			X						X
	Malaria Indicator Survey (MIS)						X			
	MICS*	X								
	Anemia & Parasitemia Survey	X								
Health facility and other surveys	Health Facility Survey			X						
	EUV survey			X	X	X	X	X	X	X
Malaria surveillance and routine system support	Epidemic malaria surveillance system in Northern Mali					X	X	X	X	X
	Enhanced malaria reporting system	X	X	X	X	X	X	X	X	X
	Support to HMIS						X	X	X	X
Therapeutic efficacy monitoring	<i>In vivo</i> efficacy testing of first/second line drugs						X		X	
	SP efficacy							X		
Entomology	Entomological surveillance and resistance monitoring	X	X	X	X	X	X	X	X	X
IRS & IPTp	RTI IRS Coverage Survey/ Barriers to IPTp Study		X							
ITNs	Culture of Net Use Study			X						
SMC	Evaluation of SMC pilot					X	X			
Other data sources	Malaria Impact Evaluation							X		

\*Not funded by PMI

**Table 13. Routine Surveillance Indicators (SLIS 2015)**

Indicators	Value	Comments
<b>1. Total number of reported malaria cases</b>	2,371,881	
<b>Total diagnostically confirmed cases</b>	2,369,245	
<b>Total clinical/presumed/unconfirmed cases</b>	2,636	This variable appears to be underreported
Outpatient number of reported malaria cases	NA	
Diagnostically confirmed	NA	
Clinical/presumed/unconfirmed	NA	
Inpatient number of reported malaria cases	NA	
Diagnostically confirmed	NA	
Clinical/presumed/unconfirmed	NA	
<b>2. Total number of reported malaria deaths</b>	1,978	Total reported deaths (all causes) = 3,192
Diagnostically confirmed	1,978	
Clinical/presumed/unconfirmed	0	
<b>3. Malaria test positivity rate (outpatients)</b>		
Numerator: Number of outpatient confirmed malaria cases	NA	Difficult to extract this information from the HMIS report
Denominator: Number of outpatients receiving a diagnostic test for malaria (RDT or microscopy)	NA	Difficult to extract this information from the HMIS report
<b>4. Completeness of monthly health facility reporting</b>		
Numerator: Number of monthly reports received from health facilities	Not yet available	PMI/Mali team will obtain this information once final HMIS report is available
Denominator: Number of health facility reports expected (i.e., number of facilities expected to report multiplied by the number of months considered)	Not yet available	PMI/Mali team will obtain this information once final HMIS report is available



### Plans and justification

Following democratic elections in Mali, the PMI program has rapidly regained ground that was lost during the crisis. Monitoring and evaluation activities play an integral role in responding to established PMI needs for program monitoring and impact assessment. The major focus of M&E activities with FY 2017 funding will be the integration of the enhanced routine information system into the scale up of the DHIS2 system. The new DHIS2 will provide timely and accurate data for the NMCP to monitor trends in epidemiologic indicators. The routine system strengthening activity will also expand the use of SMS for more timely and accurate reporting of data. This activity will also include support to the NMCP for an annual report on malaria data.

With SP now being used nationally for IPTp and for SMC in more than 50% of the country, WHO recommends including vigilant resistance monitoring in targeted sites. Mali has not routinely conducted resistance monitoring for SP previously and there are concerns that such widespread use of the drug through two different interventions might create pressure for resistance. PMI will support resistance monitoring in four sites with significant overlap of IPTp and SMC programming, using a standard protocol developed by WHO and CDC.

PMI Mali will support entomological and epidemiological monitoring of vector control interventions in with FY 2017 funding. These include the enhanced surveillance to monitor the IRS campaigns, including the new district of Fana under the NGenIRS project and the bednet durability monitoring in conjunction with the 2018 mass campaign. Details on these activities are described in the vector control section of the MOP.

In 2018, Mali is planning a DHS survey. The initial planning and survey design activities to ensure that malaria indicators and issues are incorporated into the larger survey effort were supported with FY 2016 funding. While no additional funding is included at this time, PMI will work with other USAID programs and outside partners to advocate for a fully funded survey. PMI will provide technical guidance on the malaria components of the DHS survey implementation.

### Proposed activities with FY 2017 funding: (\$821,000)

- **Resistance monitoring for SP:** Support for SP resistance monitoring in four sites. (\$100,000)
- **Routine system strengthening:** Support for improvements in the M&E system at the CSCOM and CSREF levels in Mali to improve malaria data quality and use. This activity will support training and quality control/timeliness for completion of routine SLIS reporting forms, assist in analysis and feedback on malaria indicators and promote use of findings at all levels to improve program performance. This activity will continue to support the mobile data transfer system (SMS) in USAID-targeted regions to facilitate timely malaria surveillance. This activity will also support efforts to integrate the malaria reporting system, including the SMS reporting, in the DHIS2 system as it develops. (\$721,000)

## 7. Operational research

**Table 14. PMI-funded Operational Research Studies**

<b>Completed OR Studies</b>			
<b>Title</b>	<b>Start date</b>	<b>End date</b>	<b>Budget</b>
A mixed-methods evaluation of the expanded program on immunization contact method as both a monitoring tool and intervention for malaria control and prevention in Mali.	10/2008	10/2009	\$185,000
Development of a pilot dry season vector control strategy in Mali.	06/2009	06/2010	\$80,000
Integrated vector management: Interaction of larval control and IRS on <i>Anopheles gambiae</i> density and vectorial capacity for human malaria.	06/2009	12/2010	\$110,000
The financial implications of removing user fees for malaria treatment for under-five children in Mali.	09/2010	06/2011	\$150,000
Evaluation of seasonal malaria chemoprevention (SMC) pilot in Kita District, Mali.	07/2014	04/2016	\$314,000
<b>Ongoing OR Studies</b>			
<b>Title</b>	<b>Start date</b>	<b>End date</b>	<b>Budget</b>
A field study comparing the impact of new ‘combination’ long-lasting insecticidal (mosquito) net products on entomological measures of malaria transmission: Olyset Plus® and PermaNet 3.0® versus their conventional ITN analogues: Olyset® and PermaNet 2.0®.	06/2013	12/2016	\$433,000
<b>Planned OR Studies FY 2016</b>			
<b>Title</b>	<b>Start date (est.)</b>	<b>End date (est.)</b>	<b>Budget</b>
Increasing IPTp uptake through enhanced antenatal clinic service delivery to improve maternal and child health.	7/2016	7/2018	\$400,000

### NMCP/PMI objectives

The NMCP and PMI share a common goal of conducting operational research to answer specific questions regarding the implementation and effectiveness of critical interventions. The OR studies proposed for support by PMI are identified jointly and designed to respond to key information needs in the NMCP’s National Strategic Plan.

### Progress since PMI was launched

Since the launch of PMI in Mali in 2008, multiple studies have been conducted in Mali that have helped inform malaria control and prevention activities. In October 2008, a mixed-method evaluation was conducted to: (1) evaluate the validity of the expanded program on immunization (EPI) contact method as a tool for monitoring bed net usage and treatment of common childhood illnesses by comparing data collected using the EPI contact method to that collected during baseline and follow-up representative cross-sectional household surveys; and (2) evaluate the effectiveness of the EPI contact method as an intervention to improve bed net use and the appropriate treatment of common childhood illnesses. One

intervention district (EPI-contact method) and one comparison district were selected in the Ségou Region, and both qualitative (key informant interviews, exit interviews, and focus groups) and quantitative methods (baseline and follow-up surveys) were used. The primary outcome measures were determinants of ITN use and appropriate treatment of fever in children. Results showed that the EPI contact method did not produce consistent measures of ITN utilization on a monthly basis. Health workers felt the EPI contact method lengthened the waiting time for vaccination. Observations and focus groups identified poor ITN durability as a concern and mothers' impressions that ITNs last approximately six months<sup>2</sup>. Results of the validity comparison of the EPI contact method and household survey data showed that the EPI contact method did not produce reliable estimates of health behaviors<sup>3</sup>.

From 2009 to 2010, a study was conducted to develop a dry season malaria vector control strategy in the Sudan savannah areas of Mali. A pre-test/post-test design was implemented to assess the impact of the IRS performed in eight Niger River bank hamlets on malaria transmission parameters of two larger villages located at 2-3 kilometers from the river. Monthly entomological monitoring through the rainy season was conducted following the IRS campaign to measure entomological indicators of malaria transmission. Results from 2009 showed some reductions in *Anopheles* densities per house in two of the three IRS river hamlets (Dangassa-Somonosso and Bozokin) but little difference in a third (Fourda). Similarly, *Anopheles* biting rates were reduced in Dangassa-Somonosso but not in the other two IRS river hamlets. No reductions in *Anopheles* densities or biting rates were seen in inland villages. Results in 2010 were more positive but also mixed. The IRS-treated hamlets showed significant reductions in resting densities, biting rates, and EIRs during the first three months; clearly demonstrating the effectiveness of IRS. After three months however, mosquito densities, biting rates, and EIRs quickly returned to pre-intervention levels. Cone assays performed on sprayed walls showed that ICON 10 CS (lambda-cyhalothrin) lasted only 3-4 months before activity fell well below 80% mortality thresholds; the different microclimates and interior household characteristics may explain results that diverge from the IRS districts where lambda-cyhalothrin remained active for 6 - 8 months. In addition, resistance to pyrethroids was detected at high levels in the study area (only 50 and 56% mortality in WHO assays for permethrin and lambda-cyhalothrin, respectively).

Another vector control intervention was conducted in 2009 to determine the added benefit of larviciding water sources surrounding houses that received IRS compared to houses that received only IRS. Larval control, mosquito densities, sporozoite rates, and entomological inoculation rates were assessed before and after the intervention in 2-3 villages in each arm (IRS only and IRS+larviciding) in 2009 and 2010. In both years, there was a highly significant reduction in larval breeding activity in the villages with larviciding compared to IRS only villages; in 2009 entomological measurements varied widely by location so overall there was no difference seen between intervention arms; however, in 2010 significant differences were seen in resting densities, biting rates, sporozoite rates, and EIRs between intervention arms. Investigators concluded that some benefit was seen with larviciding combined with IRS compared to IRS alone.

A USAID centrally-funded study was conducted to estimate the financial implications of removing malaria user fees (consultation, laboratory diagnosis, drugs) for children under five in primary care level/private nonprofit facilities (CSCOM) and first level public facilities (CSREF) in Mali and on third party payers. Facility and patient exit surveys, in-depth interviews, and a costing model were conducted in 40 health facilities. There was consensus among providers and stakeholders that the removal of fees

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<sup>2</sup> Wei SC, Vanden Eng JL, Patterson AE, *et. al.* 2012. Effect of the expanded program on immunization contact method of data collection on health behaviors in Mali. *JID*, 205: S103-11.

<sup>3</sup> Wei SC, Vanden Eng JL, Patterson AE, *et. al.* 2012. Validity of expanded program on immunization contact method health behavior estimates in Mali. *JID*, 205: S112-19.

was important to increase access to care, especially among the poor and the majority rural population, and decrease infant mortality. However, several concerns/challenges included potential substantial financial losses to facilities, increase in demand for services and abusive increase in utilization, which risk overcrowding health facilities, decreased quality of care, and the absence of a coherent framework that identifies real costs and proper financing mechanisms and sources. There were also strong practical objections to the removal of only malaria user fees such as being a non-feasible option, and a desire to remove all under-five user fees. According to the costing model, total estimated losses to primary care and first level reference health facilities in Mali ranged between 0.34 billion CFA and 0.45 billion CFA (approximately \$0.72 million and \$0.95 million), depending on utilization changes. Total estimated costs to a third party range between 1.1 billion CFA and 1.6 billion CFA (approximately \$2.33 million and \$3.4 million). The higher figures equal 2.4% of the Ministry of Health's 2009 approved budget.

#### Progress during the last 12-18 months

During the last 12-18 months, two OR studies have made significant progress:

*Combination ITNs:* The field study examining the effects of new 'combination' ITN products on entomological measures of malaria transmission and ITN integrity began in June 2013. Vector populations from candidate study villages were screened to confirm the presence of elevated mixed function oxidases (the resistance mechanism targeted by the 'combination' nets). Starting in October 2013, monthly vector collections were conducted to establish baselines. ITNs were distributed in February–March of 2014 and data collection is ongoing (see Other relevant evidence on progress, Vector Control).

*SMC:* The baseline survey to measure prevalence of anemia and parasitemia in children ages 3-59 months in the intervention (SMC) and comparison districts was conducted July 23 – August 2, 2014. Prevalence of fever and parasitemia were similar in intervention (23.4%) and control (29.5%) districts prior to SMC ( $p=0.34$ ). After SMC, parasitemia prevalence fell to 18% in the intervention district and increased to 46% in the control district (Difference-in-differences (DD) OR=0.35; 95% CI: 0.20-0.60). SMC also significantly reduced the odds of malaria disease (DD OR=0.20; 95% CI: 0.04-0.94) and moderate anemia ( $Hb < 8$  g/dL) (DD OR=0.26, 95% CI: 0.11-0.65). Rounds 1 – 4 of SMC adherence surveys were completed in November 2014. Preliminary results showed that the proportion of children who received SMC drugs at least on day one, dropped from 82% in Round 1 to 68% in Round 4. The proportion of children who received SMC drugs on days two and three at home remained high (>90%) between rounds one to four. This study continued for a second year in late 2015. The final report will be released in June 2016.

*IPTp:* Despite ongoing PMI support of malaria in pregnancy activities, IPTp uptake has been low. Utilization of ANC services is moderate, but the 2012-2013 DHS reported the proportion of women who received two or more doses of IPTp during their last pregnancy at 20%, well below the PMI targets for IPTp. The NMCP is committed to the new WHO policy on providing pregnant women with a minimum of three doses of IPTp. Preparedness for national level implementation is underway, however in order to effectively implement this new policy the barriers identified in empirical studies in the country must be addressed. These multi-faceted barriers suggest a significant missed opportunity to deliver effective ANC services and IPTp. Given the logistical, practical, and financial challenges together with the context of Mali just emerging from a profound socio-political crisis, sound evidence is needed to provide the best opportunity for the successful implementation of the new IPTp policy. Specifically, PMI will test an enhanced intervention package which combines intensive training (including simulated ANC consultations) and job aids, with regular and specific supervision to improve provider behaviors around IPTp dispensing. This enhanced package will be tested on its own, and with a program of community mobilization, and compared against districts receiving routine ANC activities.

Reprogrammed FY 2015 and FY 2016 funds will be requested to support two years of data collection, data analysis, and report writing for this MIP OR study. To date, the concept note has been approved by the OR committee and a final protocol is being drafted. Implementation will begin in July 2016.

#### Plans and justification

Mali is currently one of two countries (together with Senegal) where PMI is actively supporting SMC interventions. In both countries, the SMC program has shown great success, contributing to major declines in incidence and prevalence of malaria in children under five. However, examination of the routine surveillance has shown that cases of malaria continue to be a major issue in children aged 5-10 years old. Senegal has had some success extending their program to age 10 however the body of evidence for the feasibility, cost-effectiveness, and impact of adding these additional age groups is very limited. The GoM is interested in this extension as a way of tackling the persistently high parasitemia rates in the country. However, the PMI team feels such an extension merits an OR pilot before making final decisions on national policy. Such a study will also add to the global body of evidence around effective implementation of SMC in the Sahel.

#### Proposed activities with FY 2017 funding: (\$244,800)

- **Evaluation of the value-added of extending SMC to age 10:** PMI will support a study to examine the added value, including cost implications, of extending SMC interventions to children up to age 10. (\$244,800)

#### **8. Staffing and administration**

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Mali, one representing CDC and one representing USAID. In addition, one or more Foreign Service Nationals (FSNs) work as part of the PMI team. All PMI staff members are part of a single interagency team led by the USAID Mission Director or his/her designee in country. The PMI team shares responsibility for development and implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for RA positions (whether initial hires or replacements) will be evaluated and/or interviewed jointly by USAID and CDC, and both agencies will be involved in hiring decisions, with the final decision made by the individual agency.

The PMI interagency professional staff work together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

The PMI lead in country is the USAID Mission Director. The day-to-day lead for PMI is delegated to the USAID Health Office Director and thus the two PMI RAs, one from USAID and one from CDC, report to the USAID Health Office Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta and Washington complements PMI programmatic efforts.

The two PMI RAs are physically based within the USAID health office but are expected to spend approximately half of their time with and providing TA to the NMCPs and implementing partners, including time in the field monitoring program implementation and impact.

The number of locally-hired staff and necessary qualifications to successfully support PMI activities either in Ministries or in USAID will be approved by the USAID Mission Director. 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, in addition to the U.S. Global Malaria Coordinator.

Proposed activities with FY 2017 funding: (\$1,525,000)

- CDC technical and administrative support (\$625,000)
- USAID technical and administrative support (\$900,000)

**Table 1: Budget Breakdown by Mechanism****President's Malaria Initiative – Mali  
Planned Obligation for FY 2017**

<b>Mechanism</b>	<b>Geographic Area</b>	<b>Activity</b>	<b>Budget (\$)</b>	<b>%</b>
GHSC-PSM	National	Commodity procurement	\$10,551,200	42%
SSGI	National	Service delivery	\$3,550,000	14%
TBD-IRS Partner	3 districts	IRS activities	\$5,300,000	21%
CDC-IAA	National	CDC Resident Advisor and technical assistance	\$683,000	3%
TBD-Supply chain partner	National	Supply chain strengthening	\$1,050,000	4%
TBD-Case management partner	National	Case management technical assistance	\$950,000	4%
TBD	National	Net durability monitoring, operational research	\$394,800	2%
USP/PQM	National	Laboratory quality assurance/quality control	\$600,000	2%
KJK (SBCC bilateral)	4 provinces	SBCC activities	\$300,000	1%
Measure Evaluation	National	M&E activities	\$721,000	3%
USAID	National	Staffing and administration	\$900,000	4%
<b>Total</b>			<b>\$25,000,000</b>	<b>100%</b>

**Table 2: Budget Breakdown by Activity**

**President's Malaria Initiative – Mali  
Planned Obligation for FY 2017**

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total \$	Commodity \$		
<b>PREVENTIVE ACTIVITIES</b>					
<b>VECTOR MONITORING AND CONTROL</b>					
<b>Entomologic monitoring and insecticide resistance management</b>					
Entomological monitoring	TBD-IRS partner	300,000	0	13 sites	Conduct annual entomological monitoring. Support the NMCP entomologist in conducting IRS-related entomological monitoring. Support to DHPS to participate in the monitoring of IRS operations, purchasing of entomological supplies, training of spray operators and to provide coordination with NMCP on district IRS operations. Mapping insecticide resistance and mosquito biting behavior nationwide.
CDC entomological TDY	CDC-IAA	29,000	0	Nationwide	Technical assistance from CDC entomologist for entomological monitoring activities and analysis.



<b>Subtotal Ento monitoring</b>		<b>329,000</b>	0		
<b>Insecticide-treated Nets</b>					
Procurement of ITNs	GHSC-PSM	3,821,200	3,821,200	Nationwide	Procure up to 1.3 million ITNs
Distribution of ITNs	GHSC-PSM	809,000	0	Nationwide	
Net durability monitoring with 2018 campaign	TBD	150,000	0	Nationwide	Net durability monitoring as per PMI requirements
<b>Subtotal ITNs</b>		<b>4,780,200</b>	3,821,200		
<b>Indoor Residual Spraying</b>					
Indoor residual spraying	TBD-IRS partner	5,000,000	1,856,000	3 districts (Fana, Koulikoro, and Barouéli)	Procure IRS equipment (insecticide, sprayers, etc.), training, implementation, data collection, protocols, guidelines, SBCC, logistic assessment, technical assistance for spraying/entomological assessment (CDC IAA).
<b>Subtotal IRS</b>		<b>5,000,000</b>	1,856,000		
<b>SUBTOTAL VECTOR MONITORING AND CONTROL</b>		<b>10,109,200</b>	5,677,200		
<b>Malaria in Pregnancy</b>					
Procurement of SP	GHSC-PSM	120,000	120,000	Nationwide	Procure 1 million treatments of SP.
Strengthen FANC and MIP services	SSGI	450,000	0	4 regions (Koulikoro, Sikasso, Bamako, Kayes, Gao when security allows)	Continue to strengthen use of FANC and MIP services according to previous assessment and in coordination with the Reproductive Health Program and Midwives Association.
Strengthen FANC and MIP services	TBD-Case management partner	250,000	0	2 regions (Mopti and Ségou)	Support strengthening MIP services in Mopti and Ségou in order to increase coverage.

<b>Subtotal Malaria in Pregnancy</b>		<b>820,000</b>	120,000		
<b>SUBTOTAL PREVENTIVE</b>		<b>10,929,200</b>	5,797,200		
<b>CASE MANAGEMENT</b>					
<b>Diagnosis and Treatment</b>					
Procurement of RDTs	GHSC-PSM	1,850,000	1,850,000	Nationwide	Procure 3,500,000 RDTs
Procurement of ACTs	GHSC-PSM	2,000,000	2,000,000	Nationwide	Procure approximately 2,000,000 ACTs (AL)
Procurement of injectable artesunate for treatment of severe malaria	GHSC-PSM	420,000	420,000	Nationwide	
Procurement of medications for SMC	GHSC-PSM	1,560,000	1,560,000	10 districts in the 4 USAID focus regions (Koulikoro, Sikasso, Bamako, Kayes)	Cover approximately 800,000 children < 5 years with four rounds of SP-AQ co-blister for SMC. Assumes cost of \$0.49 per treatment per child (x 4 rounds).
Implementation of SMC (training, supervision, distribution)	SSGI	1,700,000	0	10 districts in the 4 USAID focus regions	Implementation of SMC in 4 USAID focus regions
Implementation of iCCM	SSGI	600,000	0	4 USAID focus regions (Koulikoro, Sikasso, Bamako, Kayes)	Implementation of iCCM in the 4 USAID focus regions

Training and supervision for case management	SSGI	600,000	0	4 USAID focus regions (Koulikoro, Sikasso, Bamako, Kayes)	Implementation of iCCM in the 4 USAID focus regions
Training and supervision for case management	TBD-Case management partner	700,000	0	Mopti and Ségou Regions and Northern regions as possible	Training includes diagnostics, case management for simple and severe malaria, and supervision on all aspects of case management in Mopti and Ségou Regions, which are not covered under the 4 USAID regions.
<b>Subtotal Diagnosis and Treatment</b>		<b>9,430,000</b>	5,830,000		
<b>Pharmaceutical Management</b>					
Supply chain strengthening	TBD-Supply chain partner	1,050,000	0	Nationwide	Strengthen pharmaceutical management and the supply chain system at national, district, and community levels. Emphasizing continued improved quantification, forecasting, and distribution. Conduct at least two end-use verification surveys, tracking commodities down to community level and case management practices with an emphasis on follow-up of findings.
<b>Subtotal Pharmaceutical Management</b>		<b>1,050,000</b>	0		
<b>SUBTOTAL CASE MANAGEMENT</b>		<b>10,480,000</b>	5,830,000		
<b>HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING</b>					

Strengthen national laboratory capacity (LNS)	USP/PQM	500,000	0	Nationwide	Strengthen national laboratory. Strengthen quality assurance and quality control of antimalarials.
Support day-to-day operations of NMCP	SSGI	200,000	0	Nationwide	Assist NMCP's day-to-day operations and ability to work closely with PMI and implementing partners.
<b>SUBTOTAL HSS &amp; CAPACITY BUILDING</b>		<b>700,000</b>	0		
<b>SOCIAL AND BEHAVIOR CHANGE COMMUNICATION</b>					
SBCC for ITNs	KJK Project (BCC bilateral)	100,000	0	Nationwide	Continued support to SBCC activities to correct hanging, use, and maintenance of nets, as well as information about how individuals' use of ITNs year-round contributes to local and national malaria control objectives. Support for the revision of national BCC plan.
SBCC for MIP	KJK Project (BCC bilateral)	100,000	0	Nationwide	Continue to promote SP IPTp uptake and MIP targeting pregnant women. Continuing focus on second and third ANC visits. Support to the revision of the national SBCC plan.

SBCC for case management	KJK Project (BCC bilateral)	100,000	0	Nationwide	Continued support of messages and communications approaches for case management; implement through relais, train on referral systems at the community level with a focus on early care-seeking behaviors. Support the National Center for Information, Education, and Communication for Health (CНИЕCS) capacity to develop and implement communications approaches and messaging for case management. Support to the revision of the national SBCC plan.
<b>SUBTOTAL SBCC</b>		<b>300,000</b>	0		
<b>SURVEILLANCE, MONITORING, AND EVALUATION</b>					
SP resistance monitoring for SMC sites	USP/PQM (MRTC)	100,000	0	4 sites	Resistance monitoring for SP in the context of SMC expansion as per WHO recommendations
Routine systems strengthening	MEASURE Evaluation	721,000	0	Nationwide	Support implementation and extension of DHIS2 and finalize integration of <i>OSP-Santé</i> into DHIS2. Support to other PMI M&E requests.
<b>SUBTOTAL SM&amp;E</b>		<b>821,000</b>	0		
<b>OPERATIONAL RESEARCH</b>					
Transmission reduction effects of SMC	TBD	244,800	0		

<b>SUBTOTAL OR</b>		<b>244,800</b>	0		
<b>IN-COUNTRY STAFFING AND ADMINISTRATION</b>					
CDC	CDC-IAA	625,000	0		Support for CDC PMI Resident Advisor (1) with salary, benefits and relocation support
USAID	USAID	900,000	0		Support for USAID PMI staff (1 PSC/1 FSN) with salaries, benefits, contribution to salaries and benefits of Mission support staff, IT support costs, office space, vehicles, other Mission program support costs, local costs for CDC PMI Resident Advisor.
<b>SUBTOTAL IN-COUNTRY STAFFING</b>		<b>1,525,000</b>	0		
<b>GRAND TOTAL</b>		<b>25,000,000</b>	<b>11,627,200</b>		