

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

BENIN

Malaria Operational Plan FY 2017

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ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ASTMH	American Society of Tropical Medicine and Hygiene
ANC	Antenatal care
ARM3	Accelerating the Reduction of Malaria Morbidity and Mortality
AS/AQ	Artesunate-amodiaquine
CAME	<i>Central d'Achats des Médicaments Essentiels et des Consommables Médicaux</i> (Central Medical Stores)
CDC	Centers for Disease Control and Prevention
CHW	Community health worker
CREC	<i>Centre de Recherche Entomologique de Cotonou</i> (Entomological Research Center of Cotonou)
DDS	Departmental Health Service, Ministry of Health
DHS	Demographic and Health Survey
DPMED	<i>Direction des Pharmacies, des Médicaments et Explorations Diagnostiques</i> (National Directorate of Pharmacies, Medicines, and Diagnostics)
DSME	<i>Direction de la Santé de la Mère et de l'Enfant</i> (National Directorate for Maternal and Child Health)
EPI	Expanded program on immunization
ETAT	Emergency triage assessment and treatment
EUV	End-use verification survey
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOB	Government of Benin
HMIS	Health management information system
HSS	Health systems strengthening
iCCM	Integrated community case management
IMCI	Integrated management of childhood illness
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LEADD	Leadership and Development
LMIS	Logistics management and information system
LMU	Logistics Management Unit
M&E	Monitoring and evaluation
MICS	Multi-Indicator Cluster Survey
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MOH	Ministry of Health
MOP	Malaria Operational Plan
NGenIRS	Next Generation Indoor Residual Spraying Project
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NSP	National Strategic Plan

OP	Organophosphate
OR	Operational research
OTSS	Outreach training and supportive supervision
PBF	Performance-based financing
PCV	Peace Corps Volunteer
PMI	President's Malaria Initiative
RAMU	<i>Régime d'Assurance Maladie Universelle</i> (Universal health insurance coverage scheme)
RBM	Roll Back Malaria
RD	Resistance to damage
RDT	Rapid diagnostic test
RMIS	Routine malaria information system
SBCC	Social and behavior change communication
SIAPS	System for Improved Pharmaceutical Services
SOP	Standard operating procedures
SP	Sulfadoxine-pyrimethamine
SSFFC	Sub-standard, spurious, falsified, falsely-labeled, and counterfeit drugs
SM&E	Surveillance, monitoring, and evaluation
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USP PQM	United States Pharmacopeia Pharmaceutical Quality Management
USG	United States Government
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme
ZS	<i>Zone sanitaire</i> (health zone)

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 the World Health Organization's (WHO) 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.

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

This FY 2017 Malaria Operational Plan presents a detailed implementation plan for Benin, 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) grants. This document briefly reviews the current status of malaria control policies and interventions in Benin, 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 Benin is \$16.5 million. PMI will support the following intervention areas with these funds:

Entomologic monitoring and insecticide resistance management:

Entomologic monitoring informs the issue of insecticide resistance management, and plays a key role in Benin's national malaria control strategy. Indoor residual spraying (IRS) and insecticide-treated mosquito net (ITN) interventions are both informed by vector-insecticide resistance data, which are

currently collected at 13 sites across Benin. The decision to conduct IRS with organophosphate-class insecticide was based on existing vector-insecticide resistance profile data, i.e., resistance to pyrethroid and carbamate-class insecticides

PMI supports entomological monitoring and evaluation based on the following indicators: vector density, taxonomy, parity, biting behavior (indoor/outdoor), infection rate, and vector-insecticide resistance testing to support selection of IRS insecticide. The *Centre de Recherche Entomologique de Cotonou* (CREC), the program partner for entomologic monitoring and evaluation, remains well positioned to support entomologic monitoring for PMI as well as for NGenIRS activities.

The IRS roadmap document (developed with PMI support) that describes a strategy for ongoing entomology/IRS monitoring and evaluation was approved by the Ministry of Health (MOH) in 2016. All proposed PMI-supported entomologic monitoring activities are currently aligned with the roadmap.

Insecticide-treated nets (ITNs):

The NMCP's revised Strategic Plan (2014-2018) promotes the provision of ITNs through two main delivery channels: universal coverage campaigns every three years and routine service delivery. PMI contributed 680,000 ITNs to the 2014 universal ITN campaign and 800,000 ITNs to routine distribution for antenatal care (ANC) and the expanded program on immunization (EPI) services in public health facilities in 2015. Using FY 2017 resources, PMI will procure and distribute 750,000 ITNs to health facilities for routine distribution to pregnant women and children under five years of age. PMI continues to support ITN durability-related monitoring, following national ITN distributions. Results to date suggest the distributed ITNs following the 2014 campaign remained functional (based on standard coverage and fabric integrity indicators) for two years, rather than three years. Currently, Benin is one of three PMI focus countries that have been approved to conduct village-scale randomized cluster comparisons of six new ITN products using a resistance to damage (RD) score approach developed by WHO. The MOP also includes funding to support NMCP's school-based distribution activity.

Indoor residual spraying (IRS):

With PMI support, the MOH/NMCP convened an IRS roadmap conference in October 2015 to debate the future of IRS. The conference report, approved in early 2016, calls for rotation of IRS from its current target communes in Atacora Department, to six high malaria-burden communes in Donga and Alibori Departments. PMI is proposing to support IRS in the new communes beginning in 2017.

The 2016 IRS campaign carried out April-May in Atacora Department sprayed approximately 268,828 structures protecting 856,989 persons. NMCP led supervisory activities for IRS operations in three communes, thereby expanding its capacity to manage and lead the IRS campaign. Prior to a pending post-spray data quality assessment, preliminary results suggest a 91% coverage rate.

Based on entomological surveillance data, resistance profiles have been used to support decisions about which insecticides to use for IRS. IRS initially (2008-2013) relied on carbamate-class insecticides (pyrethroid-class insecticides were never considered due to earlier evidence of resistance and related concerns that it could compromise the impact of the ITN intervention). However, the short residual effect of the carbamate insecticide prompted a switch to a third class of IRS insecticide, organophosphates, in 2014.

FY 2017 MOP funding will support IRS in six communes located in the departments of Alibori and Donga, as recommended in the IRS roadmap document. The entomology monitoring and evaluation

partner will receive additional budget support to conduct comprehensive surveillance to document the insecticide resistance management benefit attributed to IRS with organophosphate insecticides.

Malaria in pregnancy (MIP):

The national guidelines for intermittent preventive treatment for pregnant women (IPTp) are aligned with the WHO standards of monthly sulfadoxine-pyrimethamine (SP) treatment beginning early in the second trimester of pregnancy up until delivery. Since 2007, PMI procured more than 8 million treatments of SP and trained over 1,900 health workers in order to enhance the provision of effective MIP services in public and private health facilities in Benin. While IPTp coverage is gaining ground with an increase in pregnant women receiving two or more doses from 23% in the 2011-2012 Demographic and Health Survey (DHS) to 48% in the 2015 Malaria Indicator Survey (MIS), it remains short of the PMI and NMCP targets of 85% and 100% respectively. IPTp3 or more was 12% in the 2014 Multiple Indicator Cluster Survey (MICS) and 19% in the 2015 MIS. During the last 12-18 months, PMI has disseminated updated guidelines and trained regional trainers who are positioned to roll-out training of maternity staff nationwide. With FY 2017 resources, PMI will target efforts to low coverage areas to accelerate IPTp coverage, reinforce social behavior change messaging to improve the demand for IPTp services, and improve service delivery performance among health workers in the public and private sectors as well as reporting tools to capture IPTp2 and IPTp3 services provided.

Case management:

The national case management guidelines recommend universal diagnostic testing for malaria by all health workers, and mandate free rapid diagnostic tests and treatment by public providers and community health workers (CHWs) for children under five years of age and pregnant women. Recently the NMCP updated the national case management guidelines to align with the WHO recommendation for IPTp treatments and the treatment of severe malaria with injectable artesunate and injectable artemether. PMI continues to support a comprehensive diagnostics and treatment program that involves the training of health workers and laboratory technicians, the implementation of a quality control and quality assurance system, strengthening supervision to ensure that health workers follow clinical practice guidelines, and provision of diagnostic and treatment commodities such as rapid diagnostic tests (RDTs) and artemisinin-based combination therapies (ACTs). PMI also supported the evaluation and the institutionalization of emergency triage assessment and treatment (ETAT) strategy to improve severe malaria case management among children under five years of age and facilitated the registration of private clinics and health providers. Training of CHWs nationwide on RDTs and ACT use as part of integrated community case management (iCCM) was recently completed.

To maintain this progress, PMI will continue to procure malaria commodities such as SP, RDTs, and ACTs and will scale up access for private sector health care providers to these commodities. PMI will also reinforce the training, supervision, and strengthening of malaria diagnostic and treatment activities at national, departmental, and peripheral levels for health workers in both public and private health facilities and at the community level. In addition, PMI will support the implementation of a therapeutic efficacy study in two sites and one malaria case management situation analysis nationwide.

Health systems strengthening (HSS) and capacity building:

Benin's health system continues to receive support from major donors including PMI. This support focuses on strategic areas such as strengthening the capacity of the health system to coordinate malaria interventions as well as supporting maternal and child health. However, despite progress shown in malaria indicators in the 2014 MICS, the NMCP continues to face major challenges in coordinating malaria control activities. To support the NMCP in addressing these challenges, PMI supports joint

annual planning, monthly partner coordination meetings, and capacity building of the in-country Technical Working Group (TWG) teams designed to provide technical expertise to the NMCP to make sound and informed policy decisions. Furthermore, PMI collaborates with the Global Fund to strengthen the NMCP's operations and financial oversight capacity.

With FY 2017 resources, PMI will continue to build the management and organizational capacity within the NMCP and among key leadership staff, and strengthen the functionality of the in-country TWGs. Furthermore, PMI will support national and departmental supervision capacity. PMI will also support the development of the 2019-2024 National Malaria Strategic Plan. Support to the Peace Corps will include local, innovative approaches to improve delivery of malaria activities and support for third year malaria-dedicated volunteers. While not directly funding Performance-Based Financing (PBF), which is largely financed and implemented by the Global Fund and the World Bank, PMI will continue to support complementary HSS approaches that enable health managers to improve malaria service delivery and use validated malaria data for decision-making.

Social and behavior change communication (SBCC):

The NMCP continues to expand use of an integrated communication plan that includes strategies for advocacy, SBCC, and social mobilization. PMI provides analytical and programmatic support to deepen NMCP's understanding of and ability to address barriers to the use of IPTp, ITNs, and care-seeking for sick children. With PMI support, the NMCP is integrating findings from recently completed studies into messages related to the care and maintenance of ITNs, and the promotion of community-based testing with RDTs. With FY 2017 funding, PMI will continue to support the application of the strategies detailed in the integrated communication plan and the national malaria SBCC plan by local community health organizations and the MOH. Ongoing entomologic monitoring has been expanded to include socio-behavioral surveillance for night-time sleeping and other activities that may put individuals at risk of malaria during peak evening mosquito feeding hours. Observations from this surveillance project will be incorporated into risk reduction and ITN use messages, as warranted. Lastly, as more evidence emerges about sub-standard, spurious, falsified, falsely-labeled, and counterfeit (SSFFC) ACTs in the marketplace in Benin (and on transit routes to/from neighboring countries), PMI will expand support for communication campaigns targeting urban populations and vendors (especially in the informal sector) to discourage the purchase, sale, and use of fake ACTs.

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

PMI has contributed to strengthening Benin's SM&E systems, and the number of health facilities reporting timely and complete data to the health management information system (HMIS) has significantly increased in recent years. In past years, PMI has supported two national-level household surveys to provide information on key malaria indicators (the 2006 and 2011-2012 DHS). In 2009 and 2013, health facility surveys were conducted to assess the quality of malaria case management. With FY 2017 funding, PMI will continue providing technical guidance and financial support to strengthen the quality and use of routine malaria data collected through HMIS, and support the NMCP to monitor and evaluate variations in morbidity and mortality trends to aid in guiding programmatic activities. Support from PMI will contribute to key data collection and analysis activities, including two end-use verification surveys (EUVs), production of quarterly and annual malaria epidemiological information bulletins, and the development of standardized tables and graphs for data use and decisions at various levels.

Operational research (OR):

Since 2008, Benin has conducted multiple OR studies. Results from these studies have demonstrated the efficacy of IRS with non-pyrethroid-class insecticides on entomologic measures of malaria transmission, identified a colorimetric field test as an accurate and easier-to-use alternative to the standard bioassay for assessing ITN bio-efficacy, and quantified the serviceable life of ITNs in the field to inform the timing of net distribution and replacement. In 2014, PMI supported a study to demonstrate the feasibility of using dried tube specimens for field monitoring of RDT quality, and in 2015 studies were conducted on the impact of net maintenance campaigns on ITN durability. Results from all of these studies have been written up as abstracts; several publications are in the pipeline. Because a substantial amount of analytical work remains to be done with data from previous studies, no OR projects are planned with FY 2017 funding. PMI and NMCP staff, with support from implementing partner experts, are actively engaged in primary and secondary data analyses from these studies – and in the development and publication of abstracts and manuscripts.

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 Benin

Benin is a West African coastal country that is bordered by Togo to the west, Nigeria to the east, and Burkina Faso and Niger to the north. The population from the 2013 national census was 9,983,884,¹

¹ <http://www.insae-bj.org/recensement-population.html> accessed 12 March, 2015

representing a growth rate of 3.5% from the 2002 census; the population in 2015 was estimated to be approximately 10.9 million. The infant mortality and under-five mortality rates in Benin as reported by the 2014 Multiple Indicator Cluster Survey (MICS) are 66.5 and 105 per 1,000 live births, respectively. The maternal mortality ratio is estimated to be 350 deaths per 100,000 live births and about 46% of people in Benin live in urban areas.²

In health centers, more than 40% of malaria cases occur among children under five years of age. According to the most recent Ministry of Health (MOH) national health statistics report from 2014³, malaria is the leading cause of mortality among children under five years of age and the leading cause of morbidity among adults in Benin. Trends for admissions and deaths due to malaria have remained the same or increased since this time. The WHO estimated that there were about 800 malaria hospital admissions and 23 malaria deaths per 100,000 population (all ages), in 2012.⁴ The 2011-2012 Demographic and Health Survey (DHS) showed parasitemia prevalence of 28% in children under five years of age while the 2015 Malaria Indicator Survey (MIS) reported parasitemia of 39% among children under five years of age.

Malaria is endemic to Benin, and while transmission is stable, it is influenced by several factors, including: vector species, geography, climate, and hydrography. The primary malaria vector in Benin is *Anopheles gambiae s.s.*, but secondary vectors are also important to transmission. For example, the widespread distribution and continuous breeding of *An. gambiae s.l.* in the south, and more seasonal breeding in the north, results in a nationwide endemic transmission pattern with three distinct regions. In the coastal region that has many lakes and lagoons, there are two vectors: *An. gambiae s.s.* (particularly *An. coluzzii*: the M form) and *An. melas* only in localities along Lake Oueme, Lake Aheme and Lake Porto-Novo. In the central region of the country, malaria is holoendemic, and *An. gambiae s.s.* (*An. gambiae*: the S form and *An. coluzzii*) is the primary vector. In the northern-most region, malaria is seasonal, with a dry season (November to June) and a rainy season (July to October) during which malaria rates are highest. Recent entomological monitoring in 2012, 2013,⁵ and again in 2015⁶ confirmed the presence of insecticide resistance to carbamates among mosquito vector populations on the eastern side of one of the departments where IRS is planned (Donga Department).

² The World Statistics Pocketbook, 2014 edition (Series V, No. 38) Available on web at <https://data.un.org/CountryProfile.aspx?crName=BENIN> Accessed 59 June 2016.

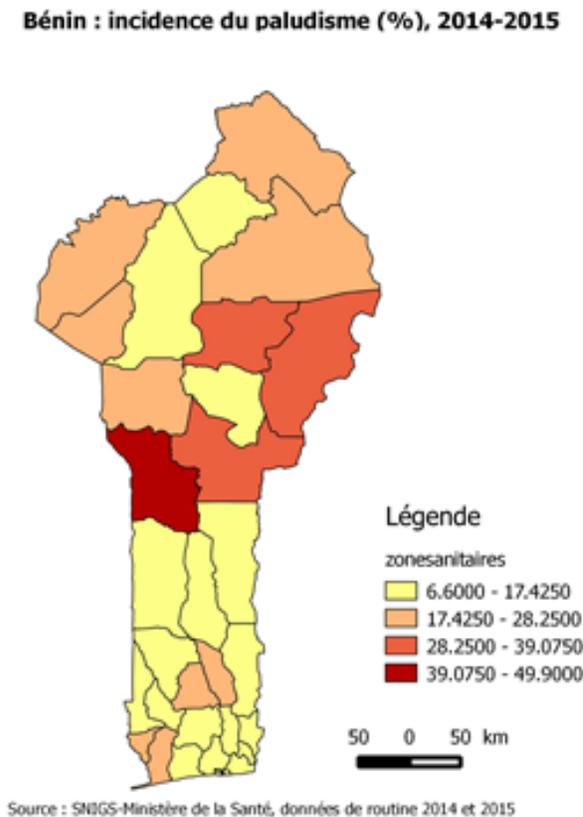
³ MOH, 2015

⁴ World Malaria Report 2013, page 106

⁵ Africa Indoor Residual Spraying project. November 2012. *Semi-Annual Report, April-September 2012*. Bethesda, MD. Africa IRS project, Abt Associates Inc.

⁶ Centre de Recherche Entomologique de Cotonou 2015 Annual report

Figure 1. Malaria incidence in Benin, 2014-2015



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

Administratively, Benin is divided into 12 departments, 77 communes, 546 *arrondissements*, and 3,747 villages. There are three metropolitan areas: Cotonou, Porto Novo, and Parakou. Benin's public health system fits within the administrative structure with a total of six health departments, which pair administrative departments, and 34 health zones, which pair an average of 2–3 communes with a population ranging from 84,000–492,000. There are three levels in Benin's pyramidal health system structure:

- Central: The MOH and its central Directorates, including the Directorate of Public Health to which the NMCP directly reports, along with one National Referral Hospital (*Centre National Hospitalier Universitaire (CNHU) Hubert Koutoukou Maga*);
- Intermediate: The six Departmental Health Directorates, including an NMCP cell of dedicated staff and the corresponding five Departmental Referral Hospitals (*Centres Hospitaliers Départementaux (CHD)*; *CNHU serves as the CHD for Cotonou*); and
- Peripheral: There are 34 health zones, including the following levels of clinical facilities in decreasing order of capacity: 29 Zonal Hospitals (*Hôpitaux de Zone*); 77 Commune Health Centers (*Centre de Santé de la Commune*), which includes inpatient services; 750 accredited private health facilities; over 700 Community Health Centers (*Centres de Santé d'Arrondissement*), and village health units (*unités villageoises de santé*) including an estimated 12,500 Community Health Workers (CHWs).

In Benin, the private health sector is diverse and growing quickly. A 2014 census of private sector clinics mapped 3,174 private facilities, 77% of which offer at least one maternal and child health service. Furthermore, 47% of the private sector clinics are unregistered, mainly due to an arduous accreditation process and low perceived benefits. Efforts are currently underway to reform the registration process in order to better align private providers' practices with national norms and standards. Other prominent types of private providers include traditional practitioners, licensed pharmacists, and informal drug vendors. A recent national study found that 70% of all antimalarial sales take place in the private sector of which two-thirds are sold within the informal sector (source: 2014 ACT Watch study funded by the Bill & Melinda Gates Foundation).

Nationwide, there are an estimated 12,500 CHWs, one-third of whom are female. National directives established primary education and residency in the community of service as requirements for all CHWs. The directives also established two types of CHWs, CHWs who reside in communities less than five kilometers from a health facility and are responsible for health promotion only; and CHWs whose communities are more than five kilometers from a health facility, and who provide basic essential health services, including integrated community case management (iCCM). Since 2014, most CHWs providing basic health services have been trained on the use of rapid diagnostic tests (RDTs) and a national effort was undertaken to train CHWs on integrated case management for malaria, pneumonia, diarrhea, and malnutrition. These CHWs typically serve 30 households each and receive a performance-based stipend of \$15-\$25 per month administered through the local government, with financial support from donors, including the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), the World Bank and the Global Fund with the aim of increasing local resource mobilization and establishment of a national budget line to reduce donor dependence.

The national community health policy was issued in 2015. This new policy emphasizes a national requirement for standardized data collection and reporting systems and the inclusion of community data in the national health information system. Furthermore, the policy calls for the introduction of a new, more qualified cadre of community health agent, or *Agent de Santé Communautaire Qualifié* (ASCQ), holding secondary education and one year of specialized training. While the harmonized monitoring and evaluation (M&E) guidelines are now in application, plans for the operationalization of the ASCQ are still under development; however, PMI anticipates supporting the introduction of this new cadre by working with local authorities on the recruitment and budgeting in the ten supported health zones. To accompany this process, local NGO implementing partners of high-impact health interventions at the community level (PIHI NGOs, *Paquet d'Interventions à Haut Impact*) have a budget to support the one-year training of two ASCQs per commune as a starting point. PMI will consider increasing the budget to support the scale-up of ASCQ trainings in the FY 2018 MOP; however, for sustainability purposes, expansion should occur at the rate at which the communes can absorb the costs of hiring these new community-level employees.

4. National malaria control strategy

Benin's recently revised National Strategic Plan (NSP) for (2014-2018) takes into account the leading challenges sustained during the preceding five years, namely: adherence to case management guidelines (every malaria case should be diagnosed with either an RDT or by microscopy before receiving the appropriate treatment); provision of at least three doses of sulfadoxine-pyrimethamine (SP) to pregnant women for IPTp, dosage for IPTp, regular and consistent use of ITNs, entomological monitoring for insecticide resistance, accurate and timely reporting on malaria morbidity and mortality, and appropriate

supply chain management of antimalarial medicines. The revised NSP (2014-2018) also revised the country's long-term vision: "By 2030, malaria will no longer be a public health problem in Benin." In order to realize this vision, the NMCP identified universal access to preventative interventions as well as proper treatment of malaria as main goals.

Primary objectives of the revised NSP (2014-2018) include:

- Reducing by 75% the number of annual cases (from the number reported in 2000) and then maintaining that reduction.
- Reaching a national mortality rate of one death per 100,000 persons.
- Strengthening the management and coordination of the malaria program.

The revised NSP (2014-2018) highlights continued implementation of key prevention strategies proven to be effective at the individual and community levels, e.g., sleeping under an ITN, IRS with long-lasting insecticides, as well as other anti-vector measures that minimize contact between humans and mosquitoes. Patients of all ages should receive a malaria diagnosis (with either RDT or microscopy) before receiving treatment, and treatment is free of charge for the most vulnerable populations in public health facilities: children under five years of age and pregnant women.

The NCMP implements the plan with a wide range of stakeholders including technical and financial partners. These partners participate in several technical malaria program working groups (monitoring and evaluation (M&E), social and behavior change communication (SBCC), supply chain, entomology, and case management) and meet on a quarterly basis to review plans, activities, and make recommendations to the NMCP. Additionally, the NMCP uses monthly RBM meetings as a platform for stakeholders to provide programmatic updates.

The revised NSP (2014-2018) incorporates many elements of malaria control. The following are the key strategies outlined in the plan:

ITN:

- Pursuing universal access to long-lasting ITNs through continuous routine distribution to high-risk groups, combined with national distribution campaigns every three years.
- Strengthening design and piloting a school-based ITN distribution in 2016.

IRS:

- Applying effective and environmentally sound practices using insecticide classes that are carefully selected and monitored entomologically for resistance.
- At least one seasonal IRS campaign conducted annually in at least one regional department of the country using an extended-release insecticide during high transmission season.

Anti-larvicidal treatment:

- This activity is currently not funded but continues to remain in the revised NSP (2014-2018).

Malaria in pregnancy (MIP):

- Promoting free universal access to at least three doses of SP for pregnant women.
- Providing free ITNs to pregnant women at their first antenatal consultation.

Case management:

- Requiring diagnosis confirmed by microscopy or RDT for all suspected malaria cases prior to treatment with first-line ACTs, artemether-lumefantrine (AL) and artesunate-amodiaquine

(AS/AQ), at all levels of care and in the community. The strategy is to provide free diagnosis and treatment of uncomplicated malaria for children less than five years of age and pregnant women who attend eligible public health facilities or are visited by a trained CHW, and to refer clients with severe malaria for inpatient care.

- Improving the accuracy of diagnosis, availability of medicines, and accessibility to equipment to improve the implementation of malaria interventions.
- Expanding universal access to proper case management at the community level by increasing case management capacity and the coverage of CHWs in communities farther than five kilometers from a health facility.

Health systems strengthening (HSS):

- This strategy focuses on the following building blocks of the health system: governance, human resource capacity, technical competence, managerial capacity, financial resource mobilization, supply chain management, public-private and international donor partnerships, as well as technical partnerships.

Surveillance and M&E:

- Optimizing NMCP management through systematic reviews and validation of M&E data collection activities, both during data analysis as well as during data collection in the field.
- Supporting the health management information system (HMIS) and periodic population-based surveys to obtain accurate, timely, and useful data that is collected with efficiency and in harmony with other information systems.
- Reinforcing high quality routine malaria information system (RMIS) data through production of quarterly bulletins and an annual publication. These publications are disseminated to health zones, health departments, and to technical and financial partners.
- Supporting surveillance and pharmacovigilance to monitor the sensitivity of malaria to recommended drugs, with appropriate investigation and reporting on any observed cases of resistance.

Operational research (OR):

- The strategy proposes and promotes the importance of conducting OR to measure impact of control and prevention activities, and to identify gaps and weaknesses in order to improve program implementation.
- Test promising innovations that could help accelerate the achievement of national targets in access, coverage, utilization, and impact.

Social and behavior change communication (SBCC):

- Strategy is to use advocacy, SBCC, and social mobilization for the increased uptake of healthy behaviors related to the prevention, detection and treatment of malaria.
- Increasing visibility through audiovisual applications, increased communication with partners, and updating NMCP website.

Private sector collaboration:

- Expand private sector collaboration to ensure that private health care providers align their diagnostic and therapeutic practices with national policies. This is strategically important due to the growing numbers of private clinics and practitioners who provide services to Benin's growing middle class.

Supply chain management:

- The NMCP closely coordinates with the Central Medical Stores (CAME) to ensure malaria medicines, products, and supplies are available. Additionally, they work with the National Directorate for Pharmacy and Laboratories to ensure regulatory functions and compliance on malaria-related issues.
- Strategy is to use different tools, including the logistics management and information system (LMIS), end-use verification (EUV) survey, joint supervision visits, and weekly monitoring summaries, to give feedback and to improve supply chain management.

5. Updates in the strategy section

A new health minister was named following the election of a new president in March 2016.

In June 2016, the NMCP, along with its partners, began a mid-term review of the revised NSP (2014–2018). This review will last until September 2016.

IRS:

- In October 2015, the NMCP and its partners held a meeting to decide the future of IRS in Benin. A roadmap that summarizes recommendations agreed by the NMCP, PMI and other IRS partners was adopted. Key elements of the roadmap include: (1) continuation of IRS (targeting new communes); (2) integration of lessons from past IRS experience into national health system IRS planning; (3) a continuation of efforts to build NMCP IRS capacity; (4) continuing support of entomological, epidemiological and behavioral data collection to inform IRS; and (5) selection of the departments of Alibori and Donga as IRS target locations beginning in 2017.

HSS:

- The NMCP was named a principal recipient of a Global Fund award in early 2016. Under this mechanism, the NMCP will be able to strengthen its capacity in many of the health system building blocks including human resources and technical competence. PMI will provide the program with short-term technical assistance to improve its managerial capacity.
- In 2015, performance based financing achieved national scale with expansion to 21 remaining health zones under Global Fund and GAVI funding. Under this intervention, cash transfers are made to health facilities and workers for validated, confirmed, simple and complicated malaria cases among children under five years of age and pregnant women as well as the provision of SP and ITNs to pregnant women. All participating health facilities are inspected on a monthly basis with the purpose of validating reported service quantities (e.g. confirmed malaria cases treated must have proper documentation in patient registers indicating diagnostic test result and ACT prescribed). Furthermore, joint quality assessments are conducted quarterly by the external validators with health zone supervision team members at all participating health facilities. During these visits, a comprehensive quality checklist is used to assess stock management, completeness of patient registers, clinical case management, service availability, and human resources.
- PMI is documenting current issues and opportunities to strengthen the contribution of performance-based financing (PBF) towards malaria (e.g. sampling corresponding RDTs in validation process, systematically including malaria commodities in supply management assessment) and to mitigate perverse incentives (e.g. inappropriate use of blood smears, hoarding of drugs in warehouse while not available to service providers). The policy environment is prime

for contribution from the national malaria control program to improve PBF as a national effort to harmonize approaches and better integrate the approach to improve sustainability

Surveillance and M&E:

- In 2016, the NMCP will launch enhanced entomological, epidemiological and behavioral monitoring in three health zones in the north of the country. The data collected will serve as a baseline in the new IRS intervention communes and allow for follow up following the withdrawal of IRS in Atacora.

Supply chain management

- The common basket strategy put in place by the NMCP under PMI leadership will serve as a regulatory tool that will enable a rational use of malaria commodities in the country and will contribute to strengthened coordination among donors in terms of commodities.
- In 2015, the MOH established a national action plan to address major bottlenecks in the pharmaceutical supply chain. For the first time, this plan intends to serve as a coordination tool, leveraging government and donor efforts to ensure products are consistently available at service delivery points.

6. Integration, collaboration, and coordination

Benin's malaria stakeholders include the local governments, civil society groups, the private sector, academia, and external donors. The MOH's NMCP, a unit of the National Directorate for Public Health (*Direction Nationale de la Santé Publique*), is the government's recognized entity to ensure coordination and supervision of the country's malaria policy and program. Various civil society organizations act as implementing partners of the NMCP, especially at the community level and in remote areas where the MOH has little or no presence. Academia's role is to conduct research, engage in policy formulation, provide technical assistance, pre-service training, and continuing education. Representatives from the private sector, including: private clinicians, individual service providers, commercial establishment owners (including CEBAC, a coalition of private enterprises located nationwide reaching over 300,000 employees and their families.), and vendors of goods and services also contribute to Benin's malaria program. In 2015, USAID supported the creation of the national Private Sector Provider's Platform which brings together professional associations of private providers, pharmacists, and enterprises to provide a greater voice to and engagement of the private sector. Collectively it represents nearly all registered private clinics and pharmacies nationwide.

PMI and the Global Fund are the principal donors to the NMCP. The Global Fund, complemented by PMI, provided most of the bed nets for mass distributions in 2011 and 2014; furthermore, they are working together to support the NMCP with the planning of the 2017 campaign. Both partners are also supporting community case management of malaria in selected health zones with promise for scale-up. The PMI Resident Advisor is a Vice-President for the donor group on the country coordination mechanism board.

The World Bank and the Belgian Technical Cooperation have provided district-focused results-based financing since 2012 and were joined by the Global Fund and GAVI in 2015 to scale up nationwide. A series of joint missions comprised of these donors along with the MOH and USAID have been held to promote the harmonization and sustainability of these efforts to improve health worker performance, particularly in the areas of malaria, HIV/AIDS, tuberculosis, and immunizations.

Relationships between the malaria stakeholders listed above are collegial and collaborative, and have been that way for several years. The Roll Back Malaria partnership brings together the NMCP with malaria partners on a monthly basis and offers a number of technical working groups to promote technical collaboration. The malaria donors worked closely to develop the Implementation Through Partnership (ITP) priorities to ensure effectiveness and absorption of the Global Fund New Model Funding to the NMCP for 2016-2017. There continues to be adequate mechanisms in place to resolve issues of mutual concern and to encourage information-sharing and harmonization of strategies and actions among Benin's malaria donors as well as the analysis and planning for the next national malaria strategic plan for 2019-2024.

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 WHO's criteria for national or sub-national pre-elimination.⁷

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

- Achieving and sustaining scale of proven interventions
- Adapting to changing epidemiology and incorporating new tools
- Improving countries' capacity to collect and use information
- Mitigating risk against the current malaria control gains
- 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 RBM 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
- 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 communes 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

⁷ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

- Proportion of women who received two or more doses of IPTp for malaria during antenatal care (ANC) visits during their last pregnancy

8. Progress on coverage/impact indicators to date

National survey data, outlined in Table A, show that progress is being made for most malaria indicators in Benin, as measured by two DHSs (2006 and 2011-2012), data from a 2014 MICS (conducted July–September), and a 2015 MIS (October – November). It should be noted that the surveys have all been conducted at different transmission periods of the year. Estimates from the 2006 DHS, which was conducted from August–November 2006 (approximating the duration of the short rainy season), serve as the baseline indicators for Benin. The 2011-2012 DHS was conducted from December 2011-March 2012 (covering the dry season). The MICS was conducted prior to the national ITN campaign, which may explain the decrease in universal coverage and utilization among pregnant women. The 2015 MIS was administered after the rainy season had ended, leading to an increase in parasitemia in some areas that may be largely due to seasonal variation as opposed to a true increase in disease burden.

Nevertheless there is consistent improvement across several indicators in malaria prevention and control interventions. Household ownership of at least one ITN rose from 25% in 2006 to 80% in 2012, following mass distribution campaigns in 2007 and 2011. The 2014 MICS and 2015 MIS report that 81% and 88% of households, respectively, possessed at least one ITN. Utilization of ITNs by children under five years of age rose from 20% in 2006 to 70% in 2012, and up to 73% and 81% respectively in 2014 and 2015. A concerning result from the 2014 MICS is a reported drop in the utilization of ITNs among pregnant from 75% in 2011-2012 DHS to 47% in 2014, but the 2015 MIS reported an increase up to 80% utilization among pregnant women suggesting that the MICS statistic may be an anomaly.

The proportion of pregnant women receiving at least two doses of IPTp with sulfadoxine-pyrimethamine (SP) from any source increased from 3% in 2006 (2006 DHS) to 23% in 2012 (2011-2012 DHS) and continued to increase in 2014 and 2015 according to the MICS and MIS reports, to 38% and 48%, respectively. There is also notable progress in diagnosis and treatment. Comparing the proportion of children with fever who received prompt treatment with an ACT in the 2006 and 2012 surveys is difficult given the introduction of RDTs in 2011 and the diagnostic guidelines mandating that treatment be given only to patients with a positive test. The DHS 2011- 2012 reported that 17% of children under five years of age who had a fever in the last two weeks received a diagnostic test, 7% received an ACT within 24 hours, and 38% received any type of antimalarial. The 2014 MICS reported similar indicators with 19% of children under five years of age with a fever receiving a test, 13% receiving an ACT, and 26% receiving any type of antimalarial. The 2015 MIS notes further progress in case management as 26% of children under five years of age who had a fever received a diagnostic test and 24% of them received an ACT.

The two parasitemia prevalence measures among children 6-59 months, from surveys which were conducted at different seasons (rainy and dry), are 28% and 39%, respectively, for 2011-2012 and 2015.

According to the most recent nationally representative survey to measure under-five mortality in Benin, all-cause under-five mortality has decreased from the pre-PMI period to 2014. The under-five mortality rates as reported by the DHS were 125 and 70 in 2006 and 2011-2012 respectively. This represents a decrease of 44% over this period, but there is a high degree of uncertainty around the 2011-2012 measure given the substantial differences observed in comparable time period for these data. For this

reason, it is believed that the 2011-2012 figure may underestimate the true rate. The 2014 MICS reported an under-five mortality rate of 105, and has more comparable rates for overlapping time periods to that of the 2006 DHS. Thus, it is likely that the more modest reduction of 16% from 2006 (DHS) to 2014 (MICS) is a more likely representation of the reality in the population.

Table A: Evolution of Key Malaria Indicators in Benin from 2006 to 2015

Indicator	2006 DHS	2011-2012 DHS	2014 MICS	2015 MIS
% Households with at least one ITN	25	80	81	88
% Households with at least one ITN for every two people	NA	45	36	29
% Children under five who slept under an ITN the previous night	20	70	73	81
% Pregnant women who slept under an ITN the previous night	20	75	47	80
% Households in targeted communes protected by IRS	NA	80	83	94 ²
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	37	39	44	NA
% Children under five with fever in the last two weeks who had a finger or heel stick	NA	17	19	26
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	<1	7	13	24
% Women who received two or more doses of IPTp ¹ during their last pregnancy in the last two years	3	23	38	48
% Women who received at least three doses of IPTp during their last pregnancy in the last two years	NA	NA	12	19

¹In 2006, this measure was from any source: ANC or elsewhere. In 2012, this indicator only included SP/Fansidar sourced from ANC.

²For sprayed area as per AIRS end of spray report

9. Other relevant evidence on progress

NA

III. OPERATIONAL PLAN

Over the past eight years, PMI has supported the Government of Benin (GOB) to implement its malaria control strategy, in partnership with all national and international stakeholders, including local non-governmental organizations (NGOs) and the private sector. The progress described in this tenth Malaria Operational Plan (MOP) with key indicators represents major accomplishments documented by key surveys including the 2011-2012 DHS and the most recent 2014 MICS and 2015 MIS, using 2006 DHS as baseline. PMI supports Benin's malaria strategy, except the use of larviciding as a vector control tool.

1. Vector monitoring and control

NMCP/PMI objectives

The Benin NMCP's revised Malaria Strategic Plan (NSP 2014-2018) supports ITN and IRS as vector control strategies, along with entomological monitoring. Benin strives to attain universal ITN coverage (one ITN per two people), as well as 100% ITN coverage of children under five years of age and pregnant women. Through several delivery channels, PMI supports this goal by 1) procuring ITNs for universal net campaigns every three years (next campaign scheduled for 2017), 2) routine net distribution via ANC and EPI programs, and 3) limited school-based distribution. PMI also supports SBCC to increase compliance with nightly use of ITNs; an ITN durability monitoring activity to better inform ITN care and maintenance messaging in the community, and; entomologic monitoring to track vector resistance and inform the selection of IRS insecticides. The NMCP's 2018 objectives also include 100% coverage of households in IRS spray areas. The NMCP IRS strategy, which aims to reduce malaria transmission through commune-wide targeted spraying in selected, high-risk communes, will be supported by PMI. In general, IRS is strategically deployed with ITNs in areas of high resistance where there is still high malaria transmission.

a. Entomologic monitoring and insecticide resistance management

Progress since PMI was launched

PMI has supported the collection of entomologic indicators to monitor IRS efficacy and vector-insecticide resistance since 2009. IRS and ITN interventions are both informed by vector-insecticide resistance data, which are currently collected at 13 sites across Benin.

Entomologic monitoring and evaluation in Benin aims to estimate changes in phenotypic resistance levels within local vector populations, as well as validate the ongoing impact of IRS on target vector populations. PMI supports entomological monitoring and evaluation based on the following indicators: vector density, taxonomy, parity, mosquito behavior, infection rate, and vector-insecticide resistance testing to support selection of IRS insecticide.

The decision to conduct IRS with organophosphate-class insecticide was based on existing vector-insecticide resistance profile data (well-documented resistance to pyrethroid⁸ and carbamate-class insecticides [Table B]), as well as the limited duration of the insecticidal effect of carbamate-class insecticides.

⁸ N'Guessan, Corbel, Akogbeto, and Roland. 2007. *Reduced efficacy of insecticide treated nets and indoor residual spraying for malaria control in pyrethroid resistance area, Benin*. *Emerg Infect Dis*13:199-206.

Table B: Insecticide susceptibility of *An. gambiae s.l* population at IRS/entomology monitoring and evaluation sites, 2015

Location	Insecticide	Number tested	Average mortality (%)	Susceptible (S)/ Resistant (R)
Boukoumbé	Bendiocarb 0.1 % (CA)	91	89	R
	Pirimiphos methyl 0.25% (OP)	90	100	S
Natitingou	Bendiocarb 0.1 % (CA)	93	87	R
	Pirimiphos methyl 0.25% (OP)	91	99	S
Materi	Bendiocarb 0.1 % (CA)	88	91	R
	Pirimiphos methyl 0.25% (OP)	79	100	S
Tanguiéta	Bendiocarb 0.1 % (CA)	90	94	R
	Pirimiphos methyl 0.25% (OP)	92	99	S

OP: organophosphate; CA: carbamate

The PMI-supported IRS monitoring and evaluation partner, the *Centre de Recherche Entomologique de Cotonou* (CREC), has university-trained entomologists carrying out both standard and more advanced IRS monitoring methods. In anticipation of Benin’s approved NGenIRS proposal, a complete package of approved IRS/entomology monitoring and evaluation measures (e.g., pyrethroid resistance intensity) will be implemented, in order to track changes in levels of pyrethroid resistance and support expanded surveillance for any signs of emerging organophosphate resistance.

The potential for IRS with organophosphate insecticides to positively impact vector indicators in a region with high resistance to other insecticides can be seen in the entomologic monitoring and evaluation data collected around the 2015 IRS intervention in the department of Atacora. Table C shows a substantial reduction in the entomological inoculation rate (EIR), perhaps the best measure of IRS impact, during the peak transmission period (period of bioefficacy) in the IRS intervention areas (Kouandé, Natitingou, Tanguiéta, and Toukountounan) as compared to the (unsprayed) comparison area (Copargo), extending into the dry season when entomological measures of transmission taper off, ideally at the same time as the IRS effect. In terms of ITN usage in the same areas, PMI conducted a detailed assessment of net usage among residents of sprayed structures in 2015. The assessment found that 87% of all household members had a net and used it for sleeping. This is similar to the 2011-2012 DHS findings for Atacora Department with 83% of pregnant women and 73% of children under five sleeping under a net the previous night of the survey, and closely matches the national average. However, observations from PMI partners indicate that many Atacora residents are sleeping outdoors during the hot, dry season and outdoor net usage is low. In 2016-2017, PMI will support enhanced monitoring of sleeping practices and bednets over seasons to better understand the situation and frame social behavior change communications at three sites, including one in Atacora and one in each of the two new sites.

Table C: Change in estimated *P. falciparum* infection rates of *An. gambiae*, s.s. populations in IRS and comparison areas before versus after spraying.

Communes	Before Campaign period (Baseline data ; March-April)			Period of bioefficacy of Actellic CS (June-August ; 24h mortality ≥80%)			Period beyond the bioefficacy of Actellic CS (Sept-Dec ; 24h mortality <80%)		
	HBR/ night	IS	EIR/ month	HBR/ night	IS	EIR/ month	HBR/ night	IS	EIR/ month
Toukountounan	0.50	0.25	3.75	0.830	0.025	0.6225	0.771	0.027	0.625
Tanguiéta	0.75	0.17	3.75	0.521	0.040	0.625	0.750	0.000	0
Natitingou	0.78	0.20	4.688	0.604	0.021	0.3776	0.750	0.028	0.625
Kouandé	0.72	0.26	5.625	0.729	0.057	1.25	0.813	0.051	1.25
Copargo*	1.03	0.09	2.813	5.417	0.227	36.875	3.125	0.020	1.875

*Unsprayed area and the comparison area within the table

HBR: Human biting rate; IS: Insecticide susceptibility; EIR: Entomological Inoculation Rate

Similarly, 2015 IRS and entomology monitoring and evaluation data showed that the residual life of the organophosphate insecticide (pirimiphos methyl CS) covered the majority of the peak transmission season in targeted IRS areas (see Table D), lasting approximately four months (until T4).

Table D: Efficacy of the spray and residual effect of pirimiphos methyl CS six months after 2015 IRS campaign: Observed percentage mortality in susceptible vector (*An. gambiae* s.s.) test populations using WHO assessment method, the cone test, applied to IRS treated surfaces, monthly until mortality declines to less than threshold (<80%) levels.

	T0 (May 2015)		T1 (June 2015)		T 2 (July 2015)		T3 (August 2015)		T4 (Sept 2015)		T6 (Nov 2015)	
	Tanguiéta	Natitingou	Tanguiéta	Natitingou	Tanguiéta	Natitingou	Tanguiéta	Natitingou	Tanguiéta	Natitingou	Tanguiéta	Natitingou
	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu	Kisumu
Cement	100	100	100	100	96.7	96	88	87	79.1	80	68	72
Mud	100	100	99.2	100	92.7	93.20	83.33	83.62	77.24	76.80	62	56

The IRS roadmap document that describes a strategy for ongoing entomology/IRS monitoring and evaluation was approved by the MOH in 2016. All proposed PMI-supported entomologic monitoring activities are currently aligned with the roadmap.

Progress during the last 12-18 months

PMI-supported vector monitoring activities included: spray efficacy and decay rates, bioassay monitoring of IRS quality, biochemical resistance to carbamates, phenotypic vector resistance to carbamates, vector density, and vector biting behavior. A general picture of widespread resistance to carbamate-class insecticides in populations of *An.gambiae* s. l. was observed (in addition to the well-

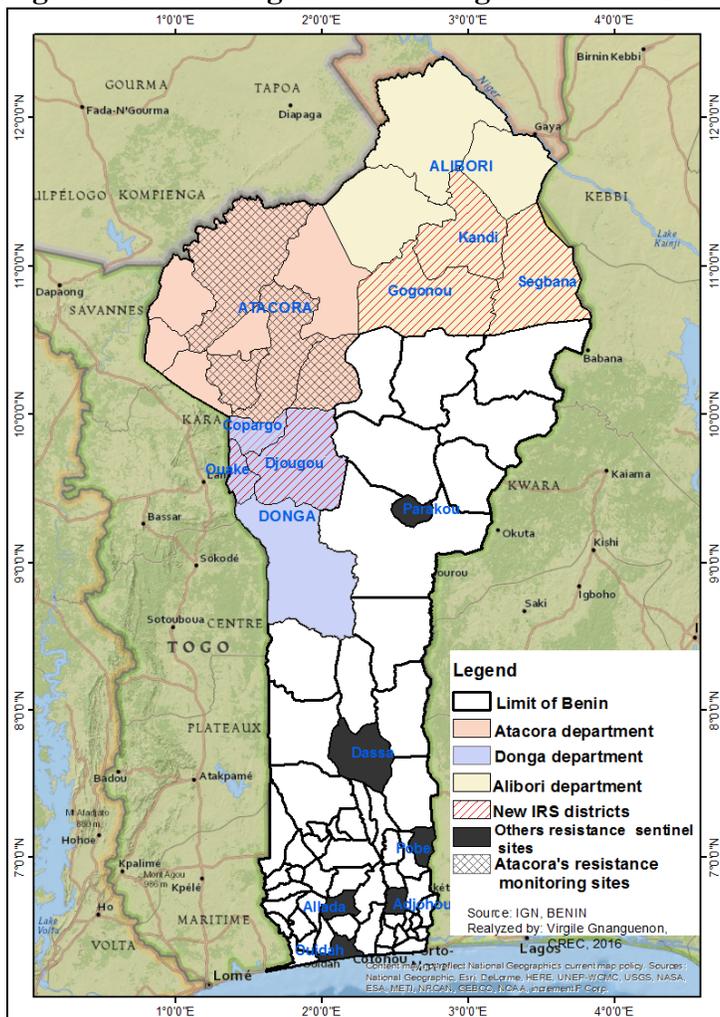
documented pyrethroid resistance), but vectors remained susceptible to organophosphate-class insecticides. New formulations of organophosphate-class insecticides have shown longer residual effect; a positive finding in an endemic country with a long peak transmission season. Furthermore, monitoring data have continued to confirm the impact of IRS on entomological measures of malaria transmission, (e.g. significantly reduced vector biting and infection rates).

Pyrethroid/DDT resistance testing has not been collected since resistance was documented in 2007 (year prior to start of PMI in Benin). However, PMI will include pyrethroid resistance testing on the panel of insecticides to complete monitoring requirements and to identify changes intensity of resistance.

Plans and justification

With FY 2017 funds, PMI will continue to build MOH/CREC capacity to implement routine, robust entomological monitoring. An IRS entomology monitoring and evaluation work plan (updated annually) will be used to program FY 2017-funded activities at sentinel surveillance and IRS monitoring sites. PMI will support a full package of entomologic monitoring in 10 sites (six in the new IRS communes in Alibori and Donga and four in former IRS communes in Atacora Department). In addition, PMI will continue to support testing for resistance and resistance mechanisms in three (of the six) entomological surveillance sites in Southern Benin (see Figure 2 below).

Figure 2. Entomological monitoring sites and IRS districts in Benin



Proposed activities with FY 2017 funding: (\$190,000)

1. *Entomological monitoring*: PMI will support the full package of entomological monitoring – vector-insecticide susceptibility, resistance intensity, vector density, vector population taxonomic status (microscopic, molecular), and vector biting behavior (indoor/outdoor biting) – in ten sentinel sites (six sites located in the new IRS target areas [one site per targeted district] and four sites in the Atacora Department). PMI will support monthly testing for insecticide decay rates in the IRS areas to assess insecticide efficiency (i.e., longevity of the insecticide on the walls). Finally, PMI will support resistance monitoring at three additional sites in southern Benin. (\$190,000)

b. Insecticide-treated nets

When PMI was launched in Benin, the MOH's objective was to provide ITN coverage to more than 90% of households with the most vulnerable populations, pregnant women and children under five years of age. According to the revised NSP (2014-2018), the NMCP's objective is to achieve 100%, or universal, coverage of the entire population (defined as one ITN for every two persons), with all residents sleeping under an ITN by the end of 2018. The plan to achieve this coverage includes: (i) nationwide mass distributions every three years, providing free nets to all population groups (defined as one long-lasting ITN for every two people); and (ii) routine distribution of ITNs to pregnant women through ANC, to children under five years of age through EPI clinic services. PMI will also support the distribution and monitoring of NMCP ITNs through children in primary and secondary schools in areas with unmet need. Social marketing is a complementary activity that contributes to the main distribution strategies.

Progress since PMI was launched

Since its launch in 2008, PMI has purchased and distributed approximately 5.6 million ITNs, of which 4.8 million were available for routine ANC and EPI distribution, including 100,000 through the private sector, and the remainder for social marketing and universal coverage campaigns. Approximately 5.3 million ITNs were distributed during the 2011 universal coverage campaign. These nets were provided primarily with Global Fund resources, with a portion obtained with World Bank Malaria Booster Program funds and another 150,000 nets from PMI. PMI also provided support for behavior change activities around the importance of using and maintaining ITNs as part of its broader SBCC strategy, especially targeting the household level. For the 2014 universal net campaign, PMI provided technical assistance to the planning, coordination, logistical, and M&E committees and provided monitoring and supervision and SBCC training as well. Shortly after the national distribution, the NMCP conducted a rapid assessment that showed:

- 5,657,707 nets were distributed to 2,199,522 households
- 85% of surveyed households received at least one ITN during the campaign against 86% in 2011; this proportion rises to 97% in households that received one coupon
- The average number of ITNs received per household was three.
- 76% of households received at least one ITN for two members during the campaign against 56% in 2011; that universal coverage was 77% in rural areas and 73% in urban areas.
- 3% of the households have at least one mosquito net against 94% in 2011
- 77 % of people slept under nets the night before the survey (ITN campaign + other).

PMI has supported longitudinal studies on ITN durability, the results of which have now been combined with information from seven other PMI focus countries. The data show variability in life expectancy among different brands of ITNs; however, a decision on the programmatic implication of these findings has yet to be reached. PMI/Benin also helped support a core-funded activity that intends to decrease malaria-related mortality by extending or preserving the operational life of ITNs.

The 2011-2012 DHS found that a majority of all households (80%) owned at least one ITN, and that 70% of children under five years of age and 75% of pregnant women reported that they had slept under an ITN the previous night. The 2014 MICS findings on ITN ownership and use the previous night by children under five years of age show slight improvements to 81%, and 73%, respectively. Although the MICS data suggest a drop in the proportion of pregnant women who reported sleeping under an ITN the previous night (47%), more recent data from the 2015 MIS contradict that estimate and suggest that net coverage in Benin continues to increase, with 80% of pregnant women reporting having slept under an ITN the previous night. Overall, data confirm enormous progress in terms of ITN ownership and use since the 2006 baseline, when ownership and usage were both less than 25%.

PMI has steadily improved the level and accuracy of consumption data for the LMIS. Currently, surveillance, monitoring, and evaluation tools to monitor facility distribution and social marketing include register books; however, facilities do not use these registers adequately to collect consumption data.

Progress during the last 12-18 months

During the last 12 months, PMI procured and delivered 730,000 nets to the both private and public sector health facilities for routine distribution through ANC and EPI programs in all 34 health zones. The distribution of nets is currently based on population demographics but a real effort has been made to increase the use and accuracy of ITN LMIS data to improve routine ITN placement and distribution.

Using several strategies to increase use and uptake of ITNs, PMI has made 2,200 more ITNs available through private sector facilities in the ProFam (*Protection de la Famille*) and ABPF (*Association Béninoise pour la Promotion de la Famille*) networks using innovative social marketing and SBCC approaches to optimize public-private partnerships. These nets are free for pregnant women and children under five per the national policy.

PMI continues to advocate for greater use of existing, standardized pharmacy registers at public and participating private sector facilities for tracking consumption data that is entered into LMIS. PMI has greatly increased its awareness and investment in distribution of ITNs via the private sector

In October and November 2015, the Global Fund supported an MIS, which served as a post-campaign survey. The MIS showed that the percentage of households with at least one ITN continues to increase (88%) as well as the proportion of pregnant women (80%) and children under five years of age (81%) who reported sleeping under net. Although the proportion of households in Benin which possess an ITN is relatively high, universal coverage remains low at less than one in three households. There is some variation in this estimate over time and across the different household surveys (i.e. DHS, MICS, and MIS). This may be related to the seasonal variation when each of these household surveys were administered (see SM&E section). For the next DHS, anticipated for late 2017, it will be important to carefully monitor the measurement of ownership, ITN utilization, and overall access to ITNs during the

evaluation. In addition, Benin will need to measure net use and conduct the household survey during the peak transmission season. The NMCP and PMI continue to seek ways to synergize existing activities that increase opportunities for messaging and measurement of net access and appropriate net use.

Given continued gaps in coverage following national campaigns, and shorter than expected net durability, substantial gaps in ITN availability continue to be reported. Beginning in 2014 Peace Corps/Benin developed a local distribution strategy to provide nets to households reporting gaps. The Peace Corps conducted needs assessment surveys among 10,000 secondary school students across 75 communities in all 12 departments where gaps were observed following the 2011 and 2014 campaigns. Results and activities were shared with the NMCP who then authorized the distribution of 14,000 nets to identified households during this time.

In 2016, PMI will support the NMCP's plans to address coverage gaps through school-based distribution points as a pilot intervention to fill gaps in universal ITN coverage, complementing the national ITN strategy which includes routine distribution through ANC and EPI services and mass distribution campaigns every three years. It will target children aged 6-11 years attending primary schools and will be conducted with the Ministry of Primary Education. According to UNICEF statistics, net primary school attendance rate is 72% among males and 68% females - in line with recommended 70% or more primary school attendance for introducing school distribution. This pilot will be conducted in approximately 1,500 primary schools in the Atlantique Department. This area is being targeted for this approach because it had the lowest ITN coverage following the 2014 campaign with some areas with less than 78% of households owning at least one net versus 95% nationally and the lowest average of nets distributed per household, i.e. 1.93 versus 2.65 nationally. This is a peri-urban area with rapid growth and higher than average education attainment of the population (the last DHS found that 75% of women aged 15-49 years of age had attended at least some primary school in the selected department versus 67% nationally). This is proposed only as a pilot with phased learning planned from the distribution in 2016.

PMI will fund the pre and post assessment, the net distribution cost, and the post distribution supervision. PMI will also fund the training of 120 teachers for the promotion of malaria school clubs in the Atlantique Department. Teachers will manage the distribution of free nets to second and third year students and promote use of ITNs among all members of the household. The areas with school-based distribution will be compared with areas with school-based distribution as well as malaria school clubs. PMI will carefully assess changes in ITN coverage, operational costs, and ownership by the Ministry of Primary Education to inform decision-making regarding scaling up. Based on the available nets and on the census that will be completed during the preparation phase, the NMCP will provide more statistics on the number of people reached and the schools targeted; additionally PMI will work with the NMCP and Ministry of Primary Education to revise these numbers using NetCalc based on school enrollment data in the Atlantique Department to get a more realistic estimate of needs. The government will contribute approximately 100,000 ITNs remaining from the 2014 campaign for this pilot in 2016. Note that no school distribution will take place in 2017 as a mass campaign is expected to reach the entire population.

The ANC and EPI distribution, funded by PMI, will continue throughout the year. Assuming positive results from the initial 2016 pilot, PMI will support the NMCP to scale-up distribution to all primary school children in the Atlantique Department in calendar year 2018. PMI will work with the NMCP to include gap distribution through schools in the Global Fund concept note once evidence of the approach and operational guidelines are in place.

Finally, PMI continues to support and strengthen entomological monitoring and evaluation of PMI vector control interventions in partnership with CREC. Three different types of nets from the 2014 national distribution are being followed. After more than one year of ITN monitoring, the durability, integrity, and bio-efficacy of all the nets remained functional and similar. This means that there is no significant difference among the types of compared nets in terms of durability. As they were in good shape during the monitoring they are functional and as there was no significant difference among them they are similar. Based on attrition and integrity data alone, the functional survival after 12 months (T12) was 93% (95% CI: 90-96) for DawaPlus 2.0®, 89% (95% CI: 85-92) for PermaNet 2.0® and 85% (95% CI: 80-89) for DuraNet®. This demonstrated that there was no significant statistical difference in the functional life of DawaPlus 2.0® vs PermaNet 2.0® nor between PermaNet 2.0® vs. DuraNet®. The difference between DawaPlus 2.0® and DuraNet® was just border line. This confirmed that the durability of these ITNs were similar and their median survival time was around three years at T12. However, care should be given to the ITNs in order to increase or maintain their effectiveness for at least three years and the findings should be used to inform the planning of the 2017 national campaign. An operational research (OR) activity (further detailed in the OR section) to track ITN loss is complete, with results already published. Benin is also one of three PMI focus countries to receive approval to conduct village-scale randomized cluster comparisons of six new ITN products using a resistance to damage (RD) score approach developed by WHO. This core-funded activity will correlate RD scores with ITN performance and estimate fabric integrity and longevity or survivorship under field conditions in Benin.

Commodity gap analysis

Table E. ITN Gap Analysis

Calendar Year	2016	2017	2018
Total targeted population ⁽¹⁾	10,882,953	11,186,785	11,496,140
Continuous Distribution Needs			
Channel #1: ANC 1 (public sector 40%) ⁽²⁾	204,191	209,892	215,696
Channel #2: EPI (public sector 40%) ⁽³⁾	152,113	156,360	160,683
Channel #3: School (Atlantique Department only)	676,897	0 ⁽⁵⁾	725,110
Channel #4: Private sector (60% ANC + EPI) ⁽⁴⁾	534,456	549,377	564,569
<i>Estimated Total Need for Continuous</i>	1,567,657	915,629	1,666,058
Mass Distribution Needs			
2017 mass distribution campaign	0	6,695,750	0
<i>Estimated Total Need for Campaigns</i>	0	6,695,750	0
Total Calculated Need: Continuous and Campaign	1,567,657	7,611,379	1,666,059
Partner Contributions			
ITNs carried over from previous year (per the 2016 routine distribution data collected)	428,071	0	0
ITNs from GOB	80,000	500,000	0
ITNs from Global Fund Round NMF	0	6,195,750	0
ITNs from other donors: PSI (private sector)	15,000	15,000	15,000
ITNs planned with PMI funding	730,000	800,000	750,000
Total ITNs Available	1,253,071	7,510,750	765,000
Total ITN Surplus (Gap)	(314,586)	(100,629)	(901,059)

(1) RGPH 4 2013 estimates

(2) 40% of the total ANC estimated to 510,478 including both public and private needs is considered as the public facilities needs per the national private sector assessment conducted by the SHOPS in 2013

(3) 40% of the total EPI estimates including both public and private needs is considered as the public facilities needs per the national private sector assessment conducted by the SHOPS in 2014 which indicated that 60% of the health care demand is covered by the private sector facilities

(4) 60% of the total ANC + EPI estimates including both public and private needs is considered as the private sector facilities needs per the national private sector assessment conducted by the SHOPS in 2014 which indicated that 60% of the health care demand is covered by the private sector facilities

(5) School-based distribution will not take place in years where there is a mass distribution campaign

The ITN gap for 2018 is estimated at about 900,000 ITNs. However, the ITNs for the distribution in the schools will be covered by a redirection of any nets remaining from the 2017 universal campaign. The school distribution will therefore be limited by the number of nets remaining, making the effective gap

closer to 176,000. The PMI team believes the projected gap will be manageable through reprogramming or changes in other donor contributions.

Plans and justification

PMI will continue to support procurement and ensure routine distribution of ITNs for pregnant women through ANC services, for children receiving EPI services, and, if it is deemed beneficial, through school-based distribution as well. PMI will continue to work with the NMCP and the accredited private sector to improve access to free ITNs distributed via routine ANC and EPI services as resources permit. ITN durability monitoring will also be supported by PMI. In addition, PMI resources will be used for communication activities that support improved compliance for year-round ITN usage; SBCC activities surrounding ITNs will be more fully described in the SBCC section.

Proposed activities with FY 2017 funding: (\$3,135,000)

1. *Procure ITNs:* PMI will procure approximately 750,000 long-lasting ITNs for routine distribution through ANC and EPI services. Accredited, private sector facilities participating in routine distribution must provide PMI-funded ITNs for free to target populations. (\$2,490,000)
2. *Pre-positioning of ITNs:* Delivery of the approximately 750,000 ITNs to health facilities across Benin for routine distribution to ANC and EPI clients. (\$495,000)
3. *Gap distribution in targeted schools:* Orientation and monitoring of primary school distribution of nets in the Atlantique Department. Nets provided by the GOB. (\$80,000)
4. *Monitor ITN durability:* After the mass national distribution campaign of 2017, PMI will monitor the use and estimate the rate of survival of three types of long-lasting polyester ITNs distributed. (\$70,000)

c. Indoor residual spraying

Progress since PMI was launched

The 2016 IRS campaign was the tenth round of IRS supported by PMI since the program began in Benin and the sixth round of IRS in Atacora Department (IRS campaigns before 2011 covered Ouémé Department in southern Benin). Entomological monitoring in 2014⁹ confirmed continued presence of vector-insecticide resistance to pyrethroid- and carbamate-class insecticides in malaria vector populations. Therefore, future IRS will continue to rely on organophosphate-class insecticides. Table F summarizes recent PMI IRS activities.

Since 2012, NMCP has participated in several key components of the IRS program, such as reviewing and validating training manuals and monitoring and evaluation tools kits, and selecting the insecticides based on the entomological results provided by CREC. Additionally, since 2015, CREC, a part of the MOH, has received direct funding from PMI to carry out IRS/entomology monitoring and evaluation activities. As a PMI partner that also belongs to the MOH, CREC serves as a good example of the PMI

⁹Centre de Recherche Entomologique de Cotonou. 2014. Monitoring-Evaluation of the efficacy of the fourth round of Indoor Residual Spraying (IRS) in Atacora, using pirimiphos methyl CS formulation and mapping of malaria transmission and insecticide resistance in sentinel sites, Benin. CREC/USAID/PNLP/Report Doc Dec 2014.

commitment to transfer technical and administrative capacity to national partners. In 2014, with the assistance of PMI, the NMCP received a WHO fellowship to build capacity around IRS implementation. Staffing and resource allocation challenges continue to limit the NMCP's ability to play a larger role in IRS.

Table F: PMI-supported IRS activities 2014 – 2018

Calendar Year	Number of Communes Sprayed	Insecticide Used	Number of Structures Sprayed	Coverage Rate	Population Protected
2014	1 department 9 communes in Atacora	organo-phosphate	254,072	96%	789,883
2015	1 department 9 communes in Atacora	organo-phosphate	252,706	94%	802,597
2016	1 department 9 communes in Atacora	organo-phosphate (pirimiphos-methyl CS)	269,170	91%	858,113
2017*	2 new departments (6 communes) in Alibori and Donga	organo-phosphate (pirimiphos-methyl CS)	160,000	NA	800,000
2018*	2 new departments (6 communes) in Alibori and Donga	organo-phosphate (pirimiphos-methyl CS)	160,000	NA	800,000

*Following the 2015 national IRS consensus meeting, PMI plans to transition IRS from Atacora to two neighboring departments starting in 2017. As on-the-ground site assessments have not yet been completed, projected numbers of structures sprayed and population protected are based on population estimates from the national census (RGPH4, INSAE web site <http://www.insae-bj.org/recensement-population.html>) and average national household size (2011-2012 DHS).

Progress during the last 12-18 months

IRS is generally conducted between April and May, prior to the rainy season, with one round each year. The 2016 IRS campaign was carried out from May 3-28, 2016 in all nine communes of Atacora Department. Spraying was carried out over a 20-day period plus an additional 2 days for mop-up in the communes of Natitingou and Matéri. The campaign results included 269,170 structures sprayed, protecting 858,113 persons, including 36,088 pregnant women and 167,041 children under five years of age. The coverage rate was 91%, lower than previous years (see Table F). This year there were challenges again with acceptance in some urban areas (Natitingou and Tanguiéta) and some shortcomings in the execution of the social mobilization strategy.

In 2016, the NMCP continued to lead supervisory activities for IRS operations in Tanguiéta health zone, which comprises Cobly, Matéri, and Tanguiéta, communes as part of its national IRS leadership and management capacity building. The 2016 campaign included the training and supervision of 3,102 persons. In 2016, PMI implemented three mHealth applications that provided important daily message

reminders to key personnel, real-time data to IRS managers, and access to electronic quality check and supervision check lists.

Since 2015, the campaign has emphasized the quality of spraying, the promotion of gender equality across operations, and expansion of the use of mobile technology. To improve quality of spraying by ensuring a constant application rate, PMI introduced the use of control flow valves on all spray pumps to steady the flow of insecticide, and ensure an even distribution of insecticide onto treated walls. To promote gender equality across operations, PMI sought to hire more female spray team members; included gender awareness and sexual harassment modules in the IRS training curricula; and enforced policies against sexual harassment at all operational sites. During the campaign the program expanded the use of mobile health technology using short message service and the data platform *TextIt*, to collect daily IRS data. PMI used this mobile data to make daily decisions and adjustments during the spray campaign. The activity also reinforced NMCP staff capacity to manage and lead the IRS campaign by extending and expanding their responsibilities in three communes. Finally, the program used smartphones to perform all environmental inspections as well as the pre-spray environmental compliance assessment, pre-contract vehicle inspection, and mid- and post-spray inspections.

Despite the high sprayed structure coverage rate and quality entomological surveillance data, there is concern about the future of IRS in Benin. PMI supported the MOH to convene a high-level national consultation in October 2015, bringing together national stakeholders, to reassess the current direction and establish a short, medium, and long-term plan for IRS in Benin for greater efficiency and maximized public health benefit. The IRS roadmap strategy coming out of this workshop included recommendations for the NMCP, PMI, and other IRS partners. Specifically, the roadmap called for: (1) the continuation of IRS in Benin (targeting new communes); (2) integration of lessons from past IRS experience into national health system IRS planning; (3) a continuation of efforts to build NMCP IRS capacity; (4) continuing support of entomological, epidemiological, and behavioral data collection to inform IRS; and (5) selection of the Alibori and Donga Departments as IRS target locations beginning in 2017. NMCP operational responsibilities are detailed in the roadmap.

Having led supervisory activities in three communes for a few years, it will be important for the NMCP to fulfill more precise and definite roles in the next campaign to permit them to demonstrate their level of readiness for greater responsibility in IRS ownership. This is, indeed, one of several elements in the IRS roadmap strategy document. According to the IRS end-of-spray reports, the NMCP is well-placed to run aspects of the IRS program. Its involvement in select activities during the previous campaigns reinforces the NMCP's competencies to run aspects of the IRS campaign in the future. In the 2015 and 2016 campaigns, PMI provided technical and financial assistance to allow the NMCP to perform IRS activities (under the mentorship of PMI's technical partner) in the health zone of Tanguiéta (consisting of three communes: Cobly, Matéri, and Tanguiéta). NMCP staff were actively involved in pre-, mid-, and post-spray environmental control inspections and assigned one database manager to the campaign. The NMCP contributed to the resolution of fuel shortage, poor performance of some teams, and strengthening community mobilization. The NMCP has also demonstrated its leadership with the updated strategic direction and development and finalization of the road map for IRS. PMI plans to support the NMCP with a full-time focal point dedicated to IRS in 2016 to improve the capability of the vector control team to play a greater leadership role in the planning, implementation, and direction of a national IRS program.

CREC also collected entomological surveillance data to evaluate the quality and effectiveness of the 2015 IRS campaign, noting that the quality of IRS preparation and application was high at the baseline

test performed on May 6 and 7 with 100% mortality rates for mosquitoes coming into contact with sprayed walls.

Plans and justification

FY 2017 MOP funding will support IRS in six communes located in the departments of Alibori and Donga, as recommended in the IRS roadmap document. Benin has been proposed as a 2017 UNITAID-funded NGenIRS project country. NGenIRS is designed to subsidize the procurement and uptake of long-lasting, non-pyrethroid insecticides (organophosphate-class insecticide) for IRS. Organophosphate-class insecticides are long-lasting, are an effective tool to manage pyrethroid resistance, and have not been associated with vector resistance in IRS target areas in Benin. As noted above, Benin's MOH has already approved the use of an organophosphate-class insecticide for IRS. In addition to addressing the threat of pyrethroid resistance, the proposed support of the NGenIRS project, will, to some extent, offset the high cost of the insecticide, pirimiphos methyl, which is now used for IRS.

In accordance with the MOH IRS roadmap, PMI is proposing to withdraw IRS from Atacora Department and begin spraying in Alibori and Donga Departments. The rationale for this shift is based on HMIS data that indicate high levels of transmission in the new target areas and dramatic reductions in entomologic indicators in Atacora. Areas that see the withdrawal of IRS will be prioritized during the 2017 ITN campaign as well as in the ongoing effort to strengthen malaria case management and supply chain in the region. In order to collect baseline monitoring and evaluation information, it is necessary to begin monitoring activities in the two new target areas before the 2017 IRS round. PMI will reprogram FY 2016 MOP funds to support baseline entomologic data collection in 2016 in Alibori and Donga Departments and one comparison, non-IRS area, as well as in Atacora Department, where IRS is being withdrawn.

Proposed activities with FY 2017 funding: (\$4,159,000)

1. *Implementation and management of 2018 IRS campaign, including technical assistance and procurement of insecticide:* PMI plans to support a single round of spray operations in six communes, using a long-lasting organophosphate insecticide formulation, to cover structures in prioritized communes of the Alibori and Donga Departments with insecticide procurement under NGenIRS project subsidy. Using a rough estimate of structures to be sprayed based on population estimates and derived household size estimates from the 2011-2012 DHS, it is estimated that the two new sites will comprise approximately 800,000 people, or 160,000 structures. The budget will cover the additional costs of implementation across two different sites as well as start-up costs for new sites. (\$4,100,000)
2. *Environmental monitoring for 2018 IRS campaign:* External environmental monitoring for the IRS campaign. The last IRS environmental compliance review was conducted in 2016. (\$30,000)
3. *Technical assistance:* An entomologist from the Centers for Disease Control and Prevention (CDC) will provide a total of two technical assistance visits for IRS monitoring and entomological surveillance. (\$29,000)

2. Malaria in pregnancy

NMCP/PMI objectives

The revised NSP (2014-2018) for MIP, which was developed by the NMCP in collaboration with the National Directorate for Maternal and Child Health (DSME), has four components: (i) free distribution of SP for IPTp; (ii) free distribution of ITNs during first contact with ANC; (iii) provision of iron/folate (200mg dose of iron and 5mg dose of folate)¹⁰, and; (iv) administration of oral quinine during the first trimester and ACTs in the second and third trimesters for treatment of uncomplicated malaria, and use of quinine during all trimesters for treatment of severe malaria. Pregnant women who are HIV-positive are treated following standard WHO guidelines.

The NMCP target is that by the end of 2018, 100% of pregnant women sleep under an ITN and receive a full course of IPTp (as per the national guidelines). In January 2015, the national IPTp guidelines were aligned with the WHO standard to provide monthly observed SP/Fansidar® treatments starting early in the second trimester of pregnancy up to the time of delivery. While there is a plan to update the routine information system this year to account for the three or more doses, currently IPTp2 is still reported as a performance measure as there is no standardized documentation on the administration of more than two doses of SP in public health facilities. The MOH is awaiting recommendations from the RMIS review that is just wrapping up before producing revised national registers by the end of 2016 (which PMI will support). The revised NSP for 2014-2018 includes targets for both IPTp2+ and 3+.

Progress since PMI was launched

Since 2008, PMI procured approximately 8 million SP treatments for IPTp, trained an estimated 1,610 public and 290 private health workers on MIP, and reached more than 3.5 million people with communication messages promoting IPTp uptake and nightly use of ITNs for the prevention of malaria in pregnancy. While PMI has supported MIP training for most maternity personnel hired prior to 2014, the cohort of newly recruited public providers in 2014, licensed private providers providing antenatal care, as well as non-professional staff who provide antenatal care, must be considered priority for future training opportunities.

Routine distribution of ITNs at first ANC visit is functioning well and to date, PMI has supplied all routine nets for pregnant women in-country since the program started in 2008. The MIS 2015 showed that the rate of ITN use among pregnant women was 80% compared with 75% in the DHS 2012 and 20% in DHS 2006 (see ITN section for further information about ITN distribution at ANC).

National surveys show that IPTp2 coverage is improving, increasing from 23% to 48% according to the DHS 2011-2012 and MIS 2015, respectively. Furthermore, the 2015 MIS showed that 19% of pregnant women received three or more doses of SP during pregnancy.

In 2012, PMI supported a barrier assessment to IPTp in two health zones. Several key social barriers were identified and are reported in the SBCC section of this document. This study showed the health

¹⁰ Current malaria guidelines call for counseling pregnant women to interrupt daily intake of the high-dose folic acid supplement for three days after the observed dose of SP; however, the PMI Resident Advisors are working with WHO and the MOH to switch to 30-60 mg elemental iron and 0.4mg of folic acid to improve the efficacy of SP and reduce patient compliance risks.

facility recovery cost for mebendazole and iron-folate (500 CFA, about one dollar), which are part of the ANC kits at public facilities, is not a major barrier to IPTp uptake.

Progress during the last 12-18 months

In 2015, PMI procured approximately 2.1 million SP treatments. Of the 800,000 ITNs that PMI procured and distributed for routine service delivery, over 483,000 were targeted for ANC. PMI plans to procure the same number of nets for 2017. PMI initiated a study to allow delivery of the SP and ITNs through private sector ANC services.

As indicated in Table H, the national guidelines were officially updated in June 2015 and PMI has supported the national dissemination of these revisions, including the reproduction and distribution of 200 facilitator guidelines and 1,200 participant manuals. PMI supported the NMCP to identify specific providers requiring training on new guidelines by department. PMI has trained regional trainers in all health departments and identified with the MOH 1,500 providers to be trained by the end of 2016. The training of providers will be funded by the Global Fund. Further, following the training of trainers, three health zones used their own funding to train 139 health providers on the new guidelines to date.

Table G. Status of IPTp policy in Benin

WHO policy updated to reflect 2012 guidance	Official update in national guidelines in June 2015
Status of training on updated IPTp policy	In process
Number of health care workers trained on new policy in the last year	139
Are the revised guidelines available at the facility level?	Yes – PMI supported the printing and dissemination
ANC registers updated to capture 3 doses of IPTp-SP?	No, planning in process; <i>Ad hoc</i> registers in place in some maternities to capture FBR performance
HMIS/ DHIS updated to capture 3 doses of IPTp-SP?	No, planning in process (see SM&E section)

PMI has also supported the MOH to supervise health workers, improve quality of services, strengthen logistics management for malaria in pregnancy commodities, improve SBCC activities promoting ANC attendance and inform pregnant women and communities on the risks of MIP and the benefits of IPTp.

In response to the sub-national variance, the MOH introduced ANC outreach services in low coverage health zones. The outreach services are organized under the leadership of the Department health authorities with the NMCP and DSME. The preparatory phase includes the selection of health facility catchment areas based on low ANC and IPTp coverage; selection of specific villages; and mobilization of community leaders, including CHWs. Teams estimate quantity requirements and prepare materials (maternal cards, registers, iron folate, ITNs, SP, RDTs, etc) and select specific sites for the service to address issues of accessibility, privacy, water, etc. A one-day detailed planning workshop is held with local operations actors in the health zone (3 nurse midwives and 20 other staff involved in maternity services, including administration of IPTp, along with 3 staff from the department and zone levels, respectively). Each team is headed by a nurse midwife. Teams conduct outreach services in six

catchment areas over a six-day period in the health zone, each covering 10 villages per catchment area. The teams offer all focused ANC services and also provide testing and treatment of malaria free of charge to pregnant women and children under five. PMI will provide funding to cover approximately three health districts. PMI plans to support documentation of this activity through its implementing partners. PMI supports the scale-up of this approach and its integration with other high-impact health services.

In 2016, PMI supported the updating and printing of IPTp messages and communication materials consistent with the updated guidelines.

Commodity gap analysis

Table H. SP Gap Analysis for Malaria in Pregnancy

Calendar Year	2016	2017	2018
SP Needs			
Total country population ⁽¹⁾	10,882,953	11,186,785	11,496,140
Total number of pregnant women ⁽²⁾	510,478	524,730	539,240
Total SP Needs based on epi data⁽³⁾	781,031	802,836	825,038
Total SP Needs based on consumption data⁽⁴⁾	855,295	855,295	855,295
Total SP Needs (Average of both above)⁽⁵⁾	818,163	829,066	840,166
Partner Contributions			
SP carried over from previous year	955,150	1,208,987	379,921
SP from GOB	0	0	0
SP from Global Fund	0	0	0
SP planned with PMI funding	1,072,000	0	500,000
Total SP Available	2,027,150	1,208,987	879,921
Total SP Surplus (Gap)	1,208,987	379,921	39,755

(1) RGPH4, INSAE web site <http://www.insae-bj.org/recensement-population.html>

Principaux_Indicateurs+projections_PrefaceRGPH4Bon.pdf on the page 25, table 16.

(2) Estimate of the total number of the Pregnant women = RGPH4 estimate Population * % of estimate of the expected pregnant women * ANC coverage per HMIS 2014

(3) Total SP Needs estimated base on epi data = +(total number of the pregnant women*0.21)+((total number of the pregnant women*2*0.48)+((total number of the pregnant women*3*0.12)

(4) Total SP needs estimate base on consumption data = +Consumption data / IPTp total probability

(5) Total estimate SP Needs = Average of (3 & 4)

With improved quality of consumption data, revised estimated SP needs for 2016 to 2018 have become more accurate. Given the lower national projected needs, PMI does not plan to procure SP during the 2017 calendar and will reduce its annual contribution to 500,000 to bring down carryover from 2016. This carryover is not at risk of expiration. With plans in place for greater use of private sector and community outreach, PMI will continue to closely monitor SP consumption and adjust its planned contribution as required to meet demand.

Plans and justification

PMI will continue to support activities aimed at enhancing the provision of effective MIP services in both public and registered private health facilities in Benin. Further, the program will promote scale-up of MIP intervention uptake at the community level. To that end, PMI will procure enough SP treatments to cover nationwide need. SP will be delivered through both the public and participating accredited private sector health clinics (faith-based, non-profit, and for-profit), free of charge to pregnant women. PMI will support laboratory diagnosis and appropriate treatment of malaria to reinforce the implementation of MIP services, including supervision of IPTp service delivery along with other aspects of effective case management, and promotion of ITN use. PMI will support revision and reproduction of maternity registers and cards to capture IPTp2 and IPTp3. Furthermore, PMI will support effective SBCC activities that inform expecting parents of the benefits of monthly SP from early trimester up through delivery and the availability of free testing and treatment of malaria for pregnant women (see SBCC section).

Proposed activities with FY 2017 funding: (\$576,000)

1. *Procure SP*: PMI will procure 500,000 SP treatments to contribute to the national supply for both public and private facilities. (\$90,000)
2. *Support for community outreach of focused ANC*: PMI will promote focused ANC outreach in targeted health zones and catchment areas with low IPTp coverage in order to increase access to MIP services for pregnant women. (\$86,000)
3. *Malaria in pregnancy situation analysis*: PMI will support a national assessment of the state of malaria in pregnancy interventions and the roadmap for achieving universal coverage. (\$100,000)
4. *Support for supervision and refresher training in IPTp*: PMI will reinforce existing results-based financing in place nationwide for ITNs and SP for pregnant women. Quality improvement activities will be supported that facilitate provider-initiated SP monthly to all pregnant women starting early in the second trimester and up to delivery, closing the gap between SP1 and SP3+, through better record-keeping, coaching, and supervision. PMI will provide support for integrated on-site supervision of health workers and refresher training to ensure correct practices regarding IPTp uptake and promotion of the prevention of malaria in pregnancy. This will include support for the development and reproduction of maternity registers. (\$300,000)

3. Case management

a. Diagnosis and treatment

NMCP/PMI objectives

The overall objective of case management as stated in the national guidelines is to promptly and accurately diagnose all suspected malaria cases, and ensure proper treatment for all confirmed cases to prevent death and other complications related to malaria. The revised NSP (2014-2018) sets the following objectives:

- 100% of all suspected malaria cases in public and accredited private health facilities as well as at the community level are tested.

- 100% of all confirmed malaria cases in public and accredited private health facilities as well as at the community level are treated correctly (as per national guidelines).
- 100% of severe malaria cases in public and accredited private health facilities are managed correctly (as per national guidelines).

The current malaria policy promotes the use of RDTs throughout the health system but access to RDTs and microscopy continues to be a challenge, particularly at the peripheral level. The national malaria case management guidelines follow WHO guidelines and standards. The first-line treatment drug for uncomplicated malaria is AL. In case of (i) non-availability of AL, or (ii) intolerance to AL and (iii) treatment of infants under six months of age, AS/AQ is the recommended treatment. Pregnant women in their first trimester will receive quinine for uncomplicated malaria. All severe cases of malaria should be treated with injectable artesunate, injectable artemether or injectable quinine. Despite the revised national guidelines, to date injectable artesunate is only in use in a limited number of hospitals. Severe cases identified in peripheral sites should be referred to a facility with inpatient capacity and it is recommended that injectable artesunate or artesunate suppositories be given for pre-referral treatment.

In 2011, Benin launched a free malaria treatment policy for children under five years of age and pregnant women. This policy has been implemented at the community level utilizing CHWs trained in iCCM including RDT use, as well as in public clinics and hospitals.

In 2014, public facilities phased in a PBF mechanism that remunerates facilities and providers for treatment of confirmed malaria cases. The existing system, funded by the Global Fund, the World Bank, GAVI, and the Belgian Technical Cooperation, now covers all 34 health zones with cash transfers to health facilities and workers for validated, confirmed, uncomplicated and complicated malaria cases among children under five years of age and pregnant women as well as the provision of SP and ITNs to pregnant women. Under PBF, all participating health facilities are inspected on a monthly basis with the purpose of validating reported service quantities (e.g. confirmed malaria cases treated must have proper documentation in patient registers indicating diagnostic test result and ACT prescribed). In 2015, the financing mechanism was scaled up to all health zones in Benin and a pilot was started in the private sector (for more details on PBF implementation in Benin, please refer to the HSS section).

Progress since PMI was launched

Since 2008, PMI has worked to build laboratory diagnostic capacity through training, supervision, and purchasing laboratory equipment and supplies. The need for microscopes is defined by the NMCP as a minimum of two microscopes for every departmental and health zone hospital, and one microscope for every commune health center. A 2013 nationally representative health facility survey of 60 public and private health centers found that only 55% of facilities had the capacity to perform either microscopy or RDTs, which largely reflects the capacity of public non-hospital facilities to perform malaria diagnostics at 54%. To date, PMI has purchased 80 microscopes, but the NMCP estimated a need of 40 additional microscopes to cover departmental hospitals, health zones, and communal health centers through 2015. Although PMI does not have plans to support development of a slide bank or an external quality assessment program, the GOB plans to procure a set of slides to start setting up its own bank in 2017. Over the past five years, training supported by PMI used a loaned slide bank from HYDAS World Health. A comprehensive three-year external quality assessment plan has been drafted and its validation is anticipated by early 2017.

PMI supports a comprehensive diagnostics strengthening program that involves training clinicians and laboratory technicians, implementation of quality assurance and control systems, and improved

supervision to ensure adherence to clinical guidelines. PMI is gradually transferring responsibility of overseeing and implementing outreach training and supportive supervision (OTSS) for malaria diagnostics and treatment. In February 2011, the NMCP updated Benin's malaria case management guidelines to recommend universal diagnostic testing for malaria. Following this new policy, PMI supported training, supervision, and assistance to increase clinical staff's awareness and implementation of the new national policy and guidelines. At health facilities, more than 2,500 health workers were trained and certified in malaria laboratory diagnostics (either RDTs or microscopy). To monitor adherence to malaria diagnosis practices, PMI has supported two nationally representative health facility surveys (2009 and 2013) and continues to collect routine surveillance data on key malaria indicators.

Approximately 9 million ACT treatments were procured from 2008 to 2015. Most government health staff and CHWs have been trained to diagnose and treat malaria as recommended according to the 2011 guidelines. PMI has also supported refresher trainings on the management of uncomplicated malaria, including confirmatory testing using RDTs and supportive supervision of 1,500 health facility workers in integrated management of childhood illness (IMCI) across all 34 health zones nationwide. From 2014 to 2015, private sector health providers were included in this training program.

In 2015, RMIS data with 95% of all health facilities reporting show that 84% of all reported malaria cases were tested by either microscopy or RDT. However, according to the 2011-2012 DHS, the 2014 MICS and the 2015 MIS report, among children under five years of age with fever, only 17%, 19% and 26%, respectively, received a diagnostic test for malaria.

Given its importance in health service delivery to nearly half of the population, PMI supports improving malaria case management at accredited private health facilities in Benin. In 2013, USAID/Benin mapped over 3,000 private clinics, of which only 750 are registered with the MOH. Since 2014, PMI has supported the fast tracking of 179 for-profit and non-profit private clinics' registration requests of which 80 have been approved. In 2015, PMI trained 289 providers from 22 for-profit and non-profit private clinics in malaria case management. Important progress has been made in RMIS reporting by the registered private clinics. Despite these gains, much more work needs to be done to strengthen regulations, improve quality of data reporting, and improve private sector access to malaria commodities (RDTs, ACTs, SP, and ITNs) to improve access by the population. While accredited private health facilities procure essential health commodities from CAME, national program commodities, including malaria, are restricted for the private sector.

To strengthen the case management of severe malaria cases in children under five years of age PMI supported the implementation of the emergency triage assessment and treatment (ETAT) approach in 25 hospitals. The ETAT program aims to improve case management for severe malaria, and performance against national standards and case fatality rates are monitored at each site monthly. During the implementation period, (from January 2013 to March 2015), ETAT hospitals showed improved case management of severe malaria in children under five years of age and case fatality rate fell from 6.0% to 3.4%.

PMI developed four training modules relating to malaria case management including a training manual, manuals for participating nurses and doctors, and an orientation manual for pharmacists. In spite of the amount of training and supervision supported to date by PMI and other partners, health worker performance still needs improvement. Preliminary results of the 2013 PMI-supported national survey of 60 public and private sector outpatient health facilities found that 96% health workers had received some type of training in ACT use, but only 56% had at least one supervision visit in the past six months and 48% had any type of ACT in stock the day of the survey. Furthermore, not all patients with

suspected malaria were tested, and patients with severe malaria often did not receive pre-referral treatment according to national guidelines.

Since 2009, PMI has supported CHWs to provide quality iCCM of malaria, diarrhea, acute respiratory infections, and screening for acute malnutrition. Through this work, PMI has assisted in the development of national training curricula, supervision standards, as well as community monitoring and evaluation systems. PMI supports the MOH effort to accelerate the scale-up of iCCM nationwide. In 2013, the NMCP began an effort to improve peripheral level malaria diagnosis by increasing the available stock of RDTs as well as the number of CHWs trained in RDT use. To date, roughly 9,000 of the 12,500 CHWs have been trained in RDT use, including 1,500 in zones supported by PMI. However, at the national level, there is still a need to continue to train/retrain CHWs and health facility workers to perform RDTs and properly manage malaria and other child diseases. PMI contributed to the national scale-up of iCCM by doubling its coverage from five to ten health zones in 2015. The remaining 24 health zones are being covered with funding from the World Bank, UNICEF, and the Global Fund. The expansion zones were selected in collaboration with the DSME and the NMCP based on the need to sustain existing PMI-supported CHW networks and to improve access to care for underserved populations. The Community Package of High Impact Interventions baseline survey found (preliminary findings) that in villages with a CHW providing iCCM services, 46% of children with fever in the past two weeks received a diagnostic test, of which nearly 40% had been tested by a CHW.

Progress during the last 12-18 months

From 2015 to mid-2016, PMI has supported the training of 294 health workers, 35 supervisors, 37 new microscopists (26 from private sector) and 222 clinicians on malaria laboratory diagnostics and RDT use. During the last 12 months, PMI conducted an assessment of the available microscopes in 124 health facilities enrolled in the OTSS scheme nationwide. Results showed that 10% (33/323) of the microscopes found in the field need to be replaced and 66% (213/323) need maintenance. PMI, in collaboration with the DIEM (*Direction de l'Équipement des Infrastructures et de la Maintenance*) developed a maintenance plan and provided basic materials for the maintenance and repair of microscopes.

According to annual reports from the NMCP and PMI implementing partners, during the past year OTSS visits to maintain and improve quality microscopy and RDT diagnoses were conducted in 114 health facilities. The latest round of OTSS (round 14) visits indicated that 94% of health facilities supervised have staff capable of performing biological diagnosis of malaria and 92% of them experienced no stockout in diagnostics commodities.

Due to continuing challenges to achieving 100% testing of suspect cases and 100% treatment of confirmed cases and the parallel use of different types of RDTs with differing operating procedures, PMI is planning to conduct a survey that will document all of the types of RDTs that are in use in the country. PMI will also take the leadership in harmonizing with partners a shortlist of RDT brands that will be used in the country.

In 2016 PMI provided 2 million RDTs to ensure the availability of testing and procured 1,687,470 ACTs to help meet the national gap; there was no central level stockout. RDTs are provided free of charge to all patients attending public health services, including CHWs. ACTs however are only provided free of charge to pregnant women and children under five as per national policy. As Benin's public health facilities operate on a cost-recovery basis, adults and older children with malaria pay up to one US dollar for a full treatment of ACTs. The revenue is used to resupply stock (not to generate a profit), or to support PMI-approved activities that are consistent with the national malaria strategy. ACT prices are

controlled and monitored by the NMCP. PMI will promote policy dialogue with the GOB in view of extending free ACTs to all patients with confirmed malaria while also maintaining a functional national supply chain system for RDTs and ACTs.

Over the past year, PMI has supported efforts to improve health facility workers' adherence to national malaria case management guidelines that recommend laboratory confirmation of all suspected malaria cases. EUV surveys conducted from 2014 to early 2016 indicated that 66-95% of children under five years of age that presented with fever had correctly received ACTs and that administration of ACTs to non-confirmed cases had decreased to less than 6%.

In addition, PMI carried out an evaluation of the performance of health workers in malaria case management in 40 health facilities in Zou-Collines and Ouémé-Plateau Departments. Results showed that respectively, only 55% and 40% of the surveyed health providers, most of whom were unskilled health workers, were able to perform the test properly. These results confirmed the need to expand the training of providers on malaria case management, especially focusing on the newly recruited health workers and unskilled health workers.

In the past 12 months, PMI trained Departmental Health Service (DDS) staff (DSME representatives, malaria focal point, and DDS statisticians) in all of the 6 health departments countrywide to sustain the monitoring of the ETAT approach that was expanded to 25 hospitals, along with the installation of 12 oxygen concentrators. The assessment of the approach conducted several months after the end of PMI support revealed that the presence of staff trained on ETAT, the availability of a stabilization room and basic emergency kits are key elements to the success of the strategy. PMI also designed job aids to help health care providers handle severe malaria cases.

Due to continued reluctance to use injectable artesunate as treatment for severe malaria, PMI will engage the MOH and WHO to identify contextual barriers to its use in Benin. The first-line malaria treatment for children under six months of age, AS/AQ, is procured directly by the GOB, however the product is not ordered or regularly prescribed by health care providers. This reluctance may be due to the fear of side effects. The CNAPS (*Comité National d'Approvisionnement des Produits de Santé*) decided to confirm reported adverse effects that may have motivated the users not to prescribe the product.

PMI supported an assessment to develop a mechanism to improve access to malaria commodities by private health facilities. The proposed approaches are undergoing national discussion with two options being considered: a) to allow access to malaria commodities through CAME to providers offering free malaria treatment to children under five years of age and pregnant women ; and b) to implement social marketing of low-cost, quality controlled RDTs, SP, and ITNs. Hybrids of these concepts are also under consideration. As per PMI policy, PMI-funded commodities cannot be distributed for-profit and must be distributed free of charge to pregnant women and children under five, per national policy; therefore, in the event that the latter option is selected, an alternative source for commodities would need to be identified. To date, data collection is completed and analysis process is underway. Findings and recommendations are expected before the end of 2016.

In 2015 and 2016, PMI provided technical assistance to support the MOH to review the National Community Health Policy document and, subsequently, the development of guidelines that maintain a focus on malaria. Also, support was given to the DNSP (*Direction Nationale de la Santé Publique*) to conduct group supervision for 520 CHWs as well as a community data quality assessment in five health zones. PMI also supported supervision of CHWs and reporting of iCCM data in northern Benin. To date,

51,189 children under five years of age were tested with RDTs and 43,765 malaria cases were correctly treated with ACTs at community level.

Improving care-seeking

The low care-seeking levels for treatment of fever among children under five years of age, irrespective of sex of child, is concerning. PMI supports multiple activities positioned to improve prompt seeking of testing and treatment services for fever cases. This work includes interpersonal communication messaging at the community level informing care-takers that fever is a danger sign, importance of seeking malaria test within 24 hours, and women's empowerment to make health care decisions. Second, PMI is conducting formative research around the question of the acceptability among caretakers of malaria testing by CHWs through a core-funded Child Survival & Health Grant activity. Finally, PMI supports improving access to treatment of children under five years of age and pregnant women at public health facilities and for children under five years of age in communities with limited physical access to services (e.g. >5km).

Therapeutic efficacy studies

The objective of the TES study (funded in Benin by WHO) was to evaluate the efficacy and safety of artemether-lumefantrine for treatment of uncomplicated *P. falciparum* infections in Kouandé, Zakpota, and Zinvié, in the departments of Atacora, Zou, and Atlantique, respectively. The study was carried out from January 2014 to December 2015 (longer than the typical data collection period [four months], due to WHO funding delays and other coordination issues). Due to data collection issues at the Kouandé site (Atacora Department), data from this site are not currently available. Results for Zakpota (Zou Department) and Zinvié (Atlantique Department) are summarized below:

- At Day 1, 89% of children treated no longer had a fever. At Day 2, over 95% of children had no fever in Zakpota while in Zinvié at Day 1, 65% of the children no longer had fever and at Day 2 almost no child had a fever.
- At Zakpota after 72 hours of treatment (Day 3) 99% of children had no malaria parasite density against 98% at Zinvié.
- The nature and incidence of adverse events and serious adverse events were sought. In total, no participant in the study reported any side effects after taking artemether-lumefantrine at the sites in Zakpota and Zinvié.

For logistical reasons related to the conservation and security of the samples, the sensitivity of *in vitro* evaluation of *P. falciparum* isolates was not made.

Commodity gap analysis

a. RDTs

The estimated need for RDTs in 2018 is 5,015,601. This projection includes the private sector, public health facilities, and community-level needs. With FY 2017 funding, PMI will purchase 2 million RDTs to cover some of the country's gap. The PMI team believes the projected gap will be manageable through reprogramming, delays in program scale-up, or changes in other donor contributions; the RDT stock situation will be monitored closely to ensure that there is no stockout. These figures will also be revised as needed as routine consumption data becomes more reliable through PMI support and the PBF program and as other LMIS strengthening activities come on line. In 2016, existing microscopy capacity will be reinforced in hospitals and larger health facilities.

Table I. RDT Gap Analysis

Calendar Year	2016	2017	2018
RDT Needs			
Total country population ⁽¹⁾	10,882,953	11,186,785	11,496,140
Population at risk for malaria ⁽²⁾	10,882,953	11,186,785	11,496,140
PMI-targeted at-risk population	10,882,953	11,186,785	11,496,140
Total number projected fever cases ⁽³⁾	8,194,473	8,396,782	8,583,213
Percent of fever cases confirmed with RDT ⁽⁴⁾	82% (public), 100% (community), 90% (private)	82% (public), 100% (community), 90% (private)	82% (public), 100% (community), 90% (private)
Total RDT Needs⁽⁵⁾	3,219,305	3,774,354	5,015,601
Partner Contributions			
RDTs carried over from previous year	4,408,645	3,513,850	2,198,316
RDTs from GOB	0	0	0
RDTs from Global Fund	134,310	268,620	300,000
RDTs from other donors/UNICEF	190,200	190,200	190,200
RDTs planned with PMI funding	2,000,000	2,000,000	2,000,000
Total RDTs Available	6,733,155	5,972,670	4,688,516
Total RDT Surplus (Gap)	3,513,850	2,198,316	(327,085)

(1) Population estimates derived from Benin's last national census (2013). Details available at: <http://www.insae-bj.org/recensement-population.html>

Principaux Indicateurs+projections_PrefaceRGPH4Bon.pdf (pg. 25, table 16)

(2) A 2013/14 SHOPS study suggested approximately 60% of malaria care seeking may occur in the private sector. However, this estimate is contested, and may be dated due to the scale up of community-based testing. For the purposes of this table, we have assumed 50% of malaria care seeking occurs in the private sector; 30% occurs in the public sector; and 20% occurs at the community level. Consumption and epidemiological data were used to generate the estimates presented above; these estimates will be adapted annually as better consumption and epidemiological data become available regarding the role of private providers and the reach of community-based approaches.

(3) For 2016, the estimated proportion of cases that receive treatment without a confirmed test result is derived from 2014 RMIS data. For 2017 and 2018, we have assumed small proportional improvements (reductions from the 2014 estimate) in the number of treatments prescribed without a confirmed test result.

(4) Global Fund estimates provided by the Global Fund.

(5) UNICEF has committed nearly 200,000 RDTs per year through 2018.

b. ACTs

In this year's MOP, the projected 2018 need of 4,072,589 ACTs includes the private sector, public health facilities, and the community-level needs. A gap of approximately 1.78 million ACTs is currently projected for 2018; however, the PMI team believes this will decline over time as additional prevention activities, including a national ITN campaign in 2017, and new SBCC campaigns, are scaled up in high-burden areas. The PMI team will also monitor epidemiological changes due to the withdrawal of IRS from two regions in northern Benin, and will adjust procurements, as needed, via reprogramming. The country team also remains in close contact with the Global Fund to ensure procurement plans are harmonized based on an agreed analysis of available data.

Table J. ACT Gap Analysis

Calendar Year	2016	2017	2018
ACT Needs			
Total country population ⁽¹⁾	10,882,953	11,186,785	11,496,140
Population at risk for malaria	10,882,953	11,186,785	11,496,140
PMI-targeted at risk population	10,882,953	11,186,785	11,496,140
Total projected number of malaria cases ⁽²⁾	2,666,342	3,102,469	4,072,589
Total ACT Needs⁽³⁾	2,666,342	3,102,469	4,072,589
Partner Contributions			
ACTs carried over from previous year	1,940,955	1,238,093	203,674
ACTs from GOB	0	0	0
ACTs from Global Fund	111,910	223,950	225,000
ACTs from other donors ⁽⁴⁾	164,100	164,100	164,100
ACTs planned with PMI funding	1,687,470	1,680,000	1,700,000
Total ACTs Available	3,904,435	3,306,143	2,292,774
Total ACT Surplus (Gap)	1,238,093	203,674	(1,779,815)

(1) Population estimates derived from Benin's last national census (2013). Details available at: <http://www.insae-bj.org/recensement-population.html>

Principaux_Indicateurs+projections_PrefaceRGPH4Bon.pdf (pg. 25, table 16).

(2) The total projected number of malaria cases based on total RDT need (see RDT table) times a 70% test positivity rate + the estimated total number of true cases that may be treated without a confirmed test (see footnote #3 in RDT gap analysis table). The test positivity rate and estimated number of cases treated without a confirmed test are derived from an analysis of epidemiological and ACT consumption data from prior years.

(3) A 2013/14 SHOPS study suggested approximately 60% of malaria care-seeking may occur in the private sector. However, this estimate is contested, and may be dated due to the scale up of community-based testing. For the purposes of this table, we have assumed 50% of malaria treatment occurs in the private sector; 30% occurs in the public sector; and 20% occurs at the community level. As noted in the RDT table, consumption and epidemiological data were used to generate the estimates presented above; these estimates will be adapted annually as better consumption and epidemiological data become available regarding the role of private providers and the reach of community-based approaches.

(4) UNICEF has pledged ACT contributions through 2018.

PMI has discontinued the procurement of severe malaria kits, since not all essential items could be provided. Currently, hospitals purchase kits directly from CAME. Costs are supported by the national budget and increasingly from PBF revenue, receiving payment of approximately \$10.40 and \$11.60 per severe child or pregnant woman case treated, respectively. PMI will discuss with the NMCP the possibility to procure injectable artesunate to complement the quinine used for severe malaria treatment.

Plans and justification

Using FY 2017 funding, PMI will procure 2 million RDTs and 1.7 million ACTs and contribute to closing the supply gap. Consistent with the free malaria treatment policy of the GOB, all PMI-procured ACTs and RDTs are provided free of charge to children under five years of age and pregnant women with confirmed malaria. Monitoring of free provision compliance of PMI-funded commodities will be conducted jointly by PMI and the MOH.

PMI plans to increase support for health zone-level performance improvement at the management, health provider and community levels, through integrated malaria case management supervision and comprehensive quality assurance approaches, to improve compliance with case management standards

and norms nationwide. This includes the development and testing of health zone summary malaria scorecards to improve coverage, frequency, and effectiveness of supervision nationwide and strengthening community case management. The FY 2017 funding will focus on supporting trained providers to improve and maintain their performance. PMI will provide technical and financial support to the health zones and departments to take on their role in supervising, in an integrated manner, the health providers in malaria diagnosis, treatment and supply chain management. PMI envisions then to decentralize the supervision in order to make it more effective. Quality assurance will be supported by the integrated supervision of health workers.

With the scaling up of CHWs who are trained to administer RDTs and ACTs in 10 health zones, PMI's plan with FY 2017 funding is to help meet the need for additional RDTs at the community, private and public health facility levels. Access to malaria commodities will be further expanded based on the pilot experience currently under negotiation with the for-profit health clinics. PMI will also take stock of the diagnostic and quality assurance needs to ensure sufficient diagnostic capacity at the health zone and health facility levels. In line with the national scale-up plan, PMI will support the expansion from 5 to 10 health zones to provide quality iCCM for children under five years of age including the adaptation of approaches to improve access to urban and peri-urban poor populations. Awards to local NGOs will cover training, routine supervision, CHW motivation, and supply chain strengthening to improve iCCM services.

Any required CDC TDY visits to support case management interventions will be funded through FY 2016 reprogramming.

Proposed activities with FY 2017 funding: (\$4,233,400)

1. *Procure RDTs:* PMI plans to procure 2 million RDTs. However, recognizing the estimated needs for RDTs (and other commodities such as ACTs) are imprecise, PMI will remain flexible about purchasing commodities and might reprogram some of the funds to purchase more or fewer RDTs and ACTs, depending on ongoing assessments. PMI will work with the NCMP, the Global Fund and other partners to clarify the true need, better understand RDT usage patterns, and ensure that supplies do not exceed demand. (\$1,102,400)
2. *Procure ACTs:* PMI will procure approximately 1.7 million AL treatments for the public and participating accredited private sector facilities providing free treatment to clients. (\$1,751,000)
3. *Support the introduction of injectable artesunate as first-line treatment for severe malaria:* PMI jointly with the NMCP will initiate discussions among partners (*Direction des Pharmacies, des Médicaments et Explorations Diagnostiques [DPMED], WHO, Direction des Hôpitaux, Faculté des Sciences de la Santé*) to identify the barriers to the use of injectable artesunate as first-line treatment for severe malaria. (\$10,000)
4. *Support training, supervision, and strengthening of malaria diagnostic activities:* This activity focuses primarily on laboratory workers with supervision conducted by microscopy experts. Ninety laboratory technicians will receive refresher training on malaria diagnosis in all of the six departments nationwide. In addition, training will be provided during supervision visits with feedback given directly and individually to health workers, emphasizing implementing policies and standard operating procedures, microscope maintenance, and quality control of slides/RDTs. There will be a focus on enhanced outreach training to improve the skills of health workers and to support supervision that improves the national malaria Quality Assurance /Quality Control (QA/QC)

program for laboratory and clinical health workers. This support will be given to mostly public sector health facilities but will also include the registered private sector providers. Existing microscopy capacity will be reinforced in hospitals and health facilities. (\$100,000)

5. *Support quality improvement and supervision of health workers at public and private facilities and at the community level:* This activity focuses on outpatient, maternity, and pediatric services with supervision conducted by clinical supervisors and health managers. PMI will provide technical and financial assistance to the regional and health zone management teams in order to decentralize the integrated malaria supervision. The assistance will support conducting regular supportive supervision visits and findings, IMCI, diagnostics, use of the standard malaria supervision module, verification of free treatment, and monitoring of health facility and community level standard case management quality improvement activities. This comprehensive system is coordinated by the MOH with technical assistance from PMI. It incorporates training of supervisors (including supervisors of CHWs), developing practical tools, conducting on-the-job observation and refresher training, monitoring record-keeping, and promoting correct use of diagnostic results. In addition, PMI will support the MOH in the institutionalization of ETAT: the DSME will conduct semi-annual data reviews, and regular supervision at departmental and peripheral levels. (\$550,000)
6. *Support therapeutic efficacy studies:* PMI plans to support therapeutic efficacy studies at two sites to monitor the susceptibility of *P. falciparum* to first-line ACTs. (\$120,000)
7. *Malaria case management situation analysis:* A national assessment of the state of malaria case management in the country will be conducted to design a roadmap for achieving universal coverage of malaria interventions. This proposed assessment will cover the public, private, and community levels and will document the provision of quality services, access/affordability of treatment as well as technical and geographic gaps. This is a start-up planning activity for the new integrated technical assistance project planned for mid-2018. (\$100,000)
8. *Support the implementation of iCCM in 10 health zones to complement the action of the Global Fund, UNICEF, and the World Bank:* Support local organizations to reinforce CHW networks in the ten selected health zones and strengthen their quality (diagnostics, treatment, referrals) and sustainability. Support will include mapping CHW coverage gaps; training of replacement CHWs as per the national iCCM training curriculum; monitoring performance through case reviews and observation; reinforcing collaboration with local leaders, women's groups, schools, and other social opinion leaders; strengthening routine community reporting; and supply chain and supervision monitoring. PMI will support household visits and group education to promote ITN use, recognizing signs of malaria and increasing care-seeking behavior and encouraging ANC attendance and IPTp through women's groups, CHWs, and mass media. (\$500,000)

b. Pharmaceutical management

NMCP/PMI objectives

The revised NSP (2014-2018) objectives for pharmaceutical management are to:

- Facilitate the purchase of ACTs, SP, ITNs, and RDTs
- Streamline spending
- Ensure sustainable distribution of essential products
- Encourage proper use of drugs and ITNs

- Monitor and evaluate the process and outcomes of the supply chain of pharmaceutical management

The pharmaceutical sub-sector in Benin is driven by several actors from both the private and public sectors and covers product selection, quantification, procurement, storage, distribution, and dispensing. Distribution in Benin uses both a push and a pull system: CAME, the central medical stores, is the point of entry for health commodities. CAME ensures the supply of essential drugs. To this end, it has a hub warehouse within its headquarters in Cotonou and three regional agencies in Cotonou, Natitingou, and Parakou. These three agencies dispatch commodities to health zone depots through a push system. The depots, whose mission is to supply commodities to health facilities (hospitals and health centers), also use a push system. Health centers supply commodities to CHWs through a pull system.

Progress since PMI was launched

CAME has been undergoing reforms during the past five years with support from many partners, the most important of which is PMI. A primary objective of PMI since its inception in FY 2007 was to use malaria as an entry point to strengthen the supply chain and pharmaceutical system to avoid recurrent stockouts or overstocking. As a result, PMI has invested in building capacity of Benin's CAME and improving its performance to ensure continued commodity availability at all service delivery points. PMI also facilitates and supports collaboration between CAME, the NMCP, and other players in the pharmaceutical management system such as the DPMED and the National Laboratory for Drug Quality Control. To improve forecasting, PMI is supporting the NMCP, DPMED, and CAME in planning and implementing malaria LMIS to ensure that adequate stocks of commodities reach the most remote service delivery points in a timely manner.¹¹

To ensure that malaria commodities are available to end-users at all levels of the health care system, PMI has supported the development of a pooled approach for managing malaria commodities. The Global Fund, UNICEF, and the GOB participate in this pooled approach for malaria commodities along with USAID. This approach implies that the commodities from various donors are pooled into one nationally-shared commodity stock. Under this umbrella, the NMCP commodities supply chain technical work group provides operational standards, roles, and responsibilities for each stakeholder to effectively respect and implement the National Malaria Supply Chain Guidelines. The DPMED provides overall oversight while the NMCP commodities supply chain technical working group and the Logistics Management Unit (LMU) are responsible for routine monitoring. Additionally this approach requires that all commodities provided by partners and by the government are delivered to CAME on time according to the national quantification and supply plan. As a result, CAME has the responsibility of managing the common commodity stock without distinguishing the source, nor the beneficiaries, but dispatching commodities through the regular national system. The implementation of these standard operating procedures for the pooled approach will ensure more equitable coverage of commodities, lower transportation costs, and reduced stockouts while also strengthening national coordination capacity.

¹¹ Note that although malaria is the only program that has a comprehensive and functional LMIS, put in place with PMI support, USAID/Benin, through its RMNCH bilateral program, and building on the malaria commodities LMIS, is working to put in place an integrated LMIS covering commodities within the high-impact health interventions package. In addition, the Global Fund and Expertise France invest in the HIV, malaria, and tuberculosis supply chain, including data quality and collection tools harmonization in order to achieve an integrated LMIS within the three different disease programs.

Progress during the last 12-18 months

During the past 18 months, PMI has supported the implementation of the recommendations coming from the last review of the national supervision of the LMIS guidelines for malaria commodities. Of the seven recommendations made and incorporated into PMI implementing partners' approved work plans, three have been fully implemented and the remaining are still in progress. By the end of 2015, 83% of the supply chain stakeholders at central level such as the NMCP, DPMED, and CAME were correctly using Medistock® software for forecasting and consumption data. The Medistock® upgrade to version 5 was functional at the end of the year 2015 in all 34 health zones. An early warning system feature to assist the National Health Commodities Committee to promptly mitigate stockouts and overstock situations is in progress while technical assistance has been provided to the NMCP on the maintenance of Medistock®. The NMCP supply chain team has been strengthened with the recruitment of a logistician and pharmacist by the Global Fund, but the establishment of the LMU is still in progress. National standard operating procedures for pooled management of malaria commodities have been developed and disseminated. This new, nationally-shared commodity stock will improve consistency of supply, prevent stockouts, and save costs. National drug quality assurance guidelines have also been completed and disseminated. Finally, a new supervision and coaching model by zonal depot managers, called 100% health facilities supervision, has been initiated in four health zones. A marked improvement in the quality of consumption and epidemiologic data has been observed. The error rate between prescribed and dispensed ACT quantities fell from 93% to 4% and 73% to 15%, respectively, for the health zones Come-Bopa-Grand Popo-Houeyogbe and Parakou-N'dali.

Ensuring appropriate commodity levels at all facilities remains a priority in Benin, and progress on this front can be seen in the most recent EUV (March 2016). During this monitoring round, no facilities were stocked out of all four ACT presentations, specifically the artemether-lumefantrine, and 63% had all four presentations of this ACT formulation. Furthermore, on the day of the visit, no facility was stocked out of two of the four ACT presentations, SP, or ITNs, and only one facility was stocked out of RDTs. Efforts remain to ensure that stockouts are minimized, and appropriate stock levels maintained. This is reflected in the fact that over half of the facilities were overstocked in every essential malaria commodity reviewed, and ensuring appropriate stock levels at all facilities remains a goal moving forward.

To improve the availability of malaria commodities for the end-users, PMI technically led and contributed financially to the completion of an informative and comprehensive nationwide supply chain assessment and its associated five-year national strategic plan. This assessment has shown that, in general, Benin's national supply chain has a maturity of 60% with completeness and promptness of malaria LMIS reporting at 86% and 27%, respectively. This strategic plan will be used as a reference document for future donor investments in supply chain management once costing is completed by the end of the FY 2016. Discussions among stakeholders are already ongoing to fund some of the activities in the national strategic plan to prevent stockouts or overstocks and strengthen the performance of the supply chain management system within the next five years.

PMI will provide technical assistance to the MOH/NMCP and the DPMED over the coming five years in accordance with the five-year national supply chain strategic plan. With FY 2017 funds, PMI will support the NMCP, *Laboratoire National du Contrôle de Qualité* (National Quality Control Laboratory), DPMED, and CAME to realize the opportunities and confront the challenges identified in the assessment with regards to the public sector supply chain and distribution system at the central, health zone, and community levels. The assessment confirmed high stockout levels at health facilities and a high rate of adjustment/modification of district warehouse resupply requests or orders placed (58%),

largely due to inadequate supply or stockout at the central and regional warehouses. In addition, other identified weaknesses in the system include poor warehousing and inventory management practices, acute shortage of qualified human resources, and inadequate means of transportation for difficult conditions in some areas of the country. Some functionality areas were rated as mature, such as medicine selection, quantification of needs, procurement management, and national quality testing of drugs. The assessment recommends that the supply chain be managed as a part of the broader pharmaceutical management system which requires effective governance, regulation, pharmacovigilance, as well as financing and logistics functions.

Despite the construction of a 32,000 square meter central-level warehouse and efforts to create additional regional warehouses, insufficient storage space is still a major challenge for CAME. PMI has supported CAME to renew its partnership agreement with the GOB as the last agreement expired in 2015. This allowed the system to maintain current achievements and avoid any setbacks.

Nationally, the GOB, through CAME, distributes and guarantees the quality of ACTs to public and some private health centers. However, there is little regulatory oversight of ACTs distributed outside the public sector and although a large proportion of the population seeks health care at private facilities, only 12% of private service providers are registered with the GOB. An abundance of substandard, spurious, falsely labelled, falsified, and counterfeit (SSFFC) medical products is often accessible through the informal sector (at both unregistered private health facilities and local markets). To help combat the low cost counterfeit malarial medications and inform the public on the dangers of illicit ACTs, PMI, in collaboration with the Office of the Inspector General, has supported the GOB through a United States Private Voluntary Organization and its local affiliate. The support proposed an integrated approach of two communications campaigns over the course of one year (calendar year 2015) targeting purchasers of antimalarials and drug sellers. In the first campaign, PMI partners employed several strategies such as a support hotline and targeting entrepreneurs that sell counterfeit ACTs in the second campaign. This one-year campaign initially targeted one of the biggest West African markets (Dantokpa Market) and its neighborhood. As a result, 1,900 vulnerable people have been reached, 10 peer educators and 750 traders have been trained and sensitized for behavior change purposes which will be evaluated by the end of this year. With FY 2017 funds, PMI will support a new private sector bilateral to build on these achievements.

Plans and justification

FY 2017 funds will be used to continue building country-level partner capacity to better forecast, track, and store malaria commodities. The LMU and the supply chain management Technical Working Group (TWG) will reinforce quarterly supervision by a monthly LMIS supervision of about 100% of health facilities in each health zone. PMI anticipates that this strategy which includes data quality checking at source will be scaled up over the 34 health zones by the end of 2017 and will contribute a 90% improvement of the LMIS and RMIS data completeness, quality, and reporting. PMI will continue to support the national laboratory in quality control testing of malaria commodities at both the port of entry and through spot checks at health facilities. Based on findings of the nationwide supply chain assessment, other challenges include inadequate drug regulatory capacity and minimal capacity to self-regulate in the large, private sector. An abundance of SSFFC products, including antimalarials, are accessible through the informal health sector, especially in local market places. Reforms to date have largely missed the private sector, a source of an estimated half of all Benin health care.

Proposed activities with FY 2017 funding: (\$666,600)

1. *Strengthen LMIS and supply chain management:* Based on the recommendations from the 2015 supply chain management assessment and the associated national strategic plan, funding will be used to support specific interventions, such as strengthening DPMED, CAME's regional offices and zonal depots, and the logistics information system. Support to strengthen LMIS and the supply chain management system will focus more on the department and zone levels through the 100% supervision model but will continue at all system levels. Funding will also help to support the implementation of the standard operating procedures for the pooled commodities, the integrated waste management plan and strategy for improving the central and decentralized system and to manage the disposal of malaria commodities. Finally, it will contribute to the funding of the implementation of the recommendations coming from the current commodities distribution circuit and models studied in 2017 as well as the strengthening of governance, regulation, leadership and donor coordination, and resource mobilization to improve financing for the supply chain. (\$450,000)
2. *Supervise and monitor the redesigned LMIS:* PMI will assist with routine LMIS through the scale up of the 100% supervision model by the NMCP in the six targeted health zones, including the health centers. This includes capacity building at the central (LMU), department (LMU) and zonal levels (LMU). (Supervision within health zones is conducted by the health zone team and supervised by the NMCP LMU). (\$86,600)
3. *Test and control drug quality:* PMI will continue providing support to the national laboratory to conduct quality control through routine testing of malaria commodities entering the port and spot checks at public and private facilities. This includes the cost of reagents, equipment for testing, and Minilabs®. (\$130,000)

4. Health systems strengthening and capacity building

NMCP/PMI objectives

PMI supports a broad array of HSS 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. Key components of PMI's support to the health system include reinforcing health zone management teams' capacity to coordinate service delivery in health facilities and at the community level. Integrated community case management is implemented by local organizations that are funded from both PMI and USAID/Benin's Maternal and Child Health and Family Planning funding streams. PMI staff coordinate integrated activities with USAID colleagues on a regular basis.

The GOB remains engaged in health financing reforms and in promoting universal health care financing through the *Régime d'Assurance Maladie Universelle* (RAMU). Donor-funded PBF, which is now in place across all health zones in Benin, has contributed to improvements in the quality, efficiency, and value of services provided by health facilities. The RAMU law was passed by the Parliament on December 28, 2015; the new government is preparing the National Agency for Health Insurance (ANAM) to implement and enforce the law and to develop new strategies to cover vulnerable populations engaged in the informal employment sector and indigents.

In 2011, the GOB made malaria case management free of charge for children under five years of age and pregnant women. The GOB expects that universal health care and PBF will contribute to containing costs associated with free malaria treatment services. In the interim, the current reimbursement process through the national budget remains slow and has debilitated the drug supply chain since some health facilities do not generate enough income to cover the cost of providing free malaria commodities to all children under five years of age and pregnant women. As a result, implementation of the free treatment policy is increasingly difficult for health providers. With PMI support the MOH is drafting a presidential decree to clarify requirements and procedures to improve implementation of the policy.

With the Global Fund, PMI is one of the primary partners supporting Benin's health system, using malaria as an entry point. Also supporting Benin's health system are the *Coopération Technique Belge*, the World Bank, the African Development Bank, UNICEF, the Global Alliance for Vaccines and Immunizations, and more recently, the *Coopération Française*, through their recently approved Muskoka Initiative.

PMI's HSS work and Benin's malaria control strategy are fully aligned with the 2008-2018 National Strategic Health Development Plan (PNDS) priorities of investing in human resources, and strengthening health sector financing and management. PMI and the NMCP regularly review PMI-supported HSS activities to ensure they remain harmonized with the PNDS. Specific examples of harmonization include PMI investments in health management and logistics information systems, as well as human resources for health. PMI is actively involved in the development of national norms for community health, including malaria diagnostics and treatment at the community level. All PMI-supported work at the community level is aligned with the new national community health policy released in October 2015.

Progress since PMI was launched

Over the past five years, the NMCP and PMI have focused on three major challenges within Benin's health system: (1) the lack of adequate human resource capacity (both in numbers and skills sets), to plan, manage, and coordinate a comprehensive malaria program; (2) the collection, management, and use of health information for M&E and surveillance purposes; and (3) supply chain management, which is especially weak at the peripheral level, resulting in recurrent stockouts, and expiration of drugs and RDTs. With these priorities in mind, PMI has worked in close collaboration with the GOB and other Roll Back Malaria in-country partners to reduce these barriers and reinforce the delivery of malaria interventions.

PMI directly invests in government and local organizations where capacity to manage funds is justified. Direct government investment for malaria control efforts is targeted towards the NMCP. PMI has invested in activities addressing the 2009 organizational capacity assessment recommendations, including human resources, RMIS and information technology, donor coordination, and supply chain management. In part, PMI's support assisted the NMCP to become a principal recipient of the Global Fund for the first time in 2016. Further, as a result of PMI's support to the supply chain management, CAME now has a well-functioning board composed of members from USAID, technical and financial partners, pharmacists, public health professionals, civil society organizations, and the private sector.

In support of Benin's continuing efforts to scale-up iCCM services nationally, PMI contributed to the development of national SM&E guidelines for community health. This investment created a harmonized package of process and performance measurements reported by partners supporting iCCM across all 34 health zones nationwide. PMI also supports SM&E capacity development and technical support to local

NGOs and their local MOH counterparts responsible for implementing PMI-funded iCCM in four health zones. This support included training in fundamental SM&E principles, supervision practices, and data quality assessments.

Since 2011, PMI has supported a full-time accountant based at the NMCP to manage finances for malaria activities implemented under a jointly managed Special Account. This account was established under mutual accord with the GOB and USAID and is dedicated for use only for pre-approved procurement of malaria commodities and/or services consistent with MOPs or to reimburse direct costs associated with implementation of malaria control activities.

PMI investments in HSS have historically focused on human capacity development, including in-service training for facility-based health care workers in the public and private sectors, and CHWs. Where needed, training is complemented with working tools, equipment, and supplies to facilitate workers' ability to practice new skills. With PMI's support, updates were made to the malaria training curricula at Parakou University (a major institution in Benin) and 33 faculty members were trained.

The Peace Corps established the Benin Against Malaria (BAM) committee to support volunteers to implement malaria prevention and control activities with key stakeholders in their respective communities.

PMI has been very active in positioning the private sector to play a greater role in universal access to high-impact health interventions, including malaria. In 2014, the USAID Mission supported a comprehensive national mapping of all private facilities (accredited and non-accredited) that found that 55% of the facilities surveyed are in rural locations and that just over half of the providers are licensed. Furthermore, key gaps in service availability and accreditation oversight persist. Four major accomplishments in the past year include: 1) a roadmap to strengthen regulation of the private facilities; 2) creation of a national consortium of private sector associations and networks into a formal public-private partnership platform to facilitate health policy dialogue and representation; 3) development of a fast-track process to support over 300 facilities to achieve registration; and; 4) establishment of a national accreditation process for the private sector which is currently operational in 10 health zones with USAID support. PMI supported the NMCP to strengthen its partnerships with the private sector by providing training on malaria in pregnancy and case management for 165 private sector health workers from the Benin Health NGOs Network, the Faith-Based Clinics Association, and Private Clinics Association networks.

As noted above, PMI has also supported two workshops on health care financing reform. The intent of these workshops was to strengthen MOH capacity to develop a presidential decree related to the implementation of a new national health care insurance policy.

Progress during the last 12-18 months

PMI works with the NMCP to monitor health facility compliance with the national free malaria treatment policy. Site visits have revealed long delays in reimbursements to health facilities for free treatment to pregnant women and children under five. In order to maintain free services to these vulnerable populations, district warehouses are providing ACTs on credit to health facilities. Given the challenges with the free treatment policy, PMI is supporting workshops to assist the MOH in the drafting of a presidential decree to clarify requirements and procedures to improve implementation of the policy.

In the past year, reporting of LMIS data has improved, with all 34 health zones reporting quarterly. LMIS reporting from health facilities within each health zone has also increased from 80% in 2014 to 85% in 2015.

In 2015, PMI supported the completion of a supply chain assessment in Benin, and the development of a roadmap to address gaps in the current system (see Pharmaceutical Management section for further information).

Current Peace Corps activities include community-driven needs assessments to identify gaps in bed net coverage and use, the development of mhealth applications to improve standardization of management of malaria activities (e.g., enumeration of homes prior to a during ITN distribution campaigns, IRS coverage validation), and promotion of malaria prevention (e.g., National Malaria Day, a two-week secondary school curriculum on malaria prevention and treatment). PMI is assisting Peace Corps to implement a community-based pilot intervention (ProAct) for active detection and treatment of children aged 2-59 months with malaria. ProAct works through a series of 16 weekly “sweeps” by CHW during the peak transmission period (April – September). The 2016 pilot is taking place in four rural villages with a population of 440 children under five years of age in the Peonga health center catchment area in Borgou Department. This activity includes a robust monitoring and evaluation plan. Collected data is organized around the goal and objectives of the intervention and includes a number of both client- and provider-based indicators. Decisions on the way forward (post-pilot) will be made in conjunction with the MOH based on the results from the pilot. PMI/Benin anticipates that scale-up will be carried out through the local NGOs delivering high-impact interventions through CHWs in ten health zones and through the NMCP through its Global Fund grant. While the Peace Corps does not have capacity for national scale-up, activities funded under this MOP would include monitoring and technical guidance to the MOH.

PMI support continued to strengthen the NMCP TWGs: SM&E, supply chain management, SBCC, case management, and vector control. There is also more visible participation of NMCP staff in PMI quarterly program reviews, the MOP planning exercise, and other malaria meetings. Additionally, PMI is contributing to the midterm performance review of the current national strategic plan.

With regard to improving the health information system, PMI supported the NMCP SM&E TWG to design a national RMIS evaluation (see SM&E section for further details).

In 2015, PMI significantly contributed to the successful Global Fund application. The resulting grant will be directly managed, for the first time, by the NMCP. PMI also played a leading role in the Implementation Through Partnership (ITP) technical assistance and capacity building. PMI and the Global Fund also conducted capacity and financial risk management assessments of the NMCP in 2015. These assessments identified important financial and administrative gaps that the NMCP is committed to resolve. In March 2016, the Global Fund established a fiscal agent based within the NMCP to provide financial management capacity building. PMI also plans to provide short/medium term management technical assistance to develop and apply written standard operating procedures; human resources management; inventory management; and planning and coordination.

PMI team members remain directly engaged in NMCP TWGs based on their area(s) of expertise, and actively participate in health sector reviews, malaria strategic planning, and annual integrated malaria plan development and reviews. PMI supported the NMCP to submit several joint abstracts to the

American Society of Tropical Medicine and Hygiene (ASTMH) annual meeting. The two PMI Resident Advisors are based at the USAID health office but also maintain a PMI office within the NMCP.

It is noteworthy that PMI contributed to joint missions to harmonize and improve the sustainability of PBF in Benin, focused on better aligning the regulation, payment, and verification processes, and to decentralize administrative functions and mobilize government and community funds to improve the longer-term viability of this promising approach. PMI does not directly fund PBF; rather it offers complementary HSS investments such as leadership and management development, provider training, strengthening data for decision-making and commodity logistics that enable local health departments to provide quality health services, including malaria. PMI currently focuses its HSS support to 10 of the 34 health zones with plans to increase geographic coverage in the coming two to three years.

PMI has also funded two capacity-building workshops to strengthen the MOH's ability to implement a new universal health care policy – another component of the government's long-term sustainability strategy.

PMI further contributed by supporting an analysis of malaria commodities access for legally registered private clinics, testing quality of ACTs in the informal markets, and the distribution of 1,000 free ITNs to pregnant women and children under five years of age.

Plans and justification

With FY 2017 funds, PMI will continue focusing on improving capacity within the MOH in the areas of leadership, management, and governance. In addition, PMI will continue dialogue with the MOH to identify key staff to collaborate with the NMCP to improve leadership across NMCP functions: coordination, information systems, supply chain management, communications, case management, and program development. PMI will provide technical assistance in collaboration with WHO, UNICEF and other major malaria donors to Benin for the development of the next national malaria strategic plan. PMI will continue to assist and support the Peace Corps work on malaria control and prevention at the community level and assist the NMCP to provide services to hard-to-reach populations and to identify unmet needs. PMI will contribute to improving universal access to malaria services through promotion of public-private partnership, technical assistance to private sector providers, and improvements in the regulatory environment for the private sector. The combined effect of these HSS and capacity building activities will enable the NMCP to shape, own, manage, and monitor malaria services at the central, health zone, and health center levels.

Proposed activities with FY 2017 funding: (\$580,000)

1. *Support capacity building of the NMCP:* PMI will continue supporting strategic and integrated planning with partners, strengthening the management of TWGs, and logistics support for monthly RBM meetings. PMI will also provide short-term human resources support (specifically, a data manager, vector control officer, and accountant). Support will also be provided for NMCP staff field supervision and production of the RMIS data collection tools, LMIS reports, and quarterly bulletin production. Staff training will also be supported per gap analysis and attendance to state-of-the-art conferences to make technical presentations on malaria work in Benin. Finally, support will be provided to support running costs of the program's operations along with the GOB and other donors (e.g. internet connection, generator fuel and maintenance, basic office supplies). (\$100,000)

2. *Peace Corps*: Support for two Peace Corps Volunteers (PCVs) who will facilitate malaria SBCC activity implementation among Benin PCVs and ensure coordination of all malaria efforts carried out by PCVs with PMI and the NMCP, including monitoring and technical guidance for the possible scale-up of ProAct activities. Funding will also be provided to support small grants proposed by PCVs for malaria activities at the community level. (\$30,000)

3. *Improve the policy environment for the delivery of malaria services and products by the private sector*: PMI will continue supporting the MOH and the NMCP to strengthen partnerships with the private sector, including the Benin Business Coalition, faith-based clinics, and the Benin Health NGO Network to increase these groups' investments in malaria control interventions in the communities they serve. Support annual private sector malaria performance and regulatory environment review, technical assistance to unregistered private clinics to obtain legal registration, supportive supervision and annual accreditation, development of partnership convention to access malaria commodities, and pilot introduction of malaria confirmatory testing in high-volume pharmacies. (\$450,000)

Table K: Health Systems Strengthening Activities

HSS Building Block Addressed	Technical Area	Description of Activity
Health Services	Case Management	PMI will continue to support improved malaria diagnosis and treatment at the health facility and community levels. PMI will also monitor commodities distribution as well as quality of drugs.
Health Workforce	Health Systems Strengthening	PMI will continue to build health workforce capacity and maintain support for OTSS. This will continue to improve CHWs' capacity for malaria case management.
Health Information	Monitoring and Evaluation	PMI will support the RMIS to enable the NMCP to collect data for timely decision-making. Also, PMI will continue its support to the commodities tracking tool developed in collaboration with the NMCP and CAME to better monitor stock level.
	Operational Research	With FY 2017 funds, PMI/Benin will continue to support analysis, interpretation, and use of data from two core-funded OR studies on net durability and SBCC strategies to promote use and acceptability of RDTs at the community level. PMI support will be provided in the form of staff inputs; no new funds are requested for OR in this FY 2017 MOP.
Essential Medical Products, Vaccines, and Technologies	Pharmaceutical management	PMI will support CAME to strengthen supply chain management and improve forecasting, procurement, quality control, storage and distribution of malaria commodities, such as ITNs, ACTs, and RDTs, mainly at the health zone level.
Health Finance	Public-Private Partnerships	PMI will continue supporting the MOH and the NMCP to strengthen partnerships with the private sector, including the Benin Business Coalition, faith-based clinics, and the Benin Health NGO Network to increase their investment in malaria control interventions for staff members and communities they serve.
	Universal health care	Where relevant, PMI will continue to support broader USAID-focused projects to strengthen MOH capacity to implement the GOB's long-term universal health care policy.
Leadership and Governance	Health Systems Strengthening	PMI will continue supporting the malaria TWGs (vector control, MIP, case management including community case management, SM&E, SBCC, and supply chain management and drug distribution) as well as the regional malaria units to help improve coordination and communication on strategic guidelines that may affect or induce policy change. PMI partners will work with the NMCP to build leadership and governance capabilities and plan for the post-2018 national malaria strategic plan.

5. Social and behavior change communication

NMCP/PMI objectives

The national malaria SBCC strategy was developed in 2014 as part of the revised NSP (2014-2018). It is designed to serve as an integrated communication plan, promoting standardized key messages and tools for all malaria partners in Benin. The strategy has identified the following universal SBCC target indicators for both urban and rural populations:

- 100% of heads of households know that ITNs are an effective means of preventing malaria
- 100% of mothers and/or child caregivers know the treatment for uncomplicated malaria
- 100% of mothers and/or child caregivers know that treatment with ACTs requires positive confirmation by RDT
- 100% of mothers and/or caregivers know the signs of malaria
- 100% of pregnant women are aware of IPTp, the national policy that recommends pregnant women receive at least three doses of SP at monthly intervals starting in the second trimester, and the advantages of preventing malaria in pregnancy

Benin's national Integrated Communication Plan for Maternal, Newborn, and Infant Survival was developed in May 2014. It is a four-year plan (2014-2018) intended to improve uptake of malaria interventions, particularly ITNs for pregnant women, newborns, and infants and prompt care-seeking for sick children. The plan is structured around documented barriers to accessing care and other determinants of health behaviors in Benin. It is designed to be used as a strategic guide and planning tool at the national, regional, and commune level. All levels of government, external donors, and civil society partners are encouraged to use the plan to design and implement standardized SBCC messages and interventions. The national plan includes a full monitoring and evaluation framework with strategic indicators from output to impact. While the plan emphasizes caretaker and health care worker knowledge and participation in individuals' (especially children under five years of age and pregnant women) health care, it also includes guidance and indicators related to structural issues, including access to health care facilities in a timely manner, functionality of the health care referral/counter-referral system, capacity for planning and social mobilization, training of providers in interpersonal communications, and financial resource allocation for health communications.

Progress since PMI was launched

Public awareness of malaria and malaria prevention methods continues to improve in Benin, as measured in national household surveys. ITN use by pregnant women and children under five years of age increased from 75% and 70% in the last DHS (2011-2012) to 80% and 81%, respectively, in the 2015 MIS. The 2015 MIS noted similar improvements in IPTp uptake compared to the last DHS. Where only 23% of women reported receiving at least two doses of SP in DHS 2011-2012, the proportion of pregnant women meeting that standard had increased to 48% in 2015 (MIS). Routine health information system data show similar improvements in the proportion of pregnant women receiving at least two doses of SP; however, approximately one-third of pregnant women do not receive any SP during their pregnancies.

Prompt care-seeking for children remains difficult to quantify; however, RMIS and preliminary data from community-based outreach pilots (CATCH, Peace Corps ProACT) suggest growing acceptance of the test-and-treat strategy. RMIS data tend to confirm this trend with increasing numbers of children under five years of age who are tested with an RDT and treated with an ACT each quarter. Similarly, the 2015 MIS indicated a high level of awareness (>90%) among mothers and care-givers that fever is the primary symptom associated with malaria. This finding confirmed the results of a PMI-supported malaria SBCC impact study in 2015. That study compared awareness among 482 mothers of children under five years of age in a health zone that received a full package of SBCC interventions, with a control area. High levels of awareness were documented around core malaria indicators, including:

- Mosquitoes cause malaria (95% in intervention area; 92% in control)
- Sleeping under a mosquito net prevents malaria (93% in intervention area; 84% in control)
- Fever is a main symptom of malaria (72% in intervention area; 58% in control).

Familiarity with ACTs as an effective treatment for malaria was less common in both study groups (47% in intervention area; 27% in control). SBCC activities funded in FY 2017 will continue to focus on improving awareness about the effectiveness of ACTs when used in combination with a positive RDT result.

PMI has historically supported a multi-pronged approach to reach all segments of the population, including those who are illiterate, through multiple channels including mass media spots on national television and radio, social mobilization events using community theatre, social marketing, as well as interpersonal communications through health facility staff, CHWs, and social and opinion leaders. Reality radio talk shows air on national and local radio. Highly visible flyers are produced on IPTp and SP, ITN use, and treatment of confirmed malaria cases with ACTs. PMI provides technical assistance in the production of radio programs including the monitoring and supervision of recording, editing, and airing. Furthermore, radio stations have guidelines to ensure appropriate and consistent messages. This strategy will continue to underpin FY 2017-funded PMI SBCC activities; however, a stronger focus will be placed on technical assistance to improve the monitoring of SBCC activities, and the analysis of output and impact indicators.

PMI has supported the revitalization of the NMCP's malaria communications TWG. The group is responsible for reviewing the technical content of all malaria SBCC messages and updating the national malaria communications strategy. Group membership is broad, including financial, technical, and implementing partners including the World Bank, UNICEF, WHO, Africare, Catholic Relief Services, PMI, *Association Béninoise du Marketing Social*, and the Peace Corps.

For communication activities specifically related to IRS, PMI adopted a streamlined approach under which the majority of spray operators are also engaged in community mobilization, structure identification, and enumeration activities.

In 2012, PMI conducted IPTp formative research, which identified a number of sociocultural issues including low awareness of the advantages of receiving SP, perceived negative consequences of taking SP during pregnancy by both mothers and health workers, and poor quality of reception at ANC consultations. Mass media and interpersonal communication channels are important tools for addressing perceptions and attitudes about SP during pregnancy. Interpersonal communications interventions with health providers in Benin have shown some improvement in client-provider reception.

PMI supports two Child Survival & Health Grants programs in Benin, which are generating evidence for determinants of malaria behaviors. The first focuses on testing local solutions for net durability and for sleeping under ITNs including preventing or repairing damage to nets (e.g. tying up during the day, storing away from food, avoiding tears during drying, keeping away from fire, etc.). The second focuses on prompt care-seeking for sick children, the acceptability of RDTs by mothers, and compliance with RDT results at the community level. Both projects are approaching their mid-point of implementation.

Progress during the last 12-18 months

During the last 12-18 months, PMI supported an SBCC assessment focused on measures of knowledge, sources of malaria messages, and utilization of IPTp services. Information derived from the 2015 study will be integrated into SBCC materials developed for mass media and interpersonal channels. Specific findings from the evaluation, including the level of exposure communities report to messages, and individuals' ability to recall messages, will be considered as new messages are developed.

A communications strategy for CHW was also updated and training modules on IPTp were developed and disseminated. Posters aimed at raising awareness of IPTp among pregnant women and health care workers were developed and validated; these static messages were complemented by two television spots to promote the "at least three doses" strategy for IPTp. Television spots were also developed to raise awareness around the importance of early identification and treatment for malaria in children under the age of five years. Seventeen thousand flyers with information about ITNs and ACTs were printed and distributed to communities and via health care facilities. Trainings and other informational briefings on SBCC messages and techniques were conducted for more than 100 health care workers in 10 health zones (remaining health zones receive community SBCC malaria support from UNICEF, the Global Fund, the World Bank, and the Belgian Development Cooperation). Support was also continued to community-based SBCC efforts to raise awareness about and use of malaria prevention tools and case management services; these included more than 20,000 home visits by CHWs.

Future work by PMI will look at additional determinants and PMI's technical assistance will remain focused on SBCC strategy development and M&E. PMI will also continue to support evaluation activities to better understand the impact SBCC interventions may (or may not) have on desired behaviors.

With the heightened concern about SSFFC ACTs on the market in Benin since 2014, PMI, with core support, designed a special communication campaign, targeting urban poor families about the risk associated with purchasing ineffective medicines and the benefits of testing before treating suspected malaria cases. This campaign was carried out over a one-year period in Cotonou. Findings from this survey will be integrated into a broader SBCC campaign against SSFFC ACTs.

Plans and justification

With FY 2017 funding, PMI will support household, community- and national-level communications campaigns to model and reinforce messages about the importance of ITN use, prompt care-seeking, the use of RDTs to confirm malaria before taking an ACT, and the use of SP by pregnant women based on the national IPTp strategy. Support will be maintained for these core messages, and expanded to integrate findings from recently completed studies on strategies to care for and maintain ITNs. In FY 2017, SBCC around ITN availability and use will also be integrated, as needed, into wrap-up activities following a planned national ITN distribution campaign in calendar year 2017. Expanded SBCC will also be launched in areas of northern Benin where IRS will be withdrawn (Atacora Department), to

ensure populations understand the additional importance of correct and consistent ITN use; and in areas where IRS will be initiated (Borgou and Donga Departments), to promote awareness about IRS as a complementary malaria control intervention – not a replacement for ITNs and other interventions. Entomological studies have also been expanded to include the collection of behavioral and demographic information to help understand behaviors (e.g., outdoor sleeping) that may increase people’s risk of exposure to infected mosquitoes. A behavioral data collection component will be included in the IRS monitoring (see above). The 2016 IRS roadmap, one of the outcomes of the 2015 IRS multisectoral meeting in Grand Popo, designates that future IRS decisions should be better informed and guided by entomologic, epidemiologic, and socio-behavioral monitoring and surveillance. The socio-behavioral monitoring will be conducted at night during the dry and rainy seasons using observation and descriptive questions. While entomologic monitoring will capture characteristics of the mosquito vector in and around households, the socio-behavioral monitoring will describe the behaviors of persons that influence exposure to risk e.g. average time under ITN each night, indoor vs outdoor sleeping, location of ITNs.

Local organizations will be supported to implement the National Malaria SBCC Strategy and Integrated Communication Plans at the commune and household level using mixed local media and interpersonal communication. Technical assistance will also continue to strengthen the SBCC TWG. As Benin captures more data on SBCC output and impact indicators, PMI staff and implementing partners will work closely with the NMCP and SBCC TWG to strengthen capacity to use these data for programmatic and strategic decision-making.

Proposed activities with FY 2017 funding: (\$390,000)

1. *Technical and financial assistance for national-level communication planning and mass campaigns:* PMI will continue to provide technical assistance to NMCP to expand the delivery of national malaria messages, and to build NMCP capacity to plan and design SBCC and advocacy messages and materials in the future. National SBCC campaign work will be coordinated with the IRS technical assistance activity to ensure that SBCC materials developed for areas from which IRS has been withdrawn are reflected in national SBCC strategies, messages, and campaigns -- and vice versa. (\$230,000)
2. *Support for World Malaria Day activities implemented by the NMCP:* PMI will use a new direct funding mechanism with the NMCP to support national efforts to promote the malaria control strategy nationally on World Malaria Day. Funding will contribute to a broader effort to build NMCP capacity to design and implement SBCC and advocacy campaigns internally. (\$10,000)
3. *Support community and household-level malaria communication activities:* FY 2017 funds will support SBCC activities to promote net use among pregnant women and children under five years of age. Additional messages derived from the findings of recently completed SBCC studies will focus on tips and tools to hang and maintain nets. FY 2017 resources for SBCC support will also help improve messages to emphasize the importance of prompt and appropriate care-seeking behavior and encourage women to attend ANC and follow national IPTp guidelines. PMI-supported local organizations working in 10 selected health zones will receive technical and financial support to implement national malaria SBCC messages and materials using multiple channels including local radio, community theatre, traditional music, local women’s groups, as well as interpersonal counseling from health providers and CHWs. (\$150,000)

6. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

Benin's national malaria SM&E strategic plan (2014–2018) describes indicators and targets set forth by the NMCP to capture the spatial distribution of malaria morbidity and mortality across the country. Ideally this information can be used to longitudinally track malaria trends over time in order to adjust program interventions, or propose new strategies, and ultimately reduce malaria burden.

Benin's SM&E activities are guided by a multi-institutional M&E TWG and the use of routinely collected data supported by periodic evaluations to monitor programmatic process and outcome indicators. Benin has multiple sources of malaria information, all of which are supported and strengthened by PMI and include: 1) household and health facility surveys; 2) EUV surveys, and; 3) the national HMIS.

Progress since PMI was launched

Household surveys: Benin has benefited from several nationally representative surveys which serve as a basis for assessing progress towards program targets and objectives. A DHS was completed in 2006 and 2011-2012; while the two surveys were methodologically similar, the 2006 survey was done at the end of the rainy season and the 2011-2012 survey, which included parasitemia, was done during the dry season. A survey based on the MIS methodology, conducted by Leadership and Development (LEADD), was conducted in November 2010; however, methodological concerns and the use of non-standard indicators have raised concerns over the validity of the results. A MICS was conducted in 2014 with no collection of biomarkers, and a MIS in October of 2015, which is generally the end of the rainy season in the northern parts of the country. The parasitemia measures from the 2015 MIS were the second point prevalence estimates in Benin, but given the fact that the 2011-2012 DHS was conducted during the dry season, and the 2015 MIS at the end of the rainy season, it is difficult to interpret the observed changes in parasitemia prevalence. Discussions are currently underway to implement a DHS in late 2017, timed to capture parasitemia at the highest transmission period (i.e., end of the rainy season) and ensure comparability to the 2015 MIS.

Health facility surveys: Given the slow uptake of case management guidelines, PMI tries to conduct a nationally representative health facility survey every four years to assess the readiness of outpatient health facilities to manage malaria, the quality of malaria case management, laboratory testing, and antenatal care. In 2009 and 2013, nationally representative health facility surveys were conducted to assess the availability of malaria-related commodities, diagnostic capacity, and the quality of malaria case management. The health facility survey conducted in October 2013 showed consistent stockouts of malaria commodities including RDTs, ACTs, and SP. As a result, diagnoses of malaria usually did not follow the national treatment guidelines, which require testing by RDT or microscopy when malaria is suspected. In response, PMI has increased efforts to strengthen the LMIS and overall supply chain system.

EUV surveys: Beginning in 2010, EUVs of commodity availability were conducted on a quarterly basis and completed on small convenience samples of health facilities. A larger EUV on a nationally representative sample of 128 health facilities was completed in April 2012. In 2013, there was a return to quarterly administered EUVs, however, due to the demands of the national ITN distribution, only

three EUVs were conducted in 2014, and in an effort to ensure maximum follow-up, the program decided to move to two EUVs annually in 2015.

Routine data and HMIS: From 2008 to 2013, PMI funded the Regional Institute of Public Health in Benin to supervise the collection and reporting of data on malaria morbidity and mortality from five hospital sentinel surveillance sites. Persistent commodity stockouts of RDTs and ACT presentations at the sites along with other situational and organizational constraints of the system prompted PMI and the NMCP to suspend the sentinel surveillance activity in 2014. Previous evaluations showed that the sentinel surveillance sites provided minimal value to the existing HMIS since they were geographically limited and did not generate representative malaria burden data to inform broad programmatic decisions. The M&E TWG in collaboration with the NMCP decided to invest PMI funds towards strengthening malaria reporting through the national HMIS.

In recent years, PMI has increased support to the national HMIS, which currently reports the number of malaria cases, deaths, and case fatality rates at the health facility level on a monthly basis. Prior to PMI, the HMIS did not distinguish clinically diagnosed cases from those confirmed by laboratory testing. In addition, concerns existed about the accuracy, timeliness, and coverage of these data, as well as how these data were used for decision-making. With the support of PMI, the World Bank, WHO, and the NMCP, the malaria module of the national HMIS (i.e., RMIS) was strengthened and a target of having at least 80% of public and registered private health facilities reporting malaria data continuously and accurately was set. With an emphasis on improved quality, timeliness, and completeness of reporting, the percentage of health facilities submitting complete and timely data on malaria burden indicators increased from 35% to 95% from October 2011 to December 2014. Since 2012, PMI has supported quarterly data validation reviews to improve the quality assurance of RMIS data produced. Each quarter three regional (North, Central, and South) five-day data validation workshops are held to review the data entered into the RMIS from all 34 health zones across the country.

The HMIS system currently collects and reports monthly on 20 key malaria indicators. The malaria module was updated in 2014 to include reports from CHWs and to capture cases confirmed diagnostically; however the precision of confirmed positivity, and ensuring reliable reporting of all malaria cases from all CHWs remains a challenge. Planned activities aimed at improving malaria reporting by CHWs include regular supervision of community health activities by the NMCP with technical assistance from PMI implementing partners, and semi-annual learning events for community health partners. Learning platforms are held every six months for NGOs, health zone managers, statistician and mayors' representatives with USAID's implementing partners and the MOH. This includes sharing results, documenting best practices, training, etc. In addition, the geographic coverage of CHWs supported by PMI through local NGOs will expand from four to ten health zones, and this increased coverage will coincide with increased and intensified supervision.

With support from PMI, quarterly malaria bulletins (PALU INFO) are prepared to keep stakeholders abreast of the current malaria epidemiological situation in Benin. Bulletins are validated at quarterly workshops and disseminated nationally to technical and financial partners, the MOH, department directors, and health zones. These data are also used by the M&E TWG to confirm ongoing data quality needs but they are currently not timely enough to inform prompt programmatic decisions. PMI continues to support training on data use for decision-making and is working with local partners and the M&E TWG to draft concrete steps for more centralized analyses and for the utilization of HMIS data for decision-making.

In 2014, PMI supported the development and introduction of a smartphone application and reporting system, CommCare, for iCCM in the health zones of Tchaourou and Bassila. An assessment of the pilot's effectiveness showed wide appreciation for the system by all zonal statisticians and most of the CHWs (e.g., saves time, ease of reporting, collaboration with supervisors). Challenges included ensuring routine daily reporting by all CHWs due to limited availability of mobile phones (one per village instead of one per CHW), poor network coverage in some localities, and difficulty in finding a power supply to recharge phones. The CommCare platform is being updated based on the findings of this pilot. There are plans in place to scale-up to an additional eight health zones. PMI provides guidance for the malaria content of the platform and the national community M&E plan. Over the next year, there will be additional focus on the inclusion of the national community monitoring data into the DHIS2, since community data is compiled into a database but is not automatically rolling into the DHIS2. There will also be an emphasis on data quality improvement across all partners. PMI is working to improve timeliness of routine data availability.

Progress during the last 12-18 months

PMI continues to support routine data collection as well as SM&E quality measures for all activities. The M&E TWG reinforces the need for high quality routine epidemiological data to better understand malaria burden and transmission at the sub-national level. In 2016, PMI provided technical support to M&E TWG members to develop and submit four scientific abstracts on malaria to the 2016 ASTMH conference. PMI will also support the participation of four NMCP staff in this event.

PMI supported trainings on the completion of the malaria forms for HMIS for CHWs as well as district and health zone coordinators. As part of the process of pursuing national scale-up of iCCM, PMI supported the training of 153 CHWs, doubling the geographic coverage of this initiative from five to ten health zones. A midterm process evaluation to assess the performance effects of the expansion to additional health zones (engaging more CHWs, and more services, supervision, and reporting into HMIS) will take place in 2017. There is also an ongoing PMI centrally-funded project, Data for Action, that is designed to demonstrate how better data analysis of existing data can be used to improve decision-making that affects malaria prevention at the community level. PMI and USAID/Benin also supported a comprehensive national SM&E community health plan that incorporated best practices and global metric standards to harmonize different data collection systems being used.

EUV: PMI continued to support implementation of EUVs to help gauge commodity availability at health facilities. The results from the most recent EUV conducted in March 2016 in the department of Atlantique – Littoral revealed that proper management of stocks resulting in stockouts is still a major issue. The results are summarized below:

Availability of commodities:

- Facilities stocked-out for three or more days in the previous three months for individual AL presentations ranged from 33-41% of facilities.
- Facilities stocked-out of RDTs for three or more days in the previous three months were 22%.
- SP stockouts of three or more days in the previous three months occurred in 16% of facilities.
- Quinine injectable stockouts of three or more days in the previous three months occurred in 26% of facilities.
- The percentage of facilities under-stocked on the day of the visit for all AL presentations ranged from 18-32%.
- The percentage of facilities over-stocked on the day of the visit for all AL presentations ranged from 53-71%

Case management:

- Test positivity rate for all fevers was 41%
- Treatment practices are directly impacted by poor stock management, resulting in 27% of malaria cases in children under five years of age not being treated with an ACT.

HMIS Support: In 2015, Benin transitioned the national HMIS from an Excel® based platform to the DHIS2 platform. During the last 18 months, PMI has played an integral role in supporting the integration of RMIS forms for HMIS onto the DHIS2 platform. Malaria reporting rates remain high and did not decline with this transition, going from the parallel RMIS forms to reporting those data from the RMIS forms onto the DHIS2 platform (completeness of reporting from the facility level is 92% and from the district level it is 98%). Community data has recently started to be uploaded onto the platform, but real-time uploading remains an obstacle. While other donors have supported training of the health zone coordinators and statisticians, PMI has supported the training of four NMCP staff on DHIS2, ensuring proper reporting and comprehension of how to use the platform. PMI also supported quarterly supervision of selected sites in six departments, covering 34 health zones, as well as two routine data quality assessment audits, in an effort to improve timely and complete collection of high quality data. PMI has plans over the coming year to strengthen capacity of health zone managers and health workers as well as the NMCP technical staff to better use the malaria data analysis features that DHIS2 offers. PMI also provided technical guidance to improve the quality of health facility data reported to the HMIS by conducting quarterly data validation workshops at the regional level. Finally, PMI supported the NMCP to produce three quarterly and one annual malaria bulletin in 2015.

Table L. Monitoring and Evaluation Data Sources

Data Source	Activities	Calendar Year (2006-2018)												
		'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18
National-level household surveys	Demographic and Health Survey (DHS)	X						X					X ¹	
	Multiple Indicator Cluster Survey (MICS)									X ²				
	MIS (conducted by LEADD)					X					X ³			
Health facility and other surveys	EUV survey					X	X	X	X	X	X	X	X	X
	Health facility survey				X				X					
Malaria surveillance and routine system support	Sentinel surveillance					X	X	X	X	X				
	Support to HMIS			X	X	X	X	X	X	X	X	X	X	X
	HMIS evaluation (see HSS section)								X		X			
Therapeutic efficacy monitoring	<i>In vivo</i> efficacy testing					X					X ⁴	X	X	
Entomology	Entomological surveillance and resistance monitoring					X	X	X	X	X	X	X	X	X
Other data sources	Malaria Impact Evaluation												X	
	ITN durability monitoring									X	X	X	X	X

¹ Ongoing discussion with partners regarding finances and year DHS will be conducted

² Funding by UNICEF

³ Funding by the Global Fund

⁴ Funding by WHO

Table M. Routine Surveillance Indicators

Indicators [Data source for all indicators is HMIS (monthly malaria for January – September 2015; October – December 2015 has not been validated)]	Value	Comments
Total number of reported malaria cases	1,075,618	
Total diagnostically confirmed cases	879,175	“Confirmed cases”
Total clinical/presumed/unconfirmed cases	195,717	“Cases treated, not confirmed”
Total number of suspect malaria cases	1,448,674	
<i>If available, report separately for outpatients and inpatients</i>		Not reported by outpatient/inpatient but by uncomplicated and severe cases
Number of reported uncomplicated malaria cases (outpatient)	982,938	
Diagnostically confirmed	805,790	
Clinical/presumed/unconfirmed	177,148	Not captured on report form (this is the number of cases minus the number of confirmed, but not actually reported on the form)
Number of reported severe malaria cases (inpatient)	92,680	
Diagnostically confirmed	74,111	
Clinical/presumed/unconfirmed	18,569	Not captured on report form (this is the number of cases minus the number of confirmed, but not actually reported on the form)
Total number of reported malaria deaths	1,132	
Diagnostically confirmed	N/A	Not captured on report form
Clinical/presumed/unconfirmed	N/A	Not captured on report form
Malaria test positivity rate (outpatients)	70.2%	Data for Jan-Sep 2015
Numerator: Number of outpatient confirmed malaria cases	879,901	
Denominator: Number of outpatients receiving a diagnostic test for malaria (RDT or microscopy)	1,252,957	
Completeness of monthly health facility reporting	92% (Jan-Sept)	District level: 98% complete
Numerator: Number of monthly reports received from health facilities	5,070	District level: 447
Denominator: Number of health facility reports expected (i.e., number of facilities expected to report multiplied by the number of months considered)	5,496	District level: 456 (38 districts x 12 months) Out of 426 missing health facility reports, 182 were from hospitals (43%)

Plans and justification

PMI is committed to working with the NMCP to support monitoring the quality of malaria data collected through HMIS and ensure that programmatic needs of the NMCP are met. There is an increased need to produce quality routine data to identify temporal and geographic variations of morbidity and mortality in endemic countries like Benin, and improving the quality of these data is of increased importance to PMI and the NMCP. In FY 2017, PMI will support key data collection and analysis activities, including two EUVs, enhanced epidemiological monitoring to intersect with entomologic monitoring, routine data validation workshops, and continued work towards strengthening the NMCP's SM&E strategy as well as the production of malaria bulletins. As part of the country's IRS roadmap, the NMCP, CREC, and other partners will begin to collaborate more closely with the Ministry of Agriculture and Environment to gather information on rainfall and agricultural insecticides being used and look for common interests regarding vector control. PMI will support the NMCP in generating improved HMIS in the IRS transition and withdrawal sites to ensure improved epidemiological data as part of this cross-sectoral approach to better understanding vector control and malaria transmission.

Proposed activities with FY 2017 funding: (\$670,000)

1. *Support national routine malaria information system:* PMI will continue support to strengthen procedures and indicators for malaria in the national HMIS and comprehensive strengthening of the overall system. The funding will support the NMCP's efforts to implement PMI's recommendations, in particular: 1) three semi-annual supervisions to health facilities from the national level; 2) production of quarterly and annual malaria epidemiological information bulletins, and 3) support in training and use of standardized graphs and data interpretation. (\$250,000)
2. *Monitor epidemiological effects of IRS transition and withdrawal:* PMI will strengthen epidemiological data through the routine health information system in order to better monitor the epidemiological effects of withdrawing IRS and transition to new IRS sites across three districts (one old IRS district and two new IRS districts) in the departments of Alibori, Atacora, and Donga. This activity will support additional supervision and monitoring of routine data recorded in the targeted areas to ensure data are routinely validated at the 8 selected health facilities per district (24 health facilities in all). This activity will serve as a first phase experience to inform and build on for future targeted routine health information strengthening activities. (\$250,000)
3. *SM&E technical assistance:* PMI will continue technical support to ensure quarterly data validation meetings occur at the regional level and build capacity at the health zone and department level to use DHIS2 for malaria data analysis. (\$120,000)
4. *Conduct EUV surveys:* FY 2017 funds will continue to support quarterly monitoring of the availability and utilization of key antimalarial commodities at the health facility level. (\$50,000)

7. Operational research

Table N. PMI-funded operational research studies

Completed OR Studies			
Title	Start date	End date	Budget
Implementation of a vector control strategy based on a combination of a pyrethroid ITN + a non-pyrethroid IRS at the community level to assess its protective efficacy against malaria in an area where <i>An. gambiae s.s.</i> has a high level of pyrethroid resistance.	4/2008	10/2011	\$300,000
Evaluation of a new technology (colorimetric test) for determining when to replace ITNs in communities.	06/2008	03/2009	\$37,000
Durability assessment of long-lasting ITNs in Benin.	07/2011	07/2013	\$200,000
Field testing of dried malaria-positive blood as quality control samples for malaria RDTs.	05/2014	01/2015	\$25,000
Ongoing OR Studies	Start date	End date	Budget
Title			
Correlating resistance to damage (RD) scores with long-lasting ITN performance and longevity in various field conditions in Africa	09/2015	09/2017	Approximately \$110,000
Planned OR Studies FY 2017			
Title	Start date (est.)	End date (est.)	Budget
<i>No planned OR activities</i>	n/a	n/a	n/a

NMCP/PMI objectives

The revised NSP (2014-2018) reiterates the importance of conducting OR as an essential strategy to measure impact of control and prevention activities, and to identify gaps and weaknesses to improve program implementation. Since Benin became a PMI focus country in 2008, OR has been integral in evaluating the efficacy of vector control strategies and assessing approaches to addressing malaria program deficiencies.

Progress since PMI was launched

With strong collaboration with CREC and the NMCP, multiple studies have been completed in Benin and have helped inform vector control strategies in various other PMI focus countries. In light of the increased resistance to pyrethroid insecticides used on ITNs, Benin completed a cluster randomized controlled study to examine the effectiveness of combining ITNs and IRS (using bendiocarb) to ITNs and carbamate-treated plastic sheeting, to full coverage with ITNs and the usual coverage as per NMCP policy (as the control arm). The primary endpoint was the incidence density rate of *P.falciparum* clinical malaria in children under six years of age. Results showed that households with IRS and ITNs or IRS and carbamate-treated plastic sheeting had lower entomological inoculation rates (EIRs) of 4.3 compared to 8 and 7.2 for the full coverage with ITN and control arms respectively. Clinical cases of

malaria decreased from 2.5 to 1.8 cases per child/year after IRS implementation. The use of IRS with a non-pyrethroid was successful in decreasing EIRs compared to communities using only ITNs.¹²

Another OR study completed in 2009 assessed a colorimetric test in comparison with the standard WHO cone bioassay test for insecticidal activities of deltamethrin. New and used/previously washed nets were tested by both the WHO cone bioassay and the colorimetric test. Results showed that the colorimetric test had a sensitivity of 93% and a specificity of 87% of accurately assessing levels of deltamethrin on ITNs, compared to the cone bioassay.¹³

National ITN distribution every three years is a key intervention in Benin's malaria control strategy. Data from the field indicate that ITN lifespan appears to vary according to intrinsic and extrinsic factors. In collaboration with CREC, PMI provided technical assistance to monitor two indicators of ITN durability: survivorship and integrity, to validate the three-year serviceable life assumption. Results showed that observed survivorship, after 18 months, was significantly less ($p < 0.0001$) than predicted, based on the assumption that nets last three years. Rather, predicted survivorship was closer to a two-year ITN serviceable life assumption ($p = 0.03$). Five factors were associated with degraded nets (loss of fabric integrity): washing frequency, proximity to water for washing, location of kitchen, type of cooking fuel, and low net maintenance. The main recommendation was that a two-year serviceable life for the current ITN intervention in Benin would be more programmatically efficient.¹⁴

Progress during the last 12-18 months

A study to determine the operational feasibility of using dried tube specimens as quality control and proficiency testing samples for malaria RDTs was completed in January 2015. Dried tube specimens proved effective (100%) concordance in all settings, although specimens stored under refrigeration appeared more stable, especially after 20 weeks of age. Still, the findings strongly suggest that dried tube specimens can be successfully implemented as a quality control method for RDTs in the field. Improved quality control may increase health worker confidence in RDT results and increase the proportion of suspected malaria cases that are confirmed by a test prior to the administration of ACTs. By contrast, this change should also decrease unnecessary antimalarial drug prescriptions to patients who test negative by RDT.

Recent studies of ITNs under field conditions have shown that the physical deterioration of nets is often a primary limiting factor in their effectiveness. In many cases, evaluations have shown the lifespan of nets is shorter than three years (the anticipated lifespan). To encourage innovation in ITN technology, textile engineers have developed RD scores based on laboratory tests designed to mimic the primary causes of damage under field conditions. Using RD scores has been proposed as a means to identify areas where changes in weave or net materials could increase the longevity of ITN and reduce costs. Current ITN products have been tested and ranked using this methodology. Using core PMI FY 2014 and FY 2015 funding, Benin has begun validating RD scores of six different ITNs, including two products with modified net structures (e.g., increased fabric weight, different knitting patterns) designed to increase their resistance to damage. The data generated by the study is expected to validate the RD scores as predictors of field durability, allow for differential pricing of long-lasting ITNs based upon

¹² Corbel V, *et al.* 2012. Combination of malaria vector control interventions in pyrethroid resistance area in Benin: a cluster randomized controlled trial. *Lancet Infect Dis*, 12: 617-26.

¹³ Green M, *et al.* 2009. Rapid colorimetric field test to determine levels of deltamethrin on PermaNet surfaces: association with mosquito bioactivity. *Trop Med Int Heal*, 14: 381-88.

¹⁴ Gnanguenon V, *et al.* 2014. Durability assessment results suggest a serviceable life of two, rather than three, years for the current long-lasting insecticidal (mosquito) net (LLIN) intervention in Benin. *BMC Infectious Diseases* 14: 69 – 79.

their RD scores, and ultimately to spur innovation among industry to develop newer, longer-lasting ITNs.

Related to the RD score project, PMI has also supported OR to determine the impact of SBCC (with and without the provision of a repair kit) on the retention and useful life of ITNs. This recently completed study conducted among 300 households divided into two intervention arms (arm 1 received SBCC only; arm 2 received SBCC and a repair kit) and a control group recorded improvements in both intervention arms. Net attrition (i.e., the inability to sleep under a useable net) and net damage (measured by the WHO Proportional Hole Index) were both significantly lower in the intervention arms, as was overall net use by children under five years of age. Factors that reduce net effectiveness (e.g., washing) were also higher in the control group. Work to ensure these findings are integrated into routine programming will continue in FY 2017.

Abstracts based on findings from all completed OR studies were presented at the 2015 ASTMH conference in Philadelphia; manuscripts to move findings from these OR projects into the scientific literature are in process.

Proposed activities with FY 2017 funding: (\$0)

Given the need to focus on a substantial pipeline of data from previous OR projects, no additional OR activities are planned with FY 2017 funding. PMI staff and implementing partners will continue to support the ongoing OR project (through September 2017), and will contribute to the analysis and write-up of data from previously funded OR projects.

8. Staffing and administration

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Benin, 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 NMCP 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: (\$1,900,000)

1. *USAID staff and other in-country administrative expenses:* Support for one USAID PMI Resident Advisor, foreign national malaria-dedicated and cross-cutting staff, and other administrative local costs to USAID/Benin, including ICASS costs. (\$1,600,000)
2. *CDC technical staff:* Support one CDC PMI Resident Advisor. (\$300,000)

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

Mechanism	Geographic Area	Activity	Budget (\$)	%
GHSC-PSM	National	Procure ITNs, RDTs, ACTs, and SP	5,938,400	36%
IRS Task Order	Select Health Zones	TA and insecticide campaign 2018	4,100,000	25%
USAID	National	Staff and M&E TDY	1,600,000	10%
ARM3/new service delivery	National	MIP, CM, M&E	1,200,000	7%
NMCP	National	C-MIP, RMIS, Diagnostics, HSS, SBCC	962,600	6%
Community PIHI implementing organizations	Select Health Zones	iCCM and SBCC	650,000	4%
TBD - Supply Chain Contract	National	Pharma + EUV	500,000	3%
New private sector bilateral	National	HSS, private sector access	450,000	3%
CDC IAA	National	Resident Advisor and entomological capacity building	329,000	2%
CREC	Select Health Zones	Entomological and bednet monitoring	260,000	2%
New integrated health bilateral	National	National MIP and CM situation analysis	200,000	1%
TBD	Selected sites	TES in 2018	120,000	1%
US PQM	National	ILP QA	130,000	1%
TBD – Environmental Management	Select Health Zones	Environmental monitoring IRS	30,000	0%
Peace Corps SPA	National	PCVs and local malaria activities	30,000	0%
Total			16,500,000	100%

Table 2: Budget Breakdown by Activity

**President's Malaria Initiative – BENIN
Planned Malaria Obligations for FY 2017**

Proposed Activity	Mechanism	Budget (\$)		Geographic Area	Description
		Total	Commodity		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Entomological monitoring	CREC	190,000		Select health zones	Entomological surveillance for insecticide resistance and sleeping pattern monitoring in enhanced monitoring sites in northern Benin. CREC will collaborate with entomologists at the NMCP.
Subtotal Ento monitoring		190,000	-		
Insecticide-treated Nets					
Procurement of ITNs for pregnant women and children under five	GHSC-PSM	2,490,000	2,490,000	National	Procure 750,000 LLINs for distribution through routine ANC and EPI services.
Pre-positioning of ITNs at health facilities for routine distribution	GHSC-PSM	495,000		National	Deliver to health facilities 750,000 LLINs for distribution through routine ANC and EPI services.
Gap distribution in targeted schools	NMCP	80,000		Atlantique Department	Orientation, distribution, and monitoring of primary school distribution of nets in the Atlantique Department. Nets provided by GOB.
ITN durability and use monitoring	CREC	70,000		Selected sites	Durability and use monitoring of the 2017 campaign nets.
Subtotal ITNs		3,135,000	2,490,000		
Indoor Residual Spraying					

IRS implementation and management	IRS Task Order	4,100,000		Select health zones	In collaboration with CREC, NMCP, MOH district and local authorities, and with continued focus on building capacity, support IRS implementation in targeted areas. IRS operations include training of personnel, purchase of insecticide and related spray equipment, community mobilization, and implementation. Pursue NGenIRS support. Implementation in Alibori and Donga Departments. Capacity assessment for NMCP to determine directly-funded activities for 2018.
IRS campaign 2018: environmental monitoring	TBD – Environmental Management	30,000		IRS area	External environmental protection monitoring for IRS campaign - last review completed IRS campaign 2018
Capacity building entomology	CDC IAA	29,000		National	Support entomological monitoring and surveillance of vectors for insecticide resistance in spray areas and in sentinel sites. CREC will collaborate with NMCP members trained in entomology.
Subtotal IRS		4,159,000	-		
SUBTOTAL VECTOR MONITORING AND CONTROL		7,484,000	2,490,000		
Malaria in Pregnancy					
Procurement of SP	GHSC-PSM	90,000		National	Procure approximately 500,000 treatments of SP to cover all projected pregnancies with three SP doses. SP will be made available to both the public and private sector.
Community ANC/IPTp outreach	NMCP	86,000		National	Support community outreach of ANC with malaria in pregnancy interventions (SP, ITNs) to communities in areas with low IPTp coverage.

Malaria in pregnancy situation analysis	TBD-IHP	100,000		Select health zones	National assessment of state of malaria in pregnancy interventions and road map for achieving universal coverage.
Support supervision and refresher training	ARM3	300,000		National	Support on-site supervision and refresher training of health care workers including benchmark assessments, on the spot-training and coaching for improved quality of service in MIP and case management.
Subtotal Malaria in Pregnancy		576,000	-		
SUBTOTAL PREVENTIVE		8,060,000	2,490,000		
CASE MANAGEMENT					
Diagnosis and Treatment					
Procurement of RDTs	GHSC-PSM	1,102,400	1,102,400	National	Procure approximately 2,000,000 RDTs which will cover most of the nationwide needs, for use in health facilities and at the community level among CHWs.
Procurement of ACTs	GHSC-PSM	1,751,000	1,751,000	National	Procure approximately 1,700,000 ACT treatments. All procurement will be treatments of AL. AS-AQ is procured by the NMCP through other sources.
Procurement of injectable artesunate for treatment of severe malaria	GHSC-PSM	10,000		National	Support with transition to injectable artesunate.
Support supervision and strengthen malaria diagnostics	NMCP	100,000		National	Support supervision and monitoring of malaria diagnostics, maintenance of microscopes, training, and quality control of slides/RDTs at the health facility and community levels.

Support quality improvement and supervision of health workers	ARM3	550,000		National	Provide support to departments and health zones to conduct on-site supervision of health workers including benchmark assessments and coaching which includes supervision of clinical, diagnostic, and logistics activities. Technical assistance for national diagnostics.
Support therapeutic efficacy study	TBD	120,000		Two sites	Support therapeutic efficacy testing of antimalarial drugs at two sites.
Malaria case management situation analysis	TBD-IHP	100,000		National	National assessment of state of malaria case management and road map for achieving universal coverage.
Support community case management	Community PIHI implementing organizations	500,000		Select health zones	Support integrated community case management of childhood illness in 10 health zones supported by USAID which will cover CHW training, reporting registers, mobile phone reporting, supervision, and medical waste safety boxes.
Subtotal Diagnosis and Treatment		4,233,400	2,853,400		
Pharmaceutical Management					
Supply chain strengthening	TBD - Supply Chain Contract	450,000		National	Support national action plan for strengthening DPMED, CAME regional offices, and zonal depots and the logistics information system.
Supervision of LMIS	NMCP	86,600		National	Routine LMIS supervision from NMCP and departments to the health zones, including the health centers. (Supervision within health zones covered under case management quality improvement).

Quality control of malaria commodities	PQM	130,000		National	Provide support to the national laboratory for quality control to conduct routine testing of ACTs entering the port and spot checks at public and private facilities. Support the cost of reagents and equipment for testing.
Subtotal Pharmaceutical Management		666,600	-		
SUBTOTAL CASE MANAGEMENT		4,900,000	2,853,400		
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Support capacity building of the NMCP	NMCP	100,000		National	Direct support for strategic and integrated planning with partners, management of technical working groups, human resource capacity building (e.g. data manager, accountant), staff training as per a gap analysis, some sponsorship for participation in international conferences, and some NMCP operational running cost gaps (i.e. internet, funds for generator maintenance, and fuel).
Peace Corps Response Volunteers and Small Project Grants	SPA	30,000		Select sites	Support to maintain two Response Volunteers in Benin (\$20,000) and to supervise volunteers throughout the country, as well as to support small project grants for malaria for which volunteers can submit applications (\$10,000).
Improve environment for delivery of malaria services and products by the private sector	TBD-PSSP	450,000		National	Support improvements in regulatory environment to enable affordable, quality malaria services and product delivery by the private sector.
SUBTOTAL HSS & CAPACITY BUILDING		580,000	-		
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					

Technical assistance for SBCC and national malaria communication campaigns	ARM3	230,000		National	Support nationwide malaria communication campaigns in collaboration with the MOH, Global Fund, UNICEF and other partners. Develop messaging and localized campaigns that respond to finding of the socio-anthropological data collection in the north. National SBCC campaign work will be coordinated with the IRS technical assistance activity to ensure that SBCC materials developed for areas from which IRS has been withdrawn are reflected in national SBCC strategies, messages and campaigns -- and vice versa.
World Malaria Day event in Benin	NMCP	10,000		National	Support organization of the national World Malaria Day campaign. Develop plan with NMCP for transition/absorption of expenses of annual campaign from national budget.
Support implementation integrated community health communication plans at community and household levels	Community PIHI implementing organizations	150,000		Select health zones	Support household visits and group education to promote ITN use, recognizing signs of malaria and increasing care-seeking behavior and encouraging ANC attendance and IPTp through women's groups, CHWs, and mass media.
SUBTOTAL SBCC		390,000	-		
SURVEILLANCE, MONITORING, AND EVALUATION					
Improve malaria reporting through the national health information system using the DHIS2 platform	NMCP	250,000		National	RMIS strengthening including production of quarterly RMIS bulletin, data quality assurance, maintenance of the database, and a data manager.
Monitor epidemiological effects of IRS transition and withdrawal	NMCP	250,000		Selected health zones in Northern Benin	Support better monitoring of the effects of withdrawing IRS and transition to new IRS sites across three health zones/districts (one former and two new IRS sites). Routine recording and validating of data will occur in eight health facilities per district.

M&E technical assistance	ARM3	120,000		National	Technical assistance to the NMCP to conduct DQA and analyses to strengthen validity of national RMIS and IRS transition monitoring
Conduct EUV surveys	TBD - Supply Chain Contract	50,000		Two departments	Monitoring of availability and utilization of key antimalarial commodities at the health facility level. Two per year.
SUBTOTAL SM&E		670,000	-		
OPERATIONAL RESEARCH					
N/A					
SUBTOTAL OR		-	-		
IN-COUNTRY STAFFING AND ADMINISTRATION					
CDC	CDC IAA	300,000		National	Support for one USAID PMI Resident Advisor and one USAID locally-engaged senior malaria specialist as well as one CDC PMI Resident Advisor, one financial analyst, one (80%) logistician, and all local costs related to sitting in USAID Mission.
USAID	USAID	1,600,000		National	
SUBTOTAL IN-COUNTRY STAFFING		1,900,000	-		
GRAND TOTAL		16,500,000	5,343,400		