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 2016 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.


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PRESIDENT'S MALARIA INITIATIVE



# PRESIDENT'S MALARIA INITIATIVE

# Ghana

# Malaria Operational Plan FY 2016

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## ABBREVIATIONS and ACRONYMS

| | |
|---|---|
| ACT | Artemisinin-based combination therapy |
| AGA | AngloGold Ashanti Mining Company |
| AGAMal | AngloGold Ashanti Malaria Control Program |
| ANC | Antenatal care |
| BCC | Behavior change communication |
| CDC | Centers for Disease Control and Prevention |
| CHPS | Community-based Health Planning and Services |
| CMS | Central Medical Stores |
| CWC | Child Welfare Clinics |
| DFID | U.K. Department for International Development |
| DHIMS2 | District Health Information Management System |
| DHS | Demographic and Health Survey |
| FY | Fiscal year |
| GH-FDA | Ghana Food and Drug Authority |
| GHS | Ghana Health Service |
| Global Fund | Global Fund to Fight AIDS, Tuberculosis and Malaria |
| GOG | Government of Ghana |
| iCCM | Integrated community case management |
| IPTp | Intermittent preventive treatment of pregnant women |
| IRS | Indoor residual spraying |
| ITN | Insecticide-treated bednet |
| KAP | Knowledge, Attitudes and Practices |
| MaVCOC | National Malaria Vector Control Oversight Committee |
| M&E | Monitoring and evaluation |
| MICC | Malaria Inter-Agency Coordinating Committee |
| MICS | Multiple Indicator Cluster Survey |
| MIP | Malaria in pregnancy |
| MIS | Malaria Indicator Survey |
| MOH | Ministry of Health |
| MOP | Malaria Operational Plan |
| NHIA | National Health Insurance Agency |
| NMCP | National Malaria Control Program |
| OTCMS | Over the Counter Medicine Sellers |
| OTSS | Outreach Training and Supportive Supervision |
| PMI | President's Malaria Initiative |
| RDT | Rapid Diagnostic Test |
| RMS | Regional Medical Stores |
| SP | Sulfadoxine-pyrimethamine |
| USG | United States Government |
| USAID | United States Agency for International Development |
| WHO | World Health Organization |

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

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

This FY 2016 Malaria Operational Plan presents a detailed implementation plan for Ghana, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Ghana, 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 2016 funding.

The proposed FY 2016 PMI budget for Ghana is $28 million. PMI will support the following intervention areas with these funds:

**Insecticide-treated nets (ITNs):**
Ghana's ITN strategy aims to achieve universal coverage of ITNs through complementary distribution channels: mass campaigns, via primary schools, antenatal care (ANC) clinics, and vaccination programs offered through child welfare clinics (CWC). The restart of facility-based distribution through ANC and CWC clinics has proven successful; a total of 1,144,100 ITNs were distributed through those channels in 2014. Following the completion of the 2014-2015 mass distribution campaign, Ghana will refocus efforts to strengthen continuous distribution channels by restarting school distribution in 2016. With FY 2016 funding, PMI will continue working with the NMCP, Global Fund, and DFID to sustain universal coverage through the continuous distribution strategy. PMI will procure and distribute 1,400,000 ITNs through continuous distribution channels, support the GOG to support a successful national continuous distribution system, and promote ITN use through targeted, effective communication efforts.

**Indoor residual spraying (IRS):**
The NMCP's 2014-2020 National Strategic Plan aims to protect at least 80% of the population at risk by 2020 through several malaria interventions, including IRS in areas with high parasite prevalence (i.e., >40% parasite prevalence). The PMI technical support for IRS in Ghana and related entomological monitoring continues to be an important component in malaria control. Epidemiological and entomological data from the PMI IRS spray districts have greatly increased the understanding of how IRS works and possible strategies to optimize its efficacy and deployment in Ghana. PMI supported anemia and parasitaemia monitoring beginning in 2010 (pre-IRS) to assess the impact of IRS in the Bunkpurugu-Yunyoo District in northern Ghana. After the switch to organophosphates in 2013, there was a decrease of more than 50% in the overall rate of parasitemia when compared to data from 2012. The sharp decline in this indicator suggests a positive epidemiologic impact of changing pesticide used in 2013, while the steady improvement of key entomological indicators in 2011 and 2012 suggests a concomitant cumulative effect of pyrethroid use.

During the 2015 spray season, one spray round of long-lasting organophosphates was conducted in five IRS districts (Bunkpurugu-Yunyoo, East Mamprusi, Mamprugu Moagduri, West Mamprusi, and Kumbungu), covering 231,345 structures and protecting a population of 596,706 people. With FY 2016 funding, PMI plans to maintain its coverage of the same five districts in the Northern Region using organophosphates.

**Malaria in pregnancy (MIP):**
The National Guidelines for Malaria in Pregnancy (MIP) apply WHO's three-pronged approach: providing five or more doses of IPTp with SP, promoting the use of ITNs at the first ANC visit, and effective case management of malaria during pregnancy. During the past 12 months, PMI strengthened the pre-service education for midwives and community and public health nurses in 38 health professional schools—100% of the public sector facilities—and provided 8,500 malaria in pregnancy (MIP) guidelines for the students. Further, PMI collaborated with NMCP and Ghana Health Service (GHS) to train more than 1,493 health care providers in MIP services. With FY 2016 funds, PMI will continue to support pre-service training activities as well as

increasing MIP services through strengthening ANC clinics and, where available, at community public health compounds.

**Case management:**
The NMCP requires confirmation of all suspected malaria cases in all age groups, by either microscopy or rapid diagnostic test (RDT), in accordance with WHO guidelines. For confirmed malaria cases, the NMCP strategy calls for widespread and prompt access to appropriate antimalarial treatment. PMI's primary strategy for improving malaria case management (diagnosis and treatment) is clinical and laboratory outreach training and supportive supervision (OTSS). Over the past year, PMI continued its extensive support to all aspects of strengthening malaria diagnosis and treatment, including training 1,160 health workers on the correct use of RDTs for malaria diagnosis in the four teaching hospitals. PMI also funded OTSS activities which reached 12,584 health workers across nine regions. With FY 2016 funds, PMI will continue to support comprehensive case management training, supervision, and quality improvement through pre-service training, continuation of OTSS, and with the procurement of an estimated 2.5 million RDTs and 1.3 million treatments. PMI will also continue critical support for strengthening Ghana's supply chain system to improve the management, distribution and availability of malaria commodities throughout the country.

**Health systems strengthening and capacity building:**
PMI supports a broad array of cross-cutting health system strengthening activities, such as training health workers, supply chain management, health information systems strengthening, drug quality monitoring, and NCMP capacity building. PMI's top health systems priority is to strengthen procurement and supply chain management, while also building capacity for quality assurance and supportive supervision, with a goal of sustainable and equitable health systems. Over the past year, PMI has continued to support two students in the Field Epidemiology Laboratory Training Program, fund small grants to Peace Corps Volunteers to facilitate malaria promotion activities in their communities, and strengthen the National Health Insurance Agency (NHIA) to build the capacity of private sector providers in under-served areas of Ashanti, Brong Ahafo, Central, Western and Eastern Regions to access financing and information on standards of quality for malaria services. With FY 2016 funds, PMI will continue to support a diverse range of activities, including: strengthening the capacity of the NMCP, ensuring that the NHIA continues to improve access to malaria diagnosis and treatment, and the NHIA capitation roll out.

**Behavior change communication (BCC):**
The NMCP National Malaria Behavior Change Communication Strategy (2010-2015) aims to guide the development of interventions and activities that raise awareness about malaria and address the key determinants of behavior for malaria prevention and control interventions, with the ultimate goal of a long-term normative shift in behaviors among the key target groups nationwide. In the past year, PMI continued to support mass media and interpersonal communication messages to increase awareness of and demand for malaria prevention and control interventions. PMI also supported a review of all communication materials this year, with the aim of revitalizing and reshaping future campaigns. With FY 2016 funding, PMI will build on previous BCC investments to promote correct and consistent use of ITNs, improved IPTp uptake, and strengthened malaria-related care seeking behavior. PMI will also work to

improve the capacity of GHS's Health Promotion Department to directly promote improved malaria prevention and care seeking behaviors.

**Monitoring and evaluation (M&E):**
The objectives of the *National Malaria Control Monitoring and Evaluation Plan (2014-2020)* are to reinforce the health information systems and processes to provide timely, accurate, reliable, and valid data for programmatic planning, management, and decision-making. PMI has contributed to strengthening Ghana's M&E system, and the number of health facilities reporting timely and complete data to the district health management information system (DHMIS2) has increased since national roll-out in 2012. Since 2008, PMI has supported three national-level household surveys to provide information on key malaria indicators (the 2008 and 2014 DHS, and the 2011 MICS). According to the 2014 DHS, from the pre-PMI period 2003 - 2008, to the PMI scale-up period from 2008–2014, all-cause under-five mortality has decreased. The FY 2016 PMI plan supports the NMCP to strengthen routine health information systems for malaria M&E through continued training and supportive supervision of regional, district and health facility data management staff. In line with NMCP and PMI strategies, FY 2016 support will continue monitoring nationwide insecticide resistance and efficacy of antimalarial drugs.

**Operational research (OR):**
The NMCP in Ghana has strong in-country technical capacity, which includes many experienced epidemiologists and entomologists and capacity for designing and implementing applied research. During 2010-2012, PMI supported an OR study that measured the prevalence of *Plasmodium falciparum* parasitemia and anemia in children under five years of age at baseline and following annual and bi-annual spraying in a northern district with a high malaria burden. Results from the study showed significant impact of one-spray round of IRS. Results from a formative study on outdoor sleeping and nighttime activities in the Upper and Northern Regions suggest that human outdoor exposure to malaria vectors may limit the impact of indoor-oriented vector control measures. Using reprogrammed FY 2015 and FY 2016 funding, PMI will support an OR study to examine the roles that human and vector behavior play in outdoor exposure to malaria transmission.

# 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.

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

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

This FY 2016 Malaria Operational Plan (MOP) presents a detailed annual implementation plan for Ghana, based on the PMI Strategy and the National Malaria Control Program (NMCP) *National Malaria Control Strategy for 2014-2020*. It was developed in consultation with the NMCP and with the participation of national and international partners, including the Global Fund, to Fight AIDS, Tuberculosis, and Malaria (Global Fund) who have been involved in malaria prevention and control in the country. The proposed PMI-supported activities are in line with the National Malaria Control Strategic Plan and build on investments made by PMI and other partners to improve and expand malaria-related services. This document briefly reviews the current status of malaria control policies and interventions in Ghana, 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 2016 funding.

## 2. Malaria situation in Ghana

Malaria is endemic and perennial in all parts of Ghana, with seasonal variations that are more pronounced in the northern part of the country. The length of the malaria transmission season varies by geographic region in Ghana, depending on the length of the dry season (December-February) during which there is little transmission. In Ghana, there are two major transmission patterns. In the northern part of the country, there is a six to seven month transmission season, with the highest number of cases occurring between July and November. In the southern part of Ghana, the transmission season is nine months or more, with a small peak from May to June and a larger peak from October to November. Although Ghana's entire population of 24.2 million is at risk of malaria infection, children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity.

Malaria cases seen in health facility outpatient departments have increased from approximately 250 per 1,000 population in 2000, to about 437 per 1,000 population in 2012. Over the same period, there was an increase in total outpatient department cases from 4.9 million to 11.3 million, resulting from better access to health due to the expanding coverage of the National Health Insurance Scheme, expanded geographical access to health care through increasing the number of Community-based Health Planning and Services (CHPS) compounds, improved data reporting, and continued presumptive diagnosis of malaria. Malaria admissions also increased from approximately 5 per 1,000 persons to approximately 17.5 per 1,000 persons, driven largely by the same reasons as those driving the increase in outpatient department cases. However, significant reductions in malaria mortality have been observed with the institutional case fatality rate among children under five declining from 14.1% in 2000 to 0.6% in 2012. Geographically, those regions that had the highest parasitemia prevalence in 2011 have seen large decreases, while most of the other regions have seen small increases (Figure 1). As a result the national parasitemia prevalence among children under five has remained stable at approximately 27-28% between 2011 and 2014.

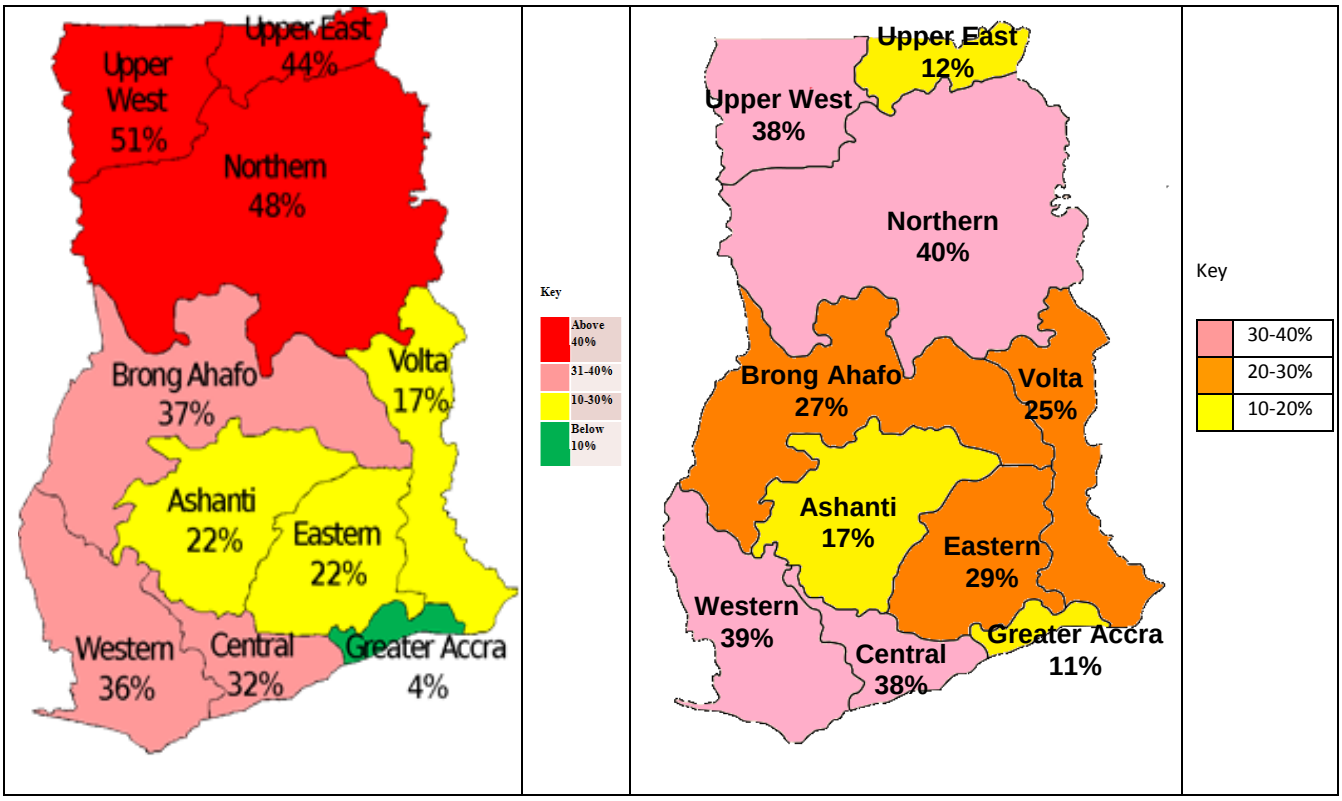
Ghana is urbanizing rapidly, with the 2010 census demonstrating that over 50% of the population now live in urban areas. According to published research, the 2011 Multiple Indicator Cluster Survey (MICS), the PMI-supported Ghana Urban Malaria Study in April 2013, and the DHS 2014, malaria transmission tends to be significantly less intense in urban areas, with parasite prevalence of 15% in urban areas compared to 38% in rural areas in 2014. The Urban Malaria Study further revealed that parasitemia rates among children under five years in the three largest cities (Accra, Kumasi and Tamale) were found to be significantly lower than in rural areas within the same ecologic zones.

*Plasmodium falciparum* accounts for 85-90% of all infections. *Plasmodium malariae (*<10%) is also found and more rarely *P. ovale* (0.15%). No cases of *P. vivax* infection have been detected in Ghana. Mixed infections of *P. falciparum* and *P. malariae* are not uncommon. The major vectors are *Anopheles gambiae* species complex and *An. funestus*. These species generally bite late in the night, rest both indoors and outdoors, and are most abundant in the rural and peri-

urban areas. Outdoor biting is common in the northern savannah (>50% outdoor biting pre-IRS was documented at several monitoring sites in the northern region). *An. melas* is found in the mangrove swamps of the southwest and *An. arabiensis* has been observed in the savannah areas of northern Ghana.

**Figure 1. Malaria Prevalence (by microscopy) in Children 6-59 months, by Region, 2011 and 2014.**

**2011 MICS** **DHS 2014**




*Both surveys were implemented during the peak transmission season: mid-September – mid-December

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

The Ministry of Health (MOH) exercises oversight and control over policy formulation and monitoring progress towards achieving established targets. The Ghana Health Service (GHS) is responsible for delivery of public health and clinical services, in parallel with the three teaching hospitals in Accra, Kumasi, and Tamale. The National Health Insurance Scheme, implemented since 2003, represents a major development in health system financing and has increased attendance at health facilities.

The GHS operates at three levels: national, regional (10 regions), and district (216 districts). Policies and major aspects of program design are developed at the national level by the central leadership and programs, such as the NMCP, while implementation and management of health

services is primarily the responsibility of the decentralized health management teams at the regional and district levels. The ratio of 0.6 nurses and 0.1 doctor per 1,000 population falls short of the WHO minimum of 2.2 and 0.2 per 1,000 population, respectively, needed by countries to achieve the Millennium Development Goals. There are 321 hospitals, 760 health centers, 1,124 clinics, and 379 private maternity homes in the country. Of these, 83% are in the public sector and 9% are faith-based institutions, most of which are closely integrated with the GHS. The remaining 8% of facilities are in the private sector and located primarily in the larger cities.

The GHS has rolled out an updated electronic District Health Information Management System (DHIMS2). The system was scaled up in early 2012, with PMI supporting improvements in malaria data quality. By mid-2012, the DHIMS2 system was providing monthly reports that met the NMCP's benchmarks that at least 90% of 216 districts report malaria morbidity and mortality data through DHIMS2, resulting in the phase out of NMCP's parallel reporting system.

The penetration of the GHS services at the community level is variable. The GHS uses the CHPS approach to extend services to underserved communities. The CHPS program was launched to address the challenge that, at the time of the launch, more than 70% of all Ghanaians lived over eight kilometers from the nearest health care provider,[1] a problem exacerbated by poor road and transportation infrastructure. CHPS compounds provide access to community health nurses in communities of at least 6,000 people. Since its inception in 1999, as of 2012, CHPS has scaled up from 300 to 1,863 functional CHPS compound. A CHPS compound refers to the base of operation for a community health nurse and consists of, at a minimum, a two-room facility with equipment for basic curative and preventive care. In many rural areas, networks of government-trained community health volunteers promote public health services. A typical district with a population of approximately 100,000 people has one district hospital, 5 health centers and between 10-15 CHPS compounds.

The NMCP is a program within GHS that is the principal recipient of grants from Global Fund. The NMCP manages all clinical and community-based interventions related to malaria. With government decentralization of services in Ghana, regional and district level malaria control activities are managed and implemented by the Malaria Focal Persons and/or the Disease Control Officers who report to the Regional and District Health Management Teams.

## 4. National malaria control strategy

In the past two decades, Ghana has consistently improved malaria control methods, increased resources for malaria prevention and control, and promptly adopted revised international technical standards. Between 2002 and 2004, Ghana adopted artemisinin-based combination therapy (ACTs) as the first-line antimalarial therapy for uncomplicated malaria. IPTp with sulfadoxine-pyrimethamine (SP) was adopted as the national policy between 2003 and 2004 and implemented by the Reproductive Health Division in collaboration with the NMCP. In 2003, international support for malaria control increased sharply; Ghana benefited from a succession of Global Fund grants, the launch of PMI in 2007, and significant additional support from the U.K.

[1] Ministry of Health of the Republic of Ghana. 1998. A profile of health inequities in Ghana. Accra: Ministry of Health.

Department for International Development (DFID), the United Nations Children's Fund (UNICEF), the World Bank, and the governments of Japan, China, and Cuba. Beginning in 2005, IRS was implemented on a district-wide scale by the AngloGold Ashanti Mining Company (AGA) in Obuasi, Ashanti Region. The availability of unprecedented external resources encouraged the NMCP to pursue an aggressive scale up of proven malaria control methods from 2008 to present.

In light of the marked inter-regional and urban/rural difference in malaria burden, the NMCP, in collaboration with major malaria partners, namely the Global Fund, DFID, and PMI, are moving away from the de facto one-size-fits-all approach to programming malaria control interventions which has characterized the past decade. Moving forward, every effort is being made to tailor malaria control and case management interventions based on the unique needs of different localities.

In 2013, the national malaria strategy was reviewed with support from the Roll Back Malaria and partners which resulted in the report of the Malaria Program Review and an *Aide Memoire* that was signed by the Minister of Health and development partners in January 2014. Based on the recommendations from the Malaria Program Review and new and emerging interventions at the global level, the NMCP developed the *National Malaria Control Strategic Plan for 2014-2020,* which was finalized in August 2014. PMI provided support in the development of the new strategic plan.

The scope of the new strategic plan is to consolidate the recent gains and accelerate malaria control in the high transmission areas to further reduce malaria burden, and move towards establishing lower-transmission areas in Ghana by the end of 2020. The plan calls for reducing the malaria morbidity and mortality burden by 75% (using 2012 as baseline) by the year 2020 with the specific objectives outlined below:

- *To protect at least 80% of the population at risk with effective malaria prevention interventions by 2020*
    - To maintain the universal coverage already achieved, distribute ITNs through mass campaigns (one ITN per two persons) and continuous distribution through antenatal clinics (ANC), child welfare clinics (CWC) and primary schools, targeting pregnant women, children under five years, and school-aged children, respectively
    - IRS for areas with high parasite prevalence
    - Larval control that involves larviciding and environmental management in the context of integrated vector management
    - Seasonal Malaria Chemoprevention (SMC) implemented in phases in the northern part of the country where malaria transmission is highly seasonal
    - Prevention of malaria in pregnancy offered as a package of interventions including the use of ITNs and IPTp3 with SP

- *To provide correct diagnosis to all suspected malaria cases and prompt and effective treatment to 100% of confirmed malaria cases in accordance with treatment guidelines by 2020*
    - Routine laboratory testing by microscopy or rapid diagnostic tests (RDTs) to address the issue of rational use of ACTs. Ghana's policy recommends that all suspected malaria cases are confirmed in accordance with the "Test, Treat, and Track" Initiative. Strengthening health worker capacity for malaria case management via supportive supervision
    - Increasing access to underserved communities where there is no CHPS compound through the integrated community case management (iCCM)
    - Improving access to diagnosis and treatment in the private sector and enforcing adherence to guidelines in the private sector

- *To strengthen and maintain the capacity for program management, partnership, and coordination to achieve malaria programmatic objectives at all levels of the health care system by 2020*
    - Holding regional and national malaria reviews
    - Facilitating relevant committee and working group meetings
    - Advocating at corporate and parliamentary levels for increased resource allocation for malaria control activities
    - Ensuring efficient and effective procurement and logistics management
    - Developing and implementing a financing sustainability plan for accelerated malaria control

- *To strengthen the systems for surveillance and M&E in order to ensure timely availability of quality, consistent and relevant malaria data at all levels by 2020*
    - Enhancing routine surveillance and coordinated monitoring of program progress
    - Supporting population based surveys: Demographic and Health Survey (DHS), Multiple Indicator Cluster Survey (MICS), Malaria Indicator Survey (MIS), and Knowledge, Attitudes and Practices (KAP) survey
    - Improving data quality and dissemination of survey and surveillance reports

- *To increase awareness and knowledge of the entire population on malaria prevention and control so as to improve uptake and correct use of all interventions by 2020*
    - Advocating to political leaders, policy makers, opinion leaders and corporate bodies for support for malaria control
    - Advocating to health worker for conforming to the Test, Treat, and Track strategy for correct case management of malaria
    - Sustaining communication, education, and community mobilization to increase knowledge among the general population to enhance uptake of malaria prevention interventions (ITN ownership and use, IRS, IPTp, etc.)

In 2009, a revised Integrated Vector Control Strategy was released and a National Malaria Vector Control Oversight Committee (MaVCOC) was established with PMI support. This committee's mandate is to ensure safe and effective implementation and management of malaria vector control operations, in accordance with WHO guidelines and local Environmental

Protection Agency pesticides regulation requirements. This committee also serves as the technical advisory body on vector control to the NMCP and the Malaria Inter-Agency Coordinating Committee (MICC). In 2014 MaVCOC, released a new standard operating procedure for IRS.

Since 2008, the MOH has sponsored the Cuban Labiofam company to conduct larviciding, beginning with a pilot in central Accra and expanding to central urban districts of Kumasi, and Sunyani. Larviciding was not considered a stand-alone intervention, but instead, part of NMCP's integrated vector management and was conducted in areas where breeding sites were few, fixed, and findable. As the number of unbiased studies on its efficacy or effectiveness in Africa is limited, larviciding in Ghana was also conducted within the context of generating data on its impact.[2] Recently, however, these activities have been suspended due to financial constraints.

## 5. Updates in the strategy section

PMI updated the strategy section during the development of FY 2014 and FY 2015 MOPs in light of the new epidemiological data and based on the National Malaria Control Strategic Plan for 2014-2020 which was developed by NMCP in collaboration with all stakeholders. There are no further updates in the strategy section at this time.

## 6. Integration, collaboration, and coordination

### *Funding*

In Ghana, PMI has traditionally provided technical assistance and filled funding and commodity gaps in support of the country's malaria control program. PMI supports key, evidence-based malaria control interventions, taking into consideration the contributions from the Government of Ghana (GOG), Global Fund, DFID, and other stakeholders to ensure priority interventions are scaled up, gaps are filled, and regional variations in malaria epidemiology and progress to-date are addressed.

Given the pivotal role played by the Global Fund grants in Ghana, PMI is working with the NMCP and the Global Fund to plan for the most effective use of resources available. During the FY 2016 MOP visit, discussions with the Global Fund were held to coordinate malaria control activities, address any gaps, and avoid duplication of efforts. Global Fund supports two active malaria grants—one to the AngloGold Ashanti Malaria Control Program (AGAMal), the primary recipient of the Round 8 Grant, and the other to the NMCP/MOH (Round 4), which have now been consolidated under the Global Fund's New Funding Mechanism.

Under Global Fund's recently implemented New Funding Model, Ghana will receive an additional funding of $42.7 million through year end 2017. This is in addition to the approximately $83 million still available under its previous grant. This represents a substantial decrease in Ghana's allocation from the Global Fund. While AGAMal previously planned to scale up IRS implementation to 40 districts, the current funding will not support the expansion.

[2]WHO, Global Malaria Program 2012
http://www.who.int/malaria/publications/atoz/interim_position_statement_larviciding_sub_saharan_africa.pdf

The NMCP is re-programming funds away from IRS, whose original grant value was $120 million, to cover other malaria control activities. Therefore, AGAMal will reduce its coverage from its current 25 districts to 10 districts in 2015. At present, there is no source of funds for this IRS project after 2016, although the NCMP and AGAMal continue to work towards securing this funding.

DFID expects to provide approximately £10 million (approximately $16 million) over five years beginning in 2013 to support malaria control in Ghana, including support for ITNs and malaria case management. DFID support includes financing the medicines for a SMC pilot in Upper West Region, in coordination with Global Fund, and support to improve data quality in the DHIMS2. PMI and DFID are coordinating closely on future program planning.

The USG is well-represented and engaged in oversight bodies in Ghana such as the Health Sector Working Group organized by the MOH, the Country Coordination Mechanism for the Global Fund, and the semi-annual health summits that draw participants from all over the country to review and plan national health interventions. In addition, the USG coordinates with malaria control stakeholders through multiple committees and subcommittees organized under the NMCP, including the MaVCOC, the LLIN Coordinating Subcommittee, Case Management Subcommittee, Communications Subcommittee, Resource Mobilization and Sustainability Subcommittee, and the Surveillance, Evaluation and Monitoring Committee. Ghana's Roll Back Malaria Coordinating Committee became defunct in 2008, a deficiency highlighted in the Malaria Program Review. With advocacy by WHO and PMI, this essential national body was revived in December 2013 as the Malaria Interagency Coordinating Committee (MICC). During this meeting, terms of reference for the MICC and its technical working groups have been reviewed, revised and approved. During the FY 2016 MOP visit, PMI sponsored a MICC meeting and, as part of the agenda, presented the PMI key activities and accomplishments to date. PMI also shared plans for the way forward with FY 2016 funds and received input from the MICC.

***Private Sector***

Ghana has a large and rapidly growing private sector whose engagement in malaria control has increased substantially during the past decade. This has encompassed corporate social responsibility programs (e.g. AGA/Global Fund, oil companies), work place health care promotion efforts (e.g. mines and plantations), and marketing of malaria medications and preventive services (e.g. pharmaceutical manufacturers, sanitation companies, and larviciding). As expected, not all private sector engagement has been aligned with NMCP policy or international public health interests (e.g., the distribution of substandard medications, the confusion of garbage control with *Anopheles* mosquito control, and the aggressive marketing of new health and diagnostic technology).

Recognizing that Ghana's categorization as a lower middle income country would lead to gradual decrease of international donor support, NMCP recently formed the Resource Mobilization and Sustainability Subcommittee with PMI support. This subcommittee aims to promote greater buy-in and involvement from private sector and the GOG.

PMI continues to work to improve malaria diagnostics, treatment, and referrals in the private sector, specifically community businesses, such as pharmacies and over the counter medicine sellers (OTCMS). PMI coordinates with the NMCP, GHS, National Drugs Program, Pharmacy Council, GOG researchers, pharmacy associations, and other stakeholders to introduce RDT diagnosis and scale up appropriate case management or referral of clients at OTCMS and pharmacies.

PMI also works with larger private sector companies involved in malaria control in Ghana. AngloGold Ashanti Mining Company, as part of its corporate social responsibility program, established a malaria control program in Obuasi in 2005 that includes IRS, targeted larviciding, and other interventions. The PMI and AGAMal IRS programs frequently collaborate in areas such as training and community mobilization, and continue to share best practices in operations, timing and duration of spray rounds, entomological monitoring, spray quality, insecticide selection, and procurement.

***Within USG***

PMI functions within the Global Health Initiative strategy and collaborates with other USG agencies supporting malaria control in Ghana such as Peace Corps, Centers for Disease Control and Prevention (CDC), Naval Medical Research Unit No. 3, Department of Defense, National Institutes of Health, and the State Department. Peace Corps volunteers are posted to United States Agency for International Development (USAID) projects to support community mobilization and promote malaria control interventions. Peace Corps volunteers have been specifically engaged in the ITN distribution, BCC and community mobilization activities and selected PMI operational research. The Department of Defense, National Institutes of Health, and Naval Medical Research Unit No. 3 support malaria vaccine research, surveillance of incidence and causes of fevers, laboratory system strengthening for infectious disease, and drug resistance monitoring. The CDC, under the President's Emergency Plan for AIDS Relief, continues to coordinate its technical assistance in strategic information, Field Epidemiology and Laboratory Training Program, and laboratory system strengthening.

The USG supports integrated health programs in Ghana to strengthen health systems while addressing specific goals in maternal and child health, nutrition, reproductive health, water and sanitation, malaria, and HIV/AIDS. USAID/Ghana works in all ten regions, at the community, district, and regional levels to encourage positive behavior change, improve the quality of service delivery, and improve health management systems, thereby achieving results across the full spectrum of health elements. PMI programs have been integrated into these efforts to ensure that malaria-specific content is strengthened (e.g. in training and quality assurance) and that health system strengthening will lead to improvement in malaria control indicators (e.g. improved availability of ITNs, RDTs and ACTs). In addition, PMI supports expanded case management interventions (e.g. lab and clinical supportive supervision, etc.) to ensure the entire country is covered.

PMI support to strengthen commodity supply chain management is combined with USG funding under the President's Emergency Plan for AIDS Relief and other Global Health Initiative areas, in a concerted effort to improve supply chain management for all pharmaceuticals and health commodities. PMI's contributions and technical assistance to strengthening IPTp is integrated

with the ANC program and includes support to strengthen training institutions for midwives throughout the country. Support for case management provided in concert with capacity building for management of other childhood illnesses, such as diarrhea and respiratory infections, brings added value to both PMI and maternal and child health programs.

## 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[3]

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

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

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key indicators recommended by the Roll Back Malaria Monitoring and Evaluation Reference Group 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 districts protected by IRS
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs
- Proportion of women who received two or more doses of IPTp for malaria during ANC visits during their last pregnancy

[3] http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

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

As in many African countries, PMI and the NMCP rely on nationally representative health surveys to track progress in coverage of malaria control interventions in Ghana. There have been five such surveys implemented by the Ghana Statistical Service and partners since 2003, each conducted during the late rainy season, albeit during different months and in some cases employing slightly different methods. The 2008 DHS, conducted in September-November 2008, provides the baseline for key PMI indicators. The 2011 MICS and 2014 DHS both incorporated a full malaria module, and were conducted in September-December. The 2014 DHS is the most recent population-based health survey.

The 2014 DHS was led by Ghana Statistical Service in collaboration with the National Public Health and Reference Laboratory, with support from PMI, Global Fund, UNICEF, United Nations Development Program (UNDP), United Nations Population Fund (UNFPA), Danish Ministry of Foreign Affairs (DANIDA), and International Labour Organization (ILO). The DHS program, a USAID-funded project, offered technical assistance in the implementation. Although the 2003 DHS and 2008 DHS included anemia testing, a new feature in the 2011 MICS and 2014 DHS included malaria prevalence data (using both microscopy and RDTs). The survey provided a unique nationwide snapshot of peak season malaria point-prevalence in children age 6-59 months, as referenced in Figure 1.

Ghana has achieved steady gains in many of the key malaria intervention indicators, as indicated in Table A. Between 2006 and 2014, ITN ownership and use, uptake of IPTp, and treatment with ACTs have all increased.

**Table A: Evolution of Key Malaria Indicators in Ghana from 2006 to 2014**

| Indicator | 2006 MICS | 2008 DHS | 2011 MICS | 2014 DHS |
|---|---|---|---|---|
| % Households with at least one ITN | 19% | 42% | 49% | 68% |
| % Households with at least one ITN for every two people | NA | NA | 25% | 45% |
| % Children under five who slept under an ITN the previous night | 22% | 39% | 39% | 46% |
| % Pregnant women who slept under an ITN the previous night | NA | 20% | 33% | 43% |
| % Rooms in PMI targeted districts protected by IRS | NA | >85%* | 93%* | 84%* |
| % Children under five years old with fever in the last two weeks for whom advice or treatment was sought | NA | NA | 50% | 56% |
| % Children under five with fever in the last two weeks who had a finger or heel stick | NA | NA | 16% | 34% |
| % Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs** | 3% | 12% | 18%*** | 37% |
| % Women who received two or more doses of IPTp during their last pregnancy in the last two years** | 28% | 44% | 64% | 67% |
| % Women who received three or more doses of IPTp during their last pregnancy in the last two years | NA | NA | NA | 38% |
| Malaria prevalence in children under five years old (RDT; microscopy) | NA | NA | 48%; 28% | 36%; 26% |
| % Children under five with haemoglobin <8.0 g/dL | NA | NA | 7 % | 8% |
| All-cause under five mortality | 111 | 80 | 82 | 60 |

* Source: Abt/AIRS annual report for 2008, 2011 and 2014; ** SP was adopted for IPTp in 2003; ACTs were adopted in 2004; *** The 2011 MICS did not distinguish adequately between responses for "amodiaquine" (23.6%) and "artesunate-amodiaquine," which was counted along with arthemeter-lumefantrin, dihydroartemisinin – piperaquine as "any ACT" (18%). Thus, the true figure may lie somewhere between 18% and an estimated 36%. Supporting this conclusion, government health centers and CHPS compounds were found to prescribe an implausible 55.6% "amodiaquine." Moreover, it has emerged that in popular speech, artesunate-amodiaquine is often called "amodiaquine."

## 9. Other relevant evidence on progress

There is no additional relevant evidence on progress at this time.

## 10. Challenges and opportunities

While essential for achieving PMI goals, health commodity supply chain reform has progressed slowly, due to competing stakeholder interests and lack of a strong and consistent will. Ghana has been plagued with perennial and recurring stock outs of essential medicines, due to financial

constraints and serious flaws in the supply chain system. In 2012, PMI supported the development of a National Supply Chain Master Plan as a major policy reform measure. After two years of partial implementation, the Ministry of Health began taking concrete actions towards full implementation during the latter part of 2014.

However, on Tuesday, January 13, 2015, a fire completely destroyed Ghana's Central Medical Stores (CMS) which warehouses and distributes all medicines, equipment, commodities, and other goods used by the Ministry of Health and its 24 agencies. The MOH estimates that $81 million worth of drugs, equipment and commodities were destroyed in this fire. The total loss of malaria commodities from various donors is estimated to be close to $15 million. These losses have endangered the supply of essential medical commodities, and once again highlighted the significant weaknesses in the system and the need for its urgent reform.

Each year, PMI donates over $10 million worth of malaria specific commodities to Ghana, including antimalarial drugs, RDTs, and ITNs, in addition to providing significant support to strengthen the pharmaceutical supply chain. With the loss of the CMS, there is a clear opportunity to reform supply chain management in Ghana. In the immediate aftermath, PMI provided most of the urgently required malaria commodities which included 1,217,057 treatments of pediatric ACTs (artesunate-amodiaquine [AS/AQ] and artemeter-lumefantrine [AL]). In addition, Global Fund procured 272,875 vials of artesunate injection. Further, the donors, in partnership with the GOG are providing technical assistance to develop a public-private pharmaceutical distribution system for program commodities as a more efficient, secure and accountable alternative to the previous system. Support is also being provided to identify and correct inadequate management controls in all ten Regional Medical Stores (RMS) and support a plan for immediate rectification of weaknesses. Consultations between the GHS, the MOH, and the country's development partners, including PMI are ongoing.

Currently, malaria diagnosis and treatment services are bundled under the National Health Insurance Agency (NHIA). As a result, malaria-related services are reimbursed regardless of whether a diagnostic test is performed. NHIA reforms are required over the long term in order to promote and appropriately incentivize diagnostic testing ensuring that malaria treatment is administered based on confirmation by microscopy or RDT.

Furthermore, delayed allocation of funds by the Government of Ghana to the resulting in delayed reimbursement to providers, continue to be a major challenge for the health sector. Long delays in reimbursing providers has often led to severe stress on the finances of health facilities which in turn leads to stockouts of essential medicines, including ACTs, and increases in out-of-pocket expenditure. Despite these challenges, NHIA continues to significantly increase access to health services. Since 2005, outpatient visits have increased 23 fold and NHIA is now estimated to cover 60% of the total heath expenditure. While malaria remains the fourth largest cost center of the NHIA, it is the most frequent diagnosed illness in the system.

Lack of harmonization in accounting practices on the previous government to government agreement with the Clinical Laboratories Unit led to the suspension of some activities to strengthen diagnostic capacity in Ghana, since third quarter 2013. A new agreement planned for

the end of 2015 will fund the implementation of outreach training and supportive supervision in all public sector facilities and a limited number of private facilities. In addition, the regional and district health teams have demonstrated capacity to directly manage agreements. This presents an excellent opportunity to use the GHS structure and support Regional Health Management Teams so they can tailor activities to their specific needs. PMI plans to provide direct financial support to GHS institutions as part of the FY 2016 funded activities.

The worsening macro-economic conditions in the country, with both a high balance of payment and trade deficit which led to rising inflation and rapidly depreciating currency, presents significant threats to short- and long-term economic growth and stability. Incomes continue to decline on a monthly basis due to depreciation of the local currency. Inadequate government support for the health sector beyond paying salaries of health staff also presents a significant threat to gains made thus far. The health system relies largely on donors for commodities, as well as most of its training needs. Although the central government recognizes the need to sustain present gains, domestic resource mobilization remains weak. PMI actively participated in the recently-formed Resource Mobilization and Sustainability sub-committee to develop a draft action plan, and has begun the implementation of some of the actions stated in the plan.

# III. OPERATIONAL PLAN

In Ghana, through the President's Malaria Initiative (PMI), the U.S. Government is committed to working closely with the GOG and in collaboration with the existing NMCP.

PMI collaborates and coordinates with the NMCP and other partners based upon the NMCP's strategic goals and priorities. The level of support for each primary intervention takes into consideration the contributions from the GOG, other bilateral and multilateral donors, such as the Global Fund and DFID, the non-governmental and private sectors, and other stakeholders. To ensure all investments are complementary, and that Roll Back Malaria and Millennium Development Goals are achieved, priority interventions are scaled up to fill gaps while avoiding duplication, and target interventions are employed to address regional variations in malaria epidemiology. PMI supports all interventions in the NMCP strategic plan except for environmental management and larviciding.

## 1. Insecticide-treated nets

*NMCP/PMI objectives*

Ghana's *National Malaria Control Strategy for 2014-2020* aims to achieve universal coverage of ITNs for the entire population, defined as one long-lasting ITN for every two people (which is quantified for procurement purposes as one net per 1.8 people to account for households with an odd number of occupants). Ghana completed its nationwide door-to-door distribution campaigns with a hang-up component at the end of 2012 and distributed more than 12.4 million long-lasting ITNs to households in all ten regions. In 2013 and 2014, the NMCP conducted continuous ITN distribution through health facility and school channels. The NMCP started mass distribution replacement campaigns during the latter part of 2014 in two regions and plans to continue throughout 2015 in rolling fashion to reach the remaining seven regions targeted in the 2014-2015 campaign.[4] In addition to mass distribution, continuous distribution efforts will be maintained. According to NMCP's current plans, the next mass distribution campaign will take place in 2017.

*Progress since PMI was launched*

After the completion of mass distribution campaigns in 2012, continuous ITN distribution through school-based mini-campaigns, antenatal care (ANC) visits and child welfare clinics (CWCs) has been the priority of NMCP and PMI in 2013 and 2014.

To maintain universal ITN coverage, the NMCP, with PMI support, pioneered a mixed model of continuous distribution channels in 2013 with a pilot to test the viability of ITN distribution through different channels, including: ANCs, CWCs (through the Expanded Program on Immunization), primary schools, and with e-vouchers in partnership with private sector shops in the Eastern Region. These distribution channels targeted, respectively, first registrants at ANCs,

[4] In planning for the 2014/2015 mass campaign, the NMCP decided to not include specific districts in the campaign because if they had also received IRS services (Upper West Region, 5 districts in Northern Region, and 1 district in Ashanti Region). Routine distribution is ongoing in this region.

children 18-24 months receiving their second measles booster vaccination, school-aged children in primary classes two and six, and the general public with the ability to purchase a subsidized net through private shops.

More than 99% of targeted school-aged children in classes two and six received nets during the pilot school-based distribution, and coverage rates for CWC and ANC were 98% and 50%, respectively. The low rate of ANC uptake was largely attributed to under reporting due to lack of dedicated space on the ANC form. In 2014, PMI worked with the NMCP and Public Health Division of the MOH to revise the ANC form. The addition of an exclusive space for ITNs will enable health workers to record ITNs distributed to pregnant women. This revision is being highlighted during the trainings for health workers. The evaluation of the Eastern Region's continuous distribution pilot confirmed that it was successful in sustaining the ownership gains made with the mass campaigns by replacing older nets as well as filling ownership gaps in households that the campaign did not completely reach.[5] Based on the coverage rates achieved and the exceptionally good level of cooperation from school authorities, the NMCP decided to scale up the distribution of ITNs nationwide using these three channels in 2014 and beyond. In addition to continuous ITN distribution at clinics, the NMCP started mass distributions during the latter part of 2014 with two regions and plans to cover all regions except Upper West by the end of 2015. School distribution has been suspended for 2015 because there are not enough nets available after the CMS fire. School distribution is scheduled to start again in 2016.

With PMI support, the NMCP also conducts communication and community mobilization activities to promote correct and consistent ITN use, with a target of 85% of pregnant women and 85% of children under five years of age sleeping under an ITN every night.

*Progress during the last 12- 18 months*

In the past year, PMI procured 300,000 long-lasting ITNs and supported continuous distribution of 2,517,900 ITNs through primary schools, ANC visits and CWCs. In addition, PMI supported the recent mass distribution campaign by ensuring the delivery of ITNs to the selected regions and providing technical assistance on monitoring and validations.

A National Continuous Distribution Monitoring Team, consisting of the NMCP and malaria key stakeholders, was formed and an orientation meeting was held in March 2015. In 2015, PMI revised ITN continuous distribution guidelines and trainings and supported the mass ITN distribution campaigns in Western and Brong Ahafo Regions and the national World Malaria Day in April. Additionally, PMI continued to support community mobilization and mass media communications to promote correct and consistent ITN use and care with behavior change communication (BCC) messages.

*School-Based Distribution*

The national school-based distribution of ITNs to students enrolled in classes two and six was led by the School Health Education Program in collaboration with the NMCP. It was organized in all ten regions during the second term of the 2013-2014 academic school year. Class

[5] For additional details, please see the "Results from Networks Ghana Eastern Region Continuous Distribution" presentation made at the 2014 VCWG Annual Meeting. The presentation can be downloaded at: http://www.rbm.who.int/partnership/wg/wg_itn/ppt/ws3/m9AKilian.pdf

enrollment registers were used to identify the students eligible for distribution. The supply chain for the nets was a successful collaboration with the Ghana Education Service. ITNs were positioned at the district stores and circuit supervisors coordinated the movement of the nets to schools in their catchment area. Once the nets arrived at the schools, distribution to students was supervised by the head teacher. Students received instruction on malaria, ITN use and care. Parent-teacher association meetings provided the platform for information dissemination on ITNs with the aim of encouraging household acceptance and use of ITNs. A total of 1,373,800 pupils attending classes two and six in more than 15,000 primary schools received nets and information on use.

*Facility-Based Distribution*
A total of 1,144,100 ITNs have been distributed through ANCs and CWCs in 2014. PMI continues to support supportive supervision for the health workers to help improve ITN distribution management, especially at lower level health facilities. PMI recognizes that proper training and education, health worker attrition, storage constraints, and accurate quantification of ITNs continue to be challenges associated with the health facility-based distribution channel. Careful monitoring of activities and supportive supervision must remain a priority to ensure continuous improvements in ITN distribution through clinics. Special BCC messaging has also been developed to promote accessing ITNs through ANC, as well as to encourage and increase use of that ITN once it is in the household. As a result of these continued efforts, PMI anticipates improvements in ITN ownership and use among pregnant women in Ghana.

*Mass Distribution*
During late 2014 and throughout 2015, the NMCP conducted mass campaigns in all regions except Upper West (which is covered by IRS), to replace nets distributed in 2011 and 2012. The NMCP distributed 1.3 million ITNs in Eastern and Volta Regions in November-December 2014 and 2.8 million ITNs in Western and Brong Ahafo Regions in April-May 2015. By the end of 2015 (September-December), it is expected that over 6 million ITNs will be distributed to the five remaining regions, completing the latest round of mass distribution. Throughout this campaign period, continuous distribution at the ANC and CWCs will be ongoing while school-based distributions are suspended until 2016.

As a result of the CMS fire, 1,436,660 ITNs were destroyed. Fortunately, the CMS had distributed many ITNs to all the RMS just before the fire; otherwise many more ITNs would have been lost. The devastating fire required the NMCP to reevaluate the mass campaign distribution timeline, as the remaining ITNs in country allowed only for distribution in two regions. An additional 6.5 million ITNs from the Global Fund are expected to arrive in September 2015, allowing for the mass distributions to resume.

*Communication and mobilization*
In 2014, PMI supported ITN-related BCC and community mobilization activities in all ten regions of the country. By the end of the year, 33 community radio stations disseminated massages on ITN use and care using 2,258 radio spots and 779 television spots. In 2014, PMI also supported BCC messaging to pregnant women, mothers and caregivers on use and care of ITNs at 24,000 primary schools and 4,342 health facilities. At the community level, over 1,500 community-based opinion leaders in rural and peri-urban areas were oriented to lead community events, (durbars) during which malaria prevention messages were disseminated.

In support of the school-based continuous distribution activities, 3,960 Parent Teacher Association meetings involving parents and school teachers are planned in the five regions scheduled to receive nets through this channel by the end of 2015. These meetings will be used as platforms for mobilizing families to promote consistent use and care of ITNs. Approximately 3,960,000 family heads and primary school teachers will be reached through this program. All of these efforts have been developed with the main purpose of bridging the net use gap, which is reported to be about 20 - 30% across the country.

*Commodity gap analysis*

The continuous distribution system was scaled up in 2014 and continued in 2015. The NMCP guideline for continuous distribution recommends procuring long-lasting ITNs in bulk to benefit from economies of scale, with shipments scheduled twice a year to cover the next six-month supply need. The ITN shipments are then divided and transported to Regional Medical Stores. Although there is no ITN distribution at primary schools in 2015, continuous distribution at the ANCs and CWCs is ongoing.

**Table B: ITN Gap Analysis**

| **Calendar Year** | **2015** | **2016** | **2017** |
|---|---|---|---|
| **Total Targeted Population**[1] | 26,203,550 | 26,860,820 | 27,534,536 |
| **Continuous Distribution Needs** | | | |
| Channel #1: ANC [2] | 1,013,553 | 1,038,977 | 1,065,036 |
| Channel #2: EPI [3] | 302,651 | 620,485 | 318,024 |
| Channel #3: Schools[4] | - | 1,324,492 | 678,140 |
| *Estimated Total Need for Continuous* | 1,316,204 | 2,983,953 | 2,061,199 |
| **Mass Distribution Needs** | | | |
| 2015 & 2017 mass distribution campaigns [5] | 8,800,000 | 0 | 7,648,482 |
| *Estimated Total Need for Campaigns* | 8,800,000 | 0 | 7,648,482 |
| **Total Calculated Need: Routine & Campaign** | **10,116,204** | **2,983,953** | **9,709,682** |
| **Partner Contributions** | | | |
| ITNs carried over from previous year | 2,800,000 | 0 | 0 |
| ITNs from Global Fund[6] | 6,595,676 | 1,824,209 | 3,535,552 |
| ITNs planned with PMI funding | 300,000 | 1,159,744 | 1,400,000 |
| **Total ITNs Available** | **9,695,676** | **2,983,953** | **4,935,552** |
| **Total ITN Surplus *(Gap)** | **(420,528)** | **(0)** | **(4,774,130)** |

1. Target population excludes people living in districts covered by IRS
2. Assuming 4% of the population becomes pregnant and ANC attendance is 96.7%
3. Assuming the population of children under one year is 3% and 77% EPI coverage
4. Because of the CMS fire and the planned mass distributions, school-based distribution was cancelled in 2015
5. Mass distribution campaigns are planned for 2014-15 and 2017-18 with coverage of one net per two individuals in the household. Approximately 50% of the distribution will take place in each of the years listed. The estimated need for 2018 is not included in this table
6. At the time of writing this MOP, with the exception of the Global Fund's commitment, contributions from other donors were not known

*Plans and justification*

PMI will strengthen multi-sectorial and stakeholder coordination for ITNs by supporting the NMCP to achieve and maintain high levels of ITN coverage. Activities will include improved planning, implementation, and monitoring of ITN distribution (e.g. strengthen validation procedures for point distribution of ITNs, on the job training of sub-district supervisors). PMI will continue to build capacity within the GHS and Ghana Educational Service to promote the uptake and sustained use of vector management interventions through community mobilization and BCC. Specifically, PMI will facilitate net use promotion activities at the community-level in schools; with the engagement of community volunteers and community leaders through the Peers for Regular Use of Nets program (Peers RUN); through community mobilization via community radio stations and deployment of mobile announcement vans; and via malaria information updates delivered at parent teacher association meetings.

PMI will continue to promote social and behavior change through community mobilization and mass media campaigns to create awareness about continuous distribution, and establish an overall net use culture by promoting correct and consistent ITN use and proper care of ITNs. The Peers RUN program, an innovative approach to community mobilization, will start in 35 communities in seven regions (Central, Western, Greater Accra, Ashanti, Eastern, Northern, and Upper East Regions). This pilot will be closely monitored and evaluated in the first quarter of 2016. If positive results emerge from the evaluation, the lessons learned will be disseminated and be used as the guiding principles for expansion to an additional 50 communities in these seven pilot regions, for a total of 85 communities engaged in this activity by the end of 2016. However, if the results from the pilot are not favorable, the program will not be continued and expanded.

Further detail on the ITN BCC strategy, background and rationale for promotion of ITN use and maintenance is covered in the BCC section of the MOP. In FY 2016, PMI will procure long-lasting ITNs for distribution through continuous distribution channels and provide technical and financial support to the NMCP and Ghana Educational Service to train staff for implementation.

*Proposed activities with FY 2016 funding: ($7,250,000)*

- *Procure and transport long-lasting ITNs:* Procure approximately 1,400,000 long-lasting ITNs to support continuous distribution channels (schools, ANC and EPI clinics) to contribute towards maintaining universal coverage of ITNs. The budget of $4.25 per unit (assumes $3.50 per ITN and $0.75 for transportation) includes transportation of ITNs to distribution points. *($5,950,000)*

- *Support, technical assistance for ITN distribution and supply chain:* Support the continuous distribution of ITNs through schools and health facilities (ANCs and CWCs) with support to the GHS/NMCP and Ghana Educational Service/School Health Education Program. Funds will support the costs of training, planning, supervision, operations, and M&E. Additional support will be provided for mass distribution, as needed. *($1,300,000)*

- *Support community-based communication efforts to promote correct and consistent use of ITNs:* Enhance the effectiveness of ITN continuous distribution efforts (via schools and facilities) through interpersonal, and community based communication activities that specifically promote correct ITN use and correct care practices. Targeted ITN-specific technical assistance will be provided to the National Malaria Control Program to ensure that overall ITN messages throughout Ghana remain state of the art. Support will also include community-level promotion of net use in schools and engagement of community volunteers and community leaders through the Peers RUN program, which is described in greater detail in the ITN section, above. (*This activity is budgeted in the BCC section.*)

## 2. Indoor residual spraying

*NMCP/PMI objectives*

The *Strategic Plan for Malaria Control in Ghana 2014-2020* aims to protect at least 80% of the population at risk by 2020 through several malaria interventions, including IRS in areas with high parasite prevalence (>40% parasite prevalence). Currently, the NMCP plans IRS coverage of 15 districts with PMI and Global Fund support: Upper West (9 districts), Northern (5 districts), and Ashanti (1 district) Regions.

*Progress since PMI was launched*

PMI began supporting IRS in Ghana in 2007, with a focus on local capacity building, strict environmental compliance, and entomological monitoring. In consultations with GHS, a cluster of districts in the Northern Region was selected for spraying due to a high malaria burden (>40% parasitemia in children under five), poor healthcare and economic infrastructure, and a relatively short unimodal malaria transmission season.

Within the first two years, the PMI IRS program demonstrated that IRS can be scaled up quickly and safely in remote rural areas. By 2011, working in collaboration with GHS and local communities, the program expanded to cover a population of over 920,000 in nine districts and employ approximately 1,300 people, with an increasing percentage of women being hired. In 2012, the emergence of pyrethroid resistance prompted the program to switch to more expensive organophosphates and, consequently, to decrease the number of districts sprayed from nine in 2012 to four in 2013.

To contribute toward the NMCP's and PMI's objective of national IRS capacity building, PMI supported the establishment of a Malaria Vector Control Oversight Committee (MaVCOC), to help the NMCP coordinate and guide IRS implementation. The committee includes partners such as AGAMal, the Noguchi Memorial Institute for Medical Research, the Environmental Protection Agency, the Ghana Atomic Energy Commission, Vestergaard, Bayer, and other vector control and IRS partners. The committee has been meeting quarterly since 2009 and has proven to be a dynamic, well-attended forum that provides technical guidance on vector control to support the NMCP in meeting national objectives for quality control, environmental compliance, and insecticide resistance management. It has established and disseminated national IRS standard operating procedures and facilitated information exchange and coordination of efforts for all major malaria control partners in Ghana.

PMI maintains 11 entomological monitoring sites located across four districts where PMI-supported IRS is currently ongoing or was previously conducted: Bunkpurugu-Yunyoo, Savelugu Nanton, Tolon, and Kumbungu. Three entomological sites are also located in Tamale municipality, which has never received IRS and serves as the untreated control for comparisons.

Ghana was the beneficiary of a five-year, $120 million Global Fund grant to further scale up IRS using AGAMal, a not-for-profit subsidiary of the gold mining company, AngloGold Ashanti Mining Company. Due to decreased funding, AGAMal scaled-down spraying from 25 districts in 2014 to 10 districts (nine in Upper West Region and one in Ashanti Region) during the 2015 spray season. Following PMI's lead, which sprays only once a year and has reduced the number of spray days from 53 to 36, AGAMal will now spray only once a year and reduce their spray season from five to three months. These recommended actions are expected to save Ghana's malaria control efforts considerable funding in future years. However, the current Global Fund grant to AGAMal ends after the 2016 spray season.

Although AGAMal, with support from the Global Fund, is the largest IRS implementer in Ghana, its decreased funding underscores the importance of PMI's focus on continuing to develop IRS practices that maintain high quality spray operations and monitoring, while also optimizing efficiency and targeting for increased impact. With MaVCOC helping to institutionalize a culture of evidence-based decision making in IRS, both the AGAMal and PMI programs have increased their investments in entomologic and epidemiologic monitoring over time. Table C illustrates the scale-up of PMI-supported IRS from 2008-2017.

**Table C: PMI-supported IRS activities, 2008-2017**

| Calendar Year | Number of Districts Sprayed | Insecticide Used | Number of Structures Sprayed | Coverage Rate | Population Protected |
|---|---|---|---|---|---|
| 2008 | 5 | Pyrethroids | 254,305 | > 85% | 601,973 |
| 2009 | 6 | Pyrethroids | 284,856 | 94% | 708,103 |
| 2010 | 8 | Pyrethroids | 342,876 | 97% | 849,620 |
| 2011 | 9 | Pyrethroids | 354,207 | 92% | 926,699 |
| 2012 | 9 | 5 Pyrethroids<br>3 Organophosphates<br>1 Both insecticides | 355,278 | 93% | 941,240 |
| 2013 | 4 | Organophosphates | 197,655 | 91% | 534,060 |
| 2014 | 4 | Organophosphates | 205,230 | 84% | 570,572 |
| 2015 | 5* | Organophosphates | 231,345 | 92% | 553,954 |
| **2016**** | 5 | Organophosphates | 238,000 | 90% | 615,000 |
| **2017**** | 5 | Organophosphates | 238,000 | 90% | 615,000 |

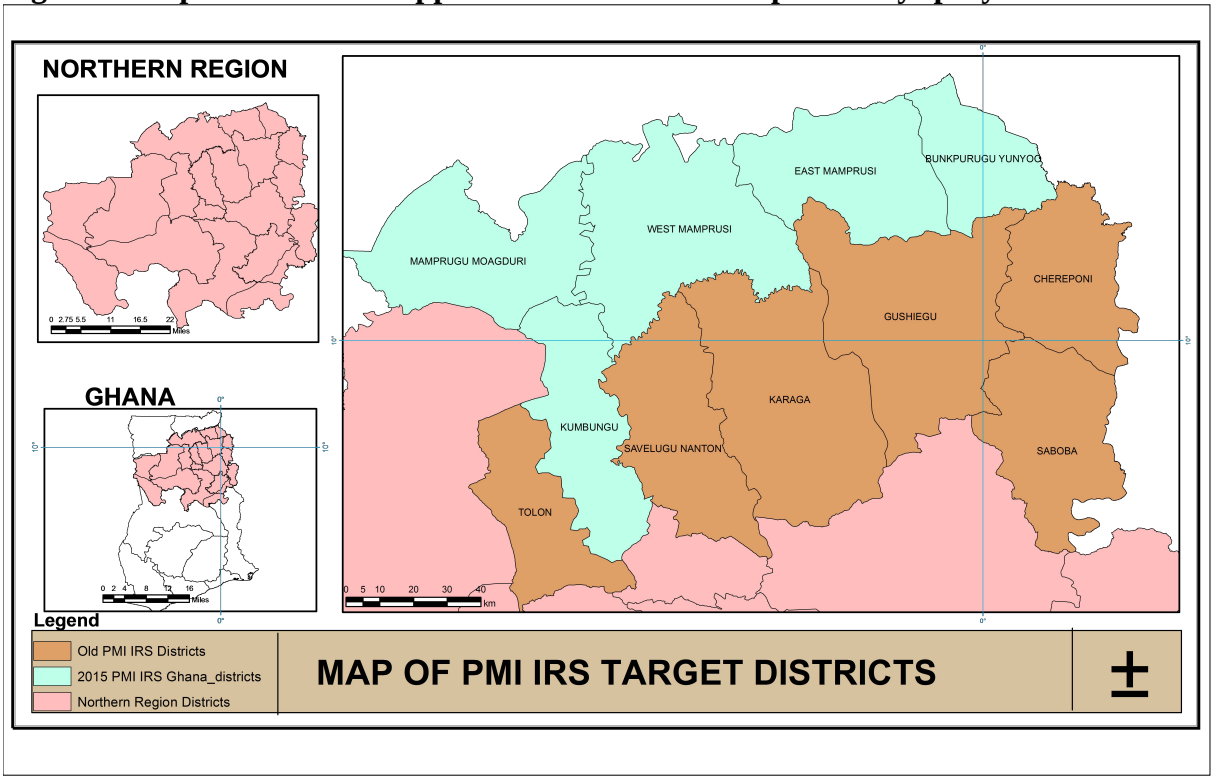
* One district was split into 2 districts: West Mamprusi became West Mamprusi and Mamprugu Moagduri ,
** Represents projected targets based on national strategic plan and/or discussions with the NMCP.

*Progress during the last 12- 18 months*

In 2015, one spray round was conducted and all five IRS districts (Bunkpurugu-Yunyoo, East Mamprusi, Mamprugu Moagduri, West Mamprusi, and Kumbungu). The coverage exceeded the PMI target of 85%, with overall coverage being 92%; this protected a population of 553,954 people, including 11,676 pregnant women and 98,575 children under five. There were 16 operational sites across the five districts, and the program provided seasonal employment to almost 800 workers from local communities, of which approximately one-quarter were women. The project also hired an additional 850 people in IRS operations, including 700 GHS community mobilizers. During the 2015 spray season, GHS and district assembly staff were embedded in PMI IRS operations and Regional EPA staff participated in poison management trainings and environmental inspections.

Until 2014, the program exceeded the 90% national target for coverage of structures found. However, improved enumeration of structures and improved monitoring in 2014 revealed that the true coverage was less than reported. As a result, overall coverage of the four districts was 83%, slightly below the PMI coverage target of 85%, in 2014. Three of the four IRS districts met or exceeded the 85% coverage target, but the fourth, Savelugu Nanton, had IRS coverage of 68%. The low coverage in Savelugu Nanton is believed to be due to its more urban nature and spray fatigue, since the district had been sprayed since 2008. Entomological monitoring data in Savelugu Nanton indicated that the entomological inoculation rate was zero in 2012 and 2013 and organophosphate/carbamate resistance was potentially emerging in the vector population (detected using ACE-1, the genetic resistance marker for acetylcholine esterase insensitivity). As a result of low IRS coverage and the entomological indicators, NMCP recommended that PMI-supported IRS be discontinued in Savelugu Nanton and re-started in Kumbungu District in the 2015 spray season (Figure 2). Kumbungu was chosen to replace Savelugu Nanton because it was one of the high coverage districts from which PMI-supported IRS was withdrawn in 2013 due to the switch to and high cost of organophosphates. Kumbungu was also chosen because of logistic considerations and the deterioration in its entomological indicators since withdrawal of IRS. In preparation for the withdrawal from Savelugu Nanton, meetings were held with district health and administrative officials to confirm that community mobilization and BCC messaging would continue to stress ITN use and that the district would continue to be covered under universal ITN distribution. Savelugu Nanton has continuous ITN distribution planned through ANC and CWC. In the Northern Region, ITN mass distribution took place in 2012, with campaigns scheduled to take place in 2015and 2017.

**Figure 2. Map of 2015 PMI-supported IRS districts and previously sprayed districts**




In 2014, PMI again supported anemia and parasitemia monitoring in Bunkpurugu-Yunyoo District, collaborating with Noguchi Institute to monitor the long term impact of IRS. From 2011 to 2013, when a pyrethroid insecticide was used, there was a modest, but statistically significant decline in parasitemia levels in Bunkpurugu-Yunyoo from 52.4% to 47.7% (p=0.005) (Table D). However, in 2013, when IRS switched to the use of an organophosphate insecticide, there was a significant decrease in parasitemia to 20.6% (p<0.005). Decreases in other malaria indicators occurred as well and all improvements were sustained through 2014.

**Table D: Selected epidemiological variables, Bunkpurugu Yunyoo, 2010-2014**

| IRS Insecticide | Pre-IRS | Pyrethroids | | Organophosphate | |
|---|---|---|---|---|---|
| **Malaria Indicators** | **2010** | **2011** | **2012** | **2013** | **2014** |
| **% children with positive RDT** | 69.9% | 70.4% | 66.0% | 28.8% | 29.1% |
| **% children with fever** | 69.4% | 59% | 43.9% | 22.1% | 26.4% |
| **Percent of children with asexual parasitemia (by microscopy)** | 52.4% | 50.0% | 47.7% | 20.6% | 22.2% |
| **Percent of children with anemia (Hb<11g/dl)** | 77.7% | 72.5% | 67.8% | 48.3% | 57.0% |
| **Percent of children with severe anemia (Hb<7g/dL)** | 7.0% | 4.6% | 3.4% | 0.8% | 2.1% |

The program has matured, completing its eighth spray round in 2015, with increased emphasis on evaluation, monitoring, and quality control. Enhanced entomologic monitoring, undertaken in

collaboration with the Noguchi Institute, has demonstrated that insecticides (from ITNs and IRS) have had a marked impact on several entomological parameters, including entomological inoculation rates, parity, and indoor resting densities. As noted in Table E, results from PMI's entomological monitoring activities demonstrate that IRS has contributed to the decline in malaria transmission potential in these high transmission areas.

**Table E: Selected entomological variables, IRS and non-IRS Districts, 2010-2014**

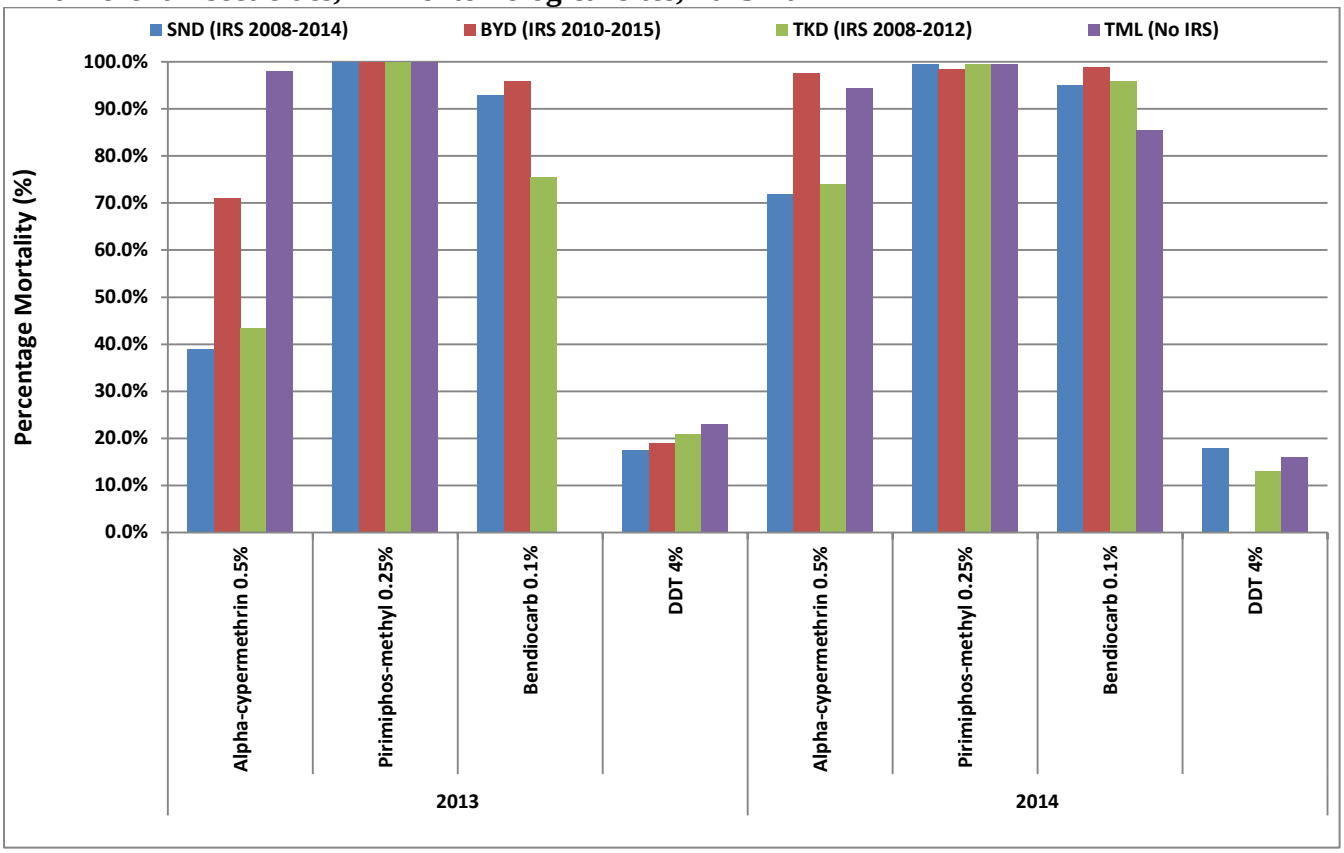
| **Bunkpurugu-Yunyoo (IRS)** | **2010 (Pre-IRS)** | **2011 (Pyrethroid)** | **2012 (Pyrethroid)** | **2013 (Organo-phosphate, OP)** | **2014 (Organo-phosphate, OP)** |
|---|---|---|---|---|---|
| [1] **Annual Entomological Inoculation Rate (EIR)** | 127.0 | 87.1 | 6.0 | 6.8 | 3.3 |
| [2] **Mosquito Parity** | 74.5% | 64.7% | 43.1% | 28.2% | 24.3% |
| [3] **Mosquito indoor resting density** | N/A | 3.0 | 1.5 | 0.2 | 0.1 |
| **Savelugu-Nanton (IRS)** | **2010 (Pyrethroid)** | **2011 (Pyrethroid)** | **2012 (OP)** | **2013 (OP)** | **2014 (OP)** |
| **Annual EIR** | 7.0 | 9.2 | 10.3 | 0.0 | 0.0 |
| **Mosquito Parity** | N/A | 44.8% | 37.4% | 27.5% | 28.1% |
| **Mosquito indoor resting density** | N/A | 1.2 | 1.6 | 0.4 | 0.7 |
| **Tolon-Kumbungu (Partial IRS)** | **2010 (Pyrethroid)** | **2011 (Pyrethroid)** | **2012 (Pyrethroid)** | **2013 (No IRS)** | **2014 (No IRS)** |
| **Annual EIR** | 21.0 | 24.0 | 102.8 | 93.3 | 166.9 |
| **Mosquito Parity** | N/A | 53.3% | 46.6% | 50.4% | 68.5% |
| **Mosquito indoor resting density** | 0.9 | 0.8 | 0.9 | 0.7 | 0.9 |
| **Tamale (Non-IRS)** | **2010 (No IRS)** | **2011 (No IRS)** | **2012 (No IRS)** | **2013 (No IRS)** | **2014 (No IRS)** |
| **Annual EIR** | 110.0 | 135.0 | 104.8 | 160.9 | 113.9 |
| **Mosquito Parity** | N/A | 68.6% | 65.8% | 64.3% | 72.3% |
| **Mosquito indoor resting density** | 3.1 | 2.6 | 1.6 | 1.7 | 2.3 |

[1] Mosquito Annual Entomological Inoculation Rate (EIR): no. infective bites/person/year
[2] Mosquito Parity: % of mosquitoes that had laid eggs
[3] Mosquito indoor resting density: no. mosquitoes/person/room/night

Resistance testing has revealed that mosquitoes remain susceptible to the organophosphate (pirimiphos-methyl, 0.025%, WHO assay) selected for IRS (Figure 3, below). Monthly wall bio-assays in 2013 and 2014 demonstrated IRS pesticide efficacy for pirimiphos-methyl of >80%

mortality for at least seven months, which was comparable in longevity to the previously used pyrethroid insecticide. During the past two years, PMI has supported the development of the National Insecticide Resistance Monitoring Partnership (NIRMOP). However, there was mixed success in completing assays due to problems with oversight and accountability. Improvement was seen in 2014, with resistance testing reported from 75% of sites. Among the sites that performed testing, on average, 42% of the required ten insecticides were tested for resistance. For 2015, PMI is supporting the establishment of ten National Insecticide Resistance Monitoring Partnership (NIRMOP) sites, with the consolidated activity led by Noguchi Institute. To date 100% of testing has been completed in the Southern part of Ghana, with operations moving to the north following the recent rains. Global Fund currently supports an additional ten NIRMOP sites, also managed by Noguchi Institute, and is expected to continue this support. After the IRS spray round was conducted in 2015, standard WHO cone assays were conducted in eight communities one to three days after spraying to test the quality of work by spray teams and to evaluate the potency of the insecticide on three main types of sprayed surfaces: mud, cement and wood. Results showed 100% mosquito mortality on all surfaces.

**Figure 3**. **Percentage mortalities of *Anopheles gambiae s.l.* exposed to diagnostic doses of different insecticides, PMI entomological sites, 2013-2014**




*Plans and justification*

Given the maturity and success of PMI's IRS program and with the importance of IRS in NMCP's strategic plan, PMI will maintain its current coverage of five districts in the Northern

Region for FY 2016 using long-lasting organophosphates. Although PMI will not continue anemia and parasitemia monitoring in Bunkpurugu Yunyoo, PMI in collaboration with NMCP, is planning to collect and analyze routine facility level data for febrile children during the peak malaria transmission season in areas with current PMI supported entomological surveillance.

PMI will also continue to play a critical role in building national capacity for IRS and informing the national strategy through its support of sentinel entomological monitoring sites in PMI-supported IRS areas. PMI will support ten sentinel insecticide resistance monitoring sites as part of NIRMOP, as well as the maintenance of a national database for insecticide resistance and entomological monitoring data, to be overseen by the Noguchi Institute.

*Proposed activities with FY 2016 funding: ($5,069,000)*

- *Support for IRS program implementation:* Support IRS implementation and programmatic evaluation in five districts in the Northern Region. Funding will support entomological monitoring, spray operations, data collection, environmental assessment and compliance monitoring, BCC activities including community mobilization, and logistics. Proposed activities include continued support for procurement of insecticide and equipment; support for supervision by GHS, Environmental Protection Agency, and Noguchi Institute personnel; and collaboration with the NMCP, MaVCOC, the Global Fund/AGAMal IRS program, and other partners. Programmatic evaluation includes the M&E activities that measure the performance of IRS, particularly those relating to monitoring coverage levels, spray quality assessment, and mosquito susceptibility levels. *($5,000,000)*

- *TA for Environmental Monitoring and Compliance:* Conduct environmental monitoring, environmental assessments, and risk mitigation in IRS districts. *($30,000)*

- *CDC technical assistance TDY visits and provision of supplies to support entomologic monitoring for IRS:* Provide technical assistance and quality assurance, through two visits by a CDC entomologist, for ongoing entomologic monitoring of the PMI-funded IRS program. *($29,000)*

- *Provision of supplies to support entomologic monitoring for IRS:* Support the procurement of entomological supplies to continue monitoring insecticide resistance and assess factors that may limit IRS impact in the Northern Region. *($10,000)*

### 3. Malaria in pregnancy

*NMCP/PMI objectives*
The National Guidelines for Malaria in Pregnancy (MIP) apply WHO's three-pronged approach: providing five or more doses of IPTp with SP, promoting the use of ITNs at the first ANC visit, and effective case management of malaria during pregnancy.

The current policy recommends 0.4 mg daily dose of folic acid instead of 5 mg daily dose, which was previously administered to pregnant women under the old policy. The new guidelines

recommend that SP should be given from 16 weeks of gestation or at quickening, and subsequent doses should be given at four week intervals for a minimum of five doses and a maximum of seven doses, until delivery. The first-line drug for the treatment of uncomplicated malaria in pregnant women is oral quinine. ACTs are not recommended for use in the first trimester except when they are considered to be life-saving or when other antimalarials are considered to be unsuitable. Malaria treatment during the second and third trimester is artesunate-amodiaquine or artemeter-lumefantrine.

*Progress since PMI was launched*

Ghana's MIP program is coordinated by an MIP technical working group comprised of the NMCP, Family Health Division of the GHS, development partners, NGOs and other stakeholders. Collaboratively, the Family Health Division and NMCP make decisions on policy guidelines and content of training.

Over the past few years, high ANC attendance rates in Ghana have provided great opportunity to achieve the NMCP and PMI IPTp goals. In 2011, there was a nationwide training of health staff at ANCs followed by supportive supervision in 2012 to ensure skills taught were applied correctly. Preliminary results from the 2014 DHS indicate that 87% of pregnant women reported attending ANC four or more times. The 2014 DHS indicates that Ghana continues to make progress on IPTp coverage. Nationally, the proportion of women reporting that they received at least two doses of IPTp during their most recent pregnancy increased from 64% (2011 MICS) to 68% (2014 DHS). In spite of this relatively high coverage and significant progress, the gap between ANC attendance and IPTp2 uptake remains significant. The main driver for this anomaly, as in the past, has been frequent SP stock-outs due to procurement and supply chain challenges. The long delay in getting SP into the country (a considerable problem from 2012-2014) has been a major contributing factor, and the subsequent destruction of almost all the national SP supply in the January 2015 CMS has only exacerbated the situation.

*Progress during the last 12- 18 months*

During the past 12 months, PMI strengthened the pre-service education for midwives and community and public health nurses by updating technical MIP and IPTp training materials within an integrated maternal health training that includes ANC and other maternal and child health activities. This revised curriculum was completed and is being disseminated to all schools for use with the start of the next academic year, starting September 2015. A total of 38 health professional schools (10 community health nursing schools, 1 public health nursing school, 1 medical assistant training school, and 26 midwifery schools) representing 100% of public sector facilities in these categories are being supported in pre-service education. An estimated 2,000 students will benefit from the stand alone e-learning module on MIP, which was recently introduced to improve the knowledge, skills, and practices of the GHS MIP guidelines. Additionally 8,500 MIP guidelines have been distributed to all health training facilities listed above. In 2015, PMI collaborated with NMCP and GHS to train more than 1,493 health care providers in MIP.

Immediately following the CMS fire, and in response to the emergency, PMI procured 3 million treatments of SP, which (given the extended lead time) is scheduled to arrive in in June 2016. This order will meet approximately one year's worth of SP needs at ANC clinics in Ghana, with

a commitment from the GOG to cover any remaining gaps through their own procurement system in 2017.

*Commodity gap analysis*

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

| Calendar Year | 2015 | 2016 | 2017 |
|---|---|---|---|
| Total Population | 27,899,195 | 28,596,675 | 29,311,592 |
| **SP Needs** | | | |
| Total number of pregnant women [1] | 1,115,968 | 1,143,867 | 1,172,464 |
| Total number of ANC visits by pregnant women annually [2] | 2,566,726 | 2,859,667 | 3,060,130 |
| **Total SP Need (in treatments)** | **2,566,726** | **2,859,667** | **3,060,130** |
| **Total SP Need (in tablets)** [3] | **7,700,178** | **8,579,002** | **9,180,390** |
| **Partner Contributions** | | | |
| SP carried over from previous year [4] | 0 | 0 | 140,333 |
| SP from MOH [5] | 1,046,220 | 0 | 0 |
| SP planned with PMI funding [6] | 0 | 3,000,000 | 0 |
| **Total SP Available (in treatments)** | 1,046,220 | 3,000,000 | 140,333 |
| **Total SP Surplus (in treatments) (Gap)** | **(1,520,506)** | **140,333** | **(2,919,797)** |

1. Approximately 4% of population become pregnant
2. NMCP estimates SP needs based on 5+ doses for each pregnant women attending ANC. IPTp coverage is estimated as: IPTp1 at 80%, IPTp2 at 75%, ITPp3 at 60%, IPTP4 at 10%, and IPTp5 at 5%
3. Three SP tablets per IPTp treatment
4. All existing SP stock at the national level was destroyed by the CMS fire.
5. The quantities to be purchased by the MOH in 2016 and 2017 are not yet known.
6. PMI's SP contribution in 2015 (900,000 treatments) was destroyed in the CMS fire.

*Plans and justification*

PMI will continue to sustain and build on increasing IPTp rates for the upcoming year. PMI will support the GHS to continue to strengthen ANC services, maintain support for pre-service training, print revised training manuals and job aids, and promote early and regular ANC attendance.

Due to the CMS fire and the immediate need for SP, PMI is procuring 3 million treatments which are expected to arrive in mid June 2016 to meet approximately one year's worth of SP needs at ANC. The GOG will cover any remaining gaps through their own procurements.

PMI supports all aspects of MIP including training, supportive supervision, community mobilization and interpersonal communication in five focus USAID regions (Greater Accra, Central, Western, Volta, and Northern Regions). In the remaining five regions, PMI will support the training of GHS staff in MIP case management of malaria. PMI will scale up case management of malaria in pregnant women and will continue to support pre-service training for IPTp and MIP in the five focus regions. PMI will also provide training and policy support on IPTp to the non-focus five regional health management teams. PMI anticipates that the NMCP, with Global Fund financing, will support intensified MIP activities in the non-PMI focus regions.

PMI intends to use the CHPS platform to expand and improve the reach of MIP services through mentoring and supportive supervision of CHPS nurses. Through a mentoring program that will allow the CHPS nurse to work with district hospitals and understudy a midwife for up to one month, PMI hopes to improve the quality of MIP services at CHPS and increase the confidence of the public in utilizing MIP services at CHPS compounds. PMI will also assist the GHS to make the CHPS nurse the link between the community volunteer and the regular health service. The CHPS nurse will support the community volunteer to provide education on MIP in communities.

*Proposed activities with FY 2016 funding: ($800,000)*

- *Strengthen provision of malaria prevention tools through ANC clinics (five focus regions):* Support ANC clinics at the health center and, where available, at CHPS compounds to effectively deliver a package of malaria prevention services to pregnant women. PMI support will focus on supportive supervision, on-site training as needed, quality improvement to increase provision of IPTp at every ANC visit, in accordance with national guidelines. Ensure distribution of an ITN to every pregnant woman at first ANC visit. *($550,000)*

- *Support pre-service training for health care workers (Nationwide):* Provide technical pre-service training for nurses, midwives, and medical assistants in prevention and treatment of malaria in pregnancy. *($250,000)*

## 4. Case management

### a. Diagnosis and Treatment

*NMCP/PMI objectives*
Since 2009, the NMCP has required confirmation of all suspected malaria cases in all age groups, by either microscopy or RDT, in accordance with WHO guidelines. Since then, the NMCP's focus has been on improving the quality of microscopy at higher-level facilities and scaling up the use of RDTs in peripheral settings, including the CHPS compounds. The NMCP targets 85% of febrile cases being diagnosed by RDT and 25% by microscopy, with some cases diagnosed by both methods.

The NMCP strategy calls for widespread and prompt access to appropriate antimalarial treatment. Ghana's first-line therapy for uncomplicated malaria includes artesunate-amodiaquine (adopted in 2004). In 2009, artemether-lumefantrine and dihydroartemisinin-piperaquine were added as additional first-line treatment options. Quinine and intramuscular artesunate are supported as therapies for severe malaria. Rectal artesunate is endorsed for pre-referral use at the CHPS compounds for severe malaria. The recommended therapy for pregnant women is described in the malaria in pregnancy section.

The Global Fund supports the provision of ACTs to both the public and private sectors. The NMCP supports scale-up of case management capacity at peripheral levels through the CHPS compounds and community case management of malaria through community-based agents. The NMCP's objective for integrated community case management is to reach all communities with access challenges to community-based treatment for uncomplicated malaria, ARI, nutrition and diarrhoea in targeted districts through community-based agents by ensuring that 90% of caregivers and parents in targeted communities will be able to recognize early signs and symptoms of malaria, diarrhoea, and ARI and have access to appropriate ACTs within 24 hours of onset of fever.

*Progress since PMI was launched*

PMI's primary strategy for improving malaria case management (diagnosis and treatment) is clinical and laboratory Outreach Training and Supportive Supervision (OTSS). OTSS is designed to provide long-term, ongoing support to strengthening malaria case management in health facilities by identifying areas that require improvement and providing support to clinicians and laboratory staff. OTSS consists of regularly scheduled supervisory visits to health facilities and their laboratories where a checklist is used to assess key issues such as: the relevant infrastructure, personnel factors such as staffing, level of training, and performance in malaria case management. Clinical OTSS focuses on the clinical aspects of malaria case management provided through the facility's out-patient department, and also includes an assessment of RDT use in these settings. Laboratory OTSS is only conducted in health facility laboratories and, although focused on microscopy, also assesses correct and consistent use of RDTs in the laboratory setting. Clinical and laboratory OTSS teams are comprised of different cadres of health professionals and, at this time, their visits do not necessarily coincide. However, PMI plans to facilitate a coordinated approach in the coming year as the GHS moves to adopt integrated OTSS.

GHS has made significant progress in improving malaria case management capacity at health facilities throughout the country. More than 90% of all prescribers in public health facilities have been trained in case management, which includes the use of RDTs at all levels of health service provision. Currently, PMI's clinical OTSS covers all public sector facilities quarterly, and since 2012, seven rounds of clinical OTSS have successfully trained more than 97% of public sector health workers in malaria case management. PMI has also facilitated extensive training in data management for health information officers and now includes data monitoring in the standard package of clinical OTSS activities.

PMI has been working closely with NMCP, the National Public Health Reference Lab, and GHS Clinical Laboratories Unit to improve the quality and scale up of malaria diagnosis in Ghana. In 2008, a national malaria laboratory assessment indicated that only 55% of laboratories had received a supervisory visit in the last six months and more than half of the laboratories had only one or no staff trained in malaria diagnosis. Since then, the laboratory OTSS program has been rolled out systematically across Ghana's ten regions. All 408 health facilities with a laboratory (as counted in a 2008 assessment) have been enrolled into laboratory OTSS, including 302 (74%) public, 45 (11%) private, and 61 (15%) public/private facilities. All staff at the enrolled facilities have been trained in malaria diagnosis. A national archive of malaria slides has been established to support proficiency testing of laboratory personnel. PMI has also supported

routine proficiency testing and quarterly malaria diagnostic refresher training for health facility laboratory staff. PMI is supporting increased use of RDT in the private sector, particularly in private clinics and among over the counter medicine sellers. Through a special arrangement with the NMCP OTCMS and private sector associations receive supplies of RDTS from the national stock and distribute to their members. Through this initiative over 54,000 RDTs were distributed to OTCMS between November 2014 and July 2015.

Availability of microscopes in the public and quasi-public sector (semi-autonomous public institutions) has significantly improved over the last few years. The laboratory and clinical OTSS program provides PMI with feedback on the condition of microscopes and PMI has supplied microscopes to NMCP/GHS on an as needed basis since 2009. The GOG, through GHS, regularly procures microscopes for its laboratories, and public health facilities generate funds to procure reagents and lab supplies. The Global Fund has procured microscopes for other disease programs such as TB and HIV, which are also used for malaria programs.

Procurement challenges encountered in previous years have been largely addressed by the NMCP's decision to use the Global Fund's Pooled Procurement Mechanism for accessing malaria commodities. Availability of ACTs, SP, and RDTs at health facilities has significantly improved over the last few years.

PMI continues to support malaria case management pre-service education, with support for midwife education expanding to include medical assistants, nurses, and medical doctors. PMI is also facilitating the update of malaria curriculum for medical and nursing schools. Ensuring that the new cohorts of health care workers entering the workforce, either through the public or private sector, have been trained on best practices for malaria case management will help ensure that high quality services continue to be provided in all health facilities throughout Ghana.

The GHS is continuing to strategically expand the CHPS compounds and services to bring basic public health and clinical services closer to communities in rural and hard to reach areas. The CHPS compounds provide community outreach services through the placement of community health nurses to provide a range of public health services. The CHPS program has broad support within the GHS system and is an excellent platform for expanding access and availability of appropriate malaria case management services. PMI's work with CHPS is in line with and in support of the GHS strategies.

*Progress during the last 12-18 months*

*Clinical and laboratory OTSS*

Ghana has a long history of presumptive treatment of malaria and while diagnostic testing rates have been historically low, the investment in training and OTSS is beginning to show results. Adherence to negative test results, as reported from the laboratory OTSS activity, improved with prescribers currently adhering 72% of the time to negative test results, while only 50% of facilities adhered consistently in 2010.

Over the past year, regular malaria diagnostic refresher training for senior GHS laboratory technologists led to improvements in advanced microscopy competency for supervisors. Table G shows consistent improvements in parasite detection, *P. falciparum* detection, and parasite quantification.

**Table G: Microscopy competency scores for malaria diagnostic refresher training**

| Training | Parasite Detection | | *P. falciparum* Detection | | Parasite Density | |
|---|---|---|---|---|---|---|
| | Pre-Training | Post-Training | Pre-Training | Post-Training | Pre-Training | Post-Training |
| MDRT 2014, Regional Average | 56% | 80% | 13% | 33% | 17% | 49% |
| Advanced MDRT 2013, National | 58% | 78% | 13% | 30% | 18% | 60% |
| Advanced MDRT 2014, National | 74% | 88% | 22% | 43% | 24% | 64% |

In the last twelve months, PMI continued to support strengthening in-service capacity to correctly manage malaria cases by training 1,160 health workers on the correct use of RDTs for malaria diagnosis in the 4 teaching hospitals. PMI also continued supporting pre-service training in 38 public health schools (community health nursing, public health nursing, and midwifery schools).

Unfortunately, no laboratory OTSS or proficiency testing has taken place since the third quarter of 2013 due to challenges in transferring funds to the GHS for these activities. The issues have been resolved and these activities are expected to resume in the second half of 2015, which will also include a new assessment of equipment needs. Despite the lack of laboratory OTSS, PMI supported GHS to complete the molecular identification by polymerase chain reaction to move towards WHO certification of the Ghana national archive of malaria slides as an international reference slide set for malaria microscopy.

To strengthening malaria treatment, PMI's technical assistance to the NMCP in the last year focused primarily on supervision of health care workers. PMI trained 1,802 health workers on the updated malaria case management guidelines that were adopted in Ghana in 2013. In the last 12 months, PMI provided technical and financial support to regional and district directorates to conduct clinical OTSS on treatment and diagnostics within all public health facility outpatient departments. In the last twelve months, PMI-funded OTSS activities reached 12,584 health workers across 9 regions. Adherence to negative test results among those supervised increased from 55% in the second round of OTSS to 76% in the third round of OTSS, three months later.

*Private Sector*

As reported in the 2014 DHS, more than 20% of febrile children are not taken to health facilities for examination, with caregivers choosing to treat them at home or seek advice from sources outside of health facilities. PMI, in collaboration with the Pharmacy Council, a regulatory body for the practice of pharmacy, has trained 8,928 over the counter medicine sellers (OTCMS) in appropriate case management and use of RDTs. Supportive supervisory visits are being

conducted to encourage and ensure that OTCMS are adhering to malaria protocols. The NMCP is also running a campaign on national TV and radio encouraging the public to demand a diagnostic test before receiving treatment. To improve the regular supply of RDTs to the private sector, PMI is collaborating with NMCP and the professional association of OTCMS to improve their access to RDTs and capacity to test clients with febrile illnesses prior to treating. Five regions received supplies of RDTs that lasted through April 2015; however, due to the CMS fire, the OTCMS have not yet been resupplied with subsidized RDTs.

*National Health Insurance Agency*

Currently, NHIS reimbursement is still made regardless of whether a diagnostic test is performed or not given that the Standard Treatment Guidelines (STGs) and Case Management Guidelines still allow for clinician to make a clinical diagnosis, particularly where testing may not be available or if RDTs are in stock-out. During clinical audit activities, the NHIA does require that adequate paperwork, with a full listing of symptoms, testing and diagnosis be submitted in order to ensure that reimbursement is not reduced. Efforts are underway to strategize how best to unbundle the services for reimbursement, review the medicines component of the National Health Insurance Scheme benefits package, develop a process to disaggregate medicines (particularly antimalarials), and develop a sustainable and implementable drug pricing model, directly benefiting malaria outcomes.

In the last year, USAID initiated support to NHIA to expand clinical audits, completing 2 rounds as of the writing of this MOP, and visiting 144 facilities. Over the course of these audits, concerns have arisen on inappropriate prescribing (including substitution of medicines), inadequate documentation of medical notes, patient satisfaction and issues pertaining to the efficient use of resources. For each clinical audit carried out, the audit team (made up of a doctor, nurse, pharmacist and NHIA clinician) meets with each facility administrator and staff to review findings and sign off on the claims that will be refunded. Specific findings from the first round of clinical audit in 72 facilities include:

- 76% (55 facilities) were found to be inappropriately prescribing antimalarials.
- Injection artemether is often used as a stat dose for the treatment of uncomplicated malaria in the out-patient department.
- Prescription of multiple antibiotics for the treatment of malaria.
- Treatment of the same patient up to six times within two months for malaria without referral to a higher level facility for further investigation.

As a result of the NHIA's clinical audits, several health facilities have identified health workers from the different departments to constitute a health facility clinical audit committee to follow up on the findings of the initial set of clinical audits. These committees are responsible for in-house monthly reviews of severe malaria treatment practices through root cause analysis designed to identify gaps, weakness and through consensus, develop practical, specific and time bound action points to address the challenges therein. Performance will benchmarked against standards highlighted in the previous meetings. It is expected that over time significant changes in the quality of severe malaria case management will be seen through this investment.

*Community-based Case Management*

In 2013, 40% of the rural population had access to CHPS services. In 2015, USAID, with PMI funding and other health funds supported the strategic expansion and improvement of CHPS services to deliver an expanded package of proven interventions to reduce maternal and child mortality and morbidity, including malaria case management, child health services, and maternal health services (including IPTp). PMI provided technical assistance in the revision and development of national iCCM guidelines for Ghana. PMI supported the NMCP in the development of tools for community-based agent OTSS, which has been adopted as a national strategy. PMI also trained 17 national officers and 67 regional officers on the revised iCCM guidelines. These trainers have since trained 652 district level supervisors nationwide. The district level officers have also trained 225 community health officers and 1084 community-based agents from 16 districts in two regions including RDT use as per the revised iCCM guidelines. PMI also supported one round of iCCM OTSS, reaching over 10,000 community-based agents nationwide. Table H illustrated the quality of OTSS CHPS performance from 2015. In FY 2016, PMI will provide limited support for iCCM in areas with access challenges.

**Table H: 2015 OTSS CHPS Performance Data**

| Indicator | CHPS | All Facilities Average |
|---|---|---|
| **RDT USAGE** | | |
| RDT Performance Score | 91.6% | 91.1% |
| Recording test results in register | 93.5% | 92.6% |
| Placing right amount of buffer in the right well | 98.3% | 98.3% |
| Putting the blood in the right well | 97.8% | 97.9% |
| Waiting for correct time before reading | 95.5% | 96.0% |
| Reading the test results correctly | 98.3% | 98.5% |
| **CLINICAL FEVER EVALUATION** | | |
| Average fever evaluation performance | 73% | 74% |
| Requesting for malaria test | 95.6% | 94.1% |
| Adhering to positive test results | 96.8% | 97.0% |
| Adhering to negative test results | 77.5% | 72.0% |
| Appropriately classify the illness | 96.2% | 94.6% |
| Treatment according to protocol | 86.6% | 86.5% |
| Trained in Malaria case management | 82.6% | 81.2% |
| **COMMODITY AVAILABILITY** | | |
| Availability of RDTs | 94.7% | 94.9% |
| Availability of AA | 97.9% | 95.3% |
| Availability of AL | 83.8% | 92.1% |

*Commodity gap analysis*

PMI supports national quantification meetings, to provide the best possible estimate of the country's consumption in the forecast years based on the agreed upon assumptions. An assumptions building workshop brought together regional, district, program personnel as well as monitoring and evaluation officers and donor partners. Following deliberations and review of

available historical data and surveys (and the opinions of experts when data was not available), the workshop participants developed the quantification assumptions that were used to put together the quantification forecasts. This year's final forecasts were made after comparing forecasts from three different data types and therefore represent the best estimates based on current approved assumptions. The forecasts will be closely monitored over time to make adjustments as needed. The national quantification will be re-examined semi-annually to ensure that the right quantities of commodities are procured at the right time. In addition, Global Fund in collaboration with PMI, embarked on a program placing Regional Logistics Support Officers in each of the Regional Medical Stores to further improve data visibility that will significantly enhance quantification and forecasting.

**Table I: RDT Gap Analysis**

| Calendar Year | 2015 | 2016 | 2017 |
|---|---|---|---|
| **RDT Needs** | | | |
| Target population at risk for malaria | 27,899,195 | 28,596,675 | 29,311,592 |
| Total number projected fever cases[1] | 34,148,615 | 35,002,330 | 35,877,388 |
| Percent of fever cases confirmed with microscopy[2] | 35% | 35% | 35% |
| Percent of fever cases confirmed with RDT[2] | 85% | 85% | 85% |
| **Total RDT Needs[3]** | **26,204,805** | **16,416,928** | **17,074,931** |
| **Partner Contributions** | | | |
| RDTs carried over (deficit) from previous year | 0 | 0 | 0 |
| RDTs from MOH | 0 | 0 | 0 |
| RDTs from Global Fund | 6,581,320 | 7,879,434 | 8,709,674 |
| RDTs from other donors [4] | 0 | 0 | 0 |
| RDTs planned with PMI funding | 5,833,000 | 4,000,000 | 2,500,000 |
| **Total RDTs Available** | 12,414,320 | 11,879,434 | 11,209,674 |
| **Total RDT Surplus (Gap)** | **(13,790,485)** | **(4,537,494)** | **(5,865,257)** |

1. Fever episodes were estimated from demographic forecast. Starting from the population for each year, the fever episodes for each age group was estimated reference from MICS 2011for each year and this was multiplied by the population. The country's target for fevers to be seen for testing or treatment was applied to obtain the targeted fever cases to be seen in all the sectors
2. Percentage tested by RDT and microscopy is more than 100% because some cases are tested by both RDT and microscopy
3. RDT requirements appear high because of the country's targets for increased testing of all fevers or suspected cases before treatment of confirmed cases. The 2015 RDT Needs includes quantities required to ensure Ghana rebuilds adequate stock levels as well as the estimated consumption needs for the year.
4. NMCP stated that DFID will provide RDTs in 2016 and 2017, but they were not clear about the quantities.

**Table J: ACT Gap Analysis**

| Calendar Year | 2015 | 2016 | 2017 |
|---|---|---|---|
| **ACT Needs** | | | |
| Target population at risk for malaria | 27,899,195 | 28,596,675 | 29,311,592 |
| Total projected number of malaria cases[1] | 7,859,419 | 7,392,711 | 6,645,586 |
| **Total ACT Needs[2]** | **10,244,315[3]** | **5,723,640** | **6,445,260** |
| **Partner Contributions** | | | |
| ACTs carried over (deficit) from previous year[4] | 0 | 0 | 0 |
| ACTs from Global Fund | 1,259,375 | 3,763,440 | 5,138,331 |
| ACTs planned with PMI funding | 5,667,180 | 2,431,122 | 1,300,000 |
| **Total ACTs Available** | 6,926,555 | 6,194,562 | 6,438,331 |
| **Total ACT Surplus (Gap)** | **(3,317,760)** | **470,922** | **(6,929)** |

1. Total malaria cases to receive ACTs in the public sector were estimated based on assumptions of key stakeholders during the recent quantification review meeting. Assumptions were based on historical data trends for reported malaria cases in Ghana's DHIMS2. Assumptions factored in the increased testing of suspected cases, decreasing positivity rates as well as increasing compliance with test results. The decreasing effect of all malaria control interventions and increases in reported cases in the DHIMS2 as a result of increased access to health facilities were also taken into account.
2. Total ACTs needed is the total ACT shipments required. For 2015, the CMS fire destroyed the national stockpile of ACTs, and additional treatments are needed in 2015 in order to rebuild the sub-national supply chain stocks.
3. The 2015 ACT Needs includes quantities required to ensure country rebuilds adequate stock levels as well as the estimated consumption needs for the year.
4. No carryover from the previous year, because during the quantification exercise this amount was taken into account as the available ACT stock before calculating the shipments required

*Plans and justification*

PMI will continue to support comprehensive case management training, supervision, and quality improvement. Over the last three years, PMI had focused significant efforts on improving the quality of care and data management and quality at district, regional, and community level health facilities, primarily through clinical OTSS. Such efforts to ensure quality of care in all facilities are ongoing and will be continued in 2017.

PMI will continue to support the laboratory OTSS program and seek mechanisms to further integrate management of this program, along with Malaria Diagnostic Refresher Training and Proficiency Testing into the GHS Clinical Laboratories Unit. PMI will also support the roll-out of RDTs in the private sector through OTCMS.

PMI will continue to procure commodities for the diagnosis and treatment of uncomplicated and severe malaria at all levels of the public health system.

*Proposed activities with FY 2016 funding: ($8,185,000)*

- *Procurement of RDTs:* Procure approximately 2,500,000 RDTs, estimated to meet about 14.5% of the national need to fill identified gaps and ensure that health facilities maintain capacity to test fevers and diagnose malaria cases. The costs are budgeted at $0.60 per RDT. *($1,500,000)*

- *Procurement of Microscopes:* Procure approximately 40 microscopes, as well as limited diagnostic supplies (e.g. microscopy kits/reagents) to fill identified gaps and ensure that health facilities maintain capacity to test fevers and diagnose malaria cases. The costs are budgeted at $2,000 per microscope. *($80,000)*

- *Procurement of ACTs:* Procure approximately 1.3 million ACTs, which is about 20% of the national need based on consumption data. This will fill the estimated commodity needs for 2017. The costs are budgeted for procurement of the adult dose at $1.81 per treatment. ($2,380,000)

- *Procurement of severe malaria treatment:* Support the national commodity needs for severe malaria as follows: procure approximately 110,000 ampules of injectable artesunate (60 mg/1ml). The costs are budgeted at $2.60 per ampule. Procure an estimated 30,000 artesunate suppositories. *($300,000)*

- *Strengthen quality of malaria microscopy capacity in laboratories: ($400,000)*
    - Conduct nationwide quarterly malaria diagnostic refresher training at the regional level to support continued quality improvements to malaria microscopy and RDT use and scale up, including improvement of coordination between laboratory staff and prescribers.
    - Provide logistic support for nationwide quarterly laboratory OTSS at the facility laboratory level to support continued quality improvements to malaria microscopy and RDT use and scale up, including improvement of coordination between laboratory staff and prescribers.

- *Support implementation of iCCM in priority areas:* Provide support for strengthening iCCM activities in 150 prioritized hard-to-reach catchment areas in Northern and Volta Regions. In these areas, the only access to care is through the community-based agents. Support will include in service training on the supervision of volunteers and facilitating supportive supervision to the community-based agents by the designated CHPS point of contact and strengthening the outreach to the community. The skills of CHPS nurses will be further enhanced in a program to provide them with targeted supervision and mentorship in district and regional hospitals. Health facility and district staff tasked with supervising CHPS nurses will be supported to provide appropriate case management supervision and supplies to the CHPS compounds for which they are responsible. Non-malaria commodities for iCCM activities (antibiotics, oral rehydration salts, and zinc) will be provided by other USAID funding, while malaria commodities will be provided from the region to the targeted areas. *($300,000)*

- *Strengthen the provision and quality of malaria case management at health facilities:* In the five USAID focus regions, support the district hospitals, health centers, CHPS compounds and at the community level to provide high quality malaria case management. This support will be provided through routine clinical OTSS visits to strengthen universal quality testing of suspected malaria cases, adherence to diagnostic results (RDT or microscopy), and ensuring proper treatment for diagnostically confirmed malaria cases in accordance with national guidelines. Malaria focused health system strengthening will also be employed to support improved cases management. *($950,000)*
    - *District Hospitals and Health Facilities*: PMI will provide OTSS to increase health care provider's knowledge, skills, and compliance with laboratory diagnostics and integrated case management protocols. Subsequent OTSS visits will assess progress made on addressing issues raised in previous visits. For facilities with performance that do not meet established standards, provision of in-service refresher training will be provided to strengthen the capacity to provide high quality malaria case management
    - *Community*: PMI will provide support for malaria case management at CHPS compounds through clinical OTSS, as well as through supply chain and pharmaceutical management, MIP services, capacity building in interpersonal skills, community mobilization, etc. PMI will scale up CHPS by providing training and supervisory support to community-level health care providers at these compounds, as well as orientation of community leaders to support the establishment and functioning of CHPS in their communities.
    - *District and Regional Malaria focused Health System Strengthening:* PMI will provide direct assistance to both the District and Regional Health Management Teams where strategic planning will help the teams prioritize activities, segment geographic coverage for greatest impact, and support facilities to remove bottlenecks and resolve challenges to improve compliance with malaria control guidelines. PMI, together with GHS staff, will also target improving malaria case management services, including strengthening the referral system for severe malaria and improving monitoring and evaluation procedures to enhance progress in applying malaria control interventions.

- *Provide technical assistance to improve malaria case management at the national and health facility levels:* In the five non-USAID focus regions, support regional and district facilities, to provide high quality malaria case management. This support will be provided through routine clinical OTSS visits to strengthen universal quality testing of suspected malaria cases, adherence to diagnostic results (RDT or microscopy), and ensuring proper treatment for diagnostically confirmed malaria cases in accordance with national guidelines. Activities will also include supporting national-level case management work with the GHS and the NMCP, including support to the technical working groups. *($850,000)*
    - *Regional and District Facilities*: PMI will provide OTSS to increase health care provider's knowledge, skills, and compliance with laboratory diagnostics and integrated case management protocols. Subsequent OTSS visits will assess progress made on addressing issues raised in previous OTSS visits. For facilities with performance that do not meet established standards, provision of in-service

refresher training will be provided to strengthen the capacity to provide high quality malaria case management
    - *National Malaria Case Management*: PMI will support the GHS Institutional Care Division to strengthen its capacity to implement and conduct clinical OTSS at the district and facility level; standardize clinical OTSS practices nationwide to ensure consistency among OTSS measurements; create tools and standards to facilitate implementation; support national policy and guideline revisions/updates. PMI will support the NMCP to organize and host national level technical working group meetings on case management. The support will include comprehensive case management work (diagnosis, treatment, outpatient department and laboratory), including the analysis of DHIMS2 data to identify key areas for follow up and use at the facility level.

- *Provide technical assistance to improve malaria case management at the national and regional levels:* Provide financial support to GHS to support national supportive supervision policy and guideline development, and to develop or adapt tools to facilitate implementation. Support will also include implementation of clinical OTSS regional teams, including organizing regional and national OTSS planning and review meetings. Technical assistance to various entities within the GOG, including sections of the GHS within the Ministry of Health, (NMCP, Institutional Care Division, and Clinical Laboratory Unit, Policy Planning Monitoring and Evaluation/Centre for Health Information Management), various malaria-related national coordinating committees and task groups. Assist the regional OTSS teams with improved management, leadership, data management, and supervision. PMI will support Regional Health Management Teams to integrate iCCM services into the GHS supervision system. *($300,000)*

- *Support pre-service training for health care workers and physicians to improve malaria case management capacity: ($390,000)*
    - Support pre-service training for general nurses, midwives, and medical assistants to improve competencies in knowledge, skills, and practices for malaria diagnosis and case management in compliance with GHS guidelines and protocols. Support implementation of revised school curricula.
    - Support pre-service and/or continuing medical education training for physicians and revision of medical school curricula to improve competencies in knowledge, skills, and practices for malaria diagnosis and case management in compliance with GHS guidelines and protocols.

- *Strengthen the malaria case management capacity of OTCMS and pharmacies:* Support activities to build the capacity of OTCMS and pharmacists to comply with GHS malaria diagnosis, treatment and referral guidelines. Address issues related to for-profit, business motivations to comply with GHS guidelines. Support OTCMS to achieve NHIA accreditation, with emphasis on geographic areas with gaps in National Health Insurance Scheme coverage. *($400,000)*

- *Support NHIA to implement clinical audits:* Continue support for NHIA to expand the conduct clinical audits to improve treatment standards and the quality of service provision among accredited providers, to ensure adherence to standard protocols, and to check against fraud and abuse. The audits will ensure accountability in both public and private facilities and will contribute to the institutionalization of correct prescribing behavior based on a reward and sanctions system. Additional efforts will be made in the coming year to link the PMI-supported OTSS activities with specific follow-up post clinical audit exercises to reinforce provider performance in USAID target regions. *($325,000)*

- *Technical assistance for diagnostics:* Provide technical assistance for lab OTSS, proficiency testing, microscopy quality assurance, and RDT proficiency and scale-up. *($10,000)*

### b. Pharmaceutical Management

*NMCP/PMI objectives*

A main component of the *National Malaria Control Strategy for 2014-2020* is to reach universal coverage of key malaria commodities. However, this cannot be achieved without consistent access and availability of essential malaria commodities through a functioning supply chain system. The NMCP and PMI plan to increase the availability of malaria commodities through a strengthened supply chain, improved understanding and implementation of logistics management as well as improved Logistics Management Information System for malaria commodities.

*Progress since PMI was launched*

*Supply chain management:* The supply chain system was largely a "pull' system of distribution where the Regional Medical Stores, districts, health centers and CHPS compounds pulled their needed health commodities from the higher level facilities. Community-based agents obtain their health commodities from the CHPS compounds.

Prior to the January 2015 fire at the Central Medical Stores, the MOH managed the purchasing, in-country storage, and distribution of medicines in Ghana. The MOH procured drugs through government tenders and stored them at the CMS in Tema for distribution to RMS in the ten administrative regions. The CMS also warehoused and distributed commodities procured by the key donors such as PMI, DFID, and the Global Fund.

After the CMS fire, Global Fund and USAID have also developed an interim parallel private storage and scheduled distribution system for USAID, PMI and Global Fund commodities. This is increasing drug availability at the RMS level and providing more data and better oversight of commodities, which will enhance quantification, forecasting as well as availability. It is expected that there will continue to be improvements in drug availability as a result of these efforts. Over the next few years, efforts will be made to extend the "push" model of distribution to the service delivery point.

PMI, together with President's Emergency Plan for AIDS Relief, has been supporting the MOH/GHS to improve supply chain mechanisms for all pharmaceuticals and health commodities. With PMI support, work started in 2011 to design a sector-wide Supply Chain Master Plan. This plan outlines a five-year strategy for a comprehensive restructuring of the public sector supply chain and includes a series of strategic interventions and activities for creating a supply chain that fully supports the MOH's objectives for a strong and reliable national health system. Health commodity supply chain reform has progressed slowly. However, as described in the Challenges and Opportunities section, total destruction of the CMS during a fire in January 2015 brought warehousing and supply chain issues to the forefront once again. Consultations regarding supply chain system redevelopment and restructuring among the GHS, the MOH, and the country's development partners, including PMI, are ongoing.

*Regulation and drug quality:*
The Ghana Food and Drugs Authority (GH-FDA) is the national regulatory body within the MOH that is mandated to regulate the manufacture, importation, exportation, distribution, use and advertisements of food, drugs, cosmetics, medical devices and household chemicals with respect to ensuring their safety, quality and efficacy. The GH-FDA is also responsible for providing regulatory oversight to ensure the quality, safety, and efficacy of malaria medicines in Ghana, including the registration of locally produced and imported ACTs.

The local pharmaceutical sector in Ghana is very active and supplies many antimalarial medicines, many of which are known to be of poor quality and inconsistent with global and national treatment guidelines. Local procurement of medicines from these suppliers is allowed at all levels of government and the supply chain has evolved to a point where over 1,000 regional and district health offices are carrying out procurements from the private sector, often at high prices and questionable quality. Increased regulation and oversight of these local suppliers is needed.

*Progress during the last 12-18 months*
PMI's investments in supply chain and pharmaceutical management have primarily focused on building NMCP capacity to better manage malaria commodities through participation in quantification training, integrated supportive supervision, improvements to the logistics management information system, and quarterly end use verifications.

In January 2015, end-use verification activities detected significant stock outs of key malaria commodities on the day of the visit (RDT: 33.3%; artemether-lumefantrine adult dose: 51.4%, child dose: 97.3%; artesunate-amodiaquine adult dose: 29.7%, infant dose: 67.6%). Despite the observation that health facilities in most cases have the ability to treat clients with malaria due to availability of alternative ACTs, these stock out rates are a matter of concern. Stock shortages are a problem at all levels of the system for a number of reasons including scheduled delivery not being fully implemented, facilities not reporting, and debt between the levels within the system.

Each year, PMI supports national quantification exercises for malaria RDTs, ACTs, and severe malaria medicines for the public health facilities. In addition, PMI investments have been supporting the MOH's Supply Chain Master Plan development to address the overall public sector supply challenges.

In the aftermath of the CMS fire, PMI supported the emergency quantification of malaria commodities to avoid disruption in service delivery and procured ACTs and severe malaria medications that were needed urgently. Additionally, PMI assisted with the redistribution of malaria commodities that were already in the RMS to ensure each region had adequate quantities of malaria commodities; supported the regional warehouse and storage facility inspections in all RMS and three teaching hospitals across the country to ensure safety of commodities; contracted a non-pharmaceutical grade warehouse to store PMI procured ITNs earmarked for mass distribution; and supported the development of an interim public-private partnership distribution plan for the distribution of commodities from the central level. A continued constraint is data visibility on actual consumption of commodities at the facility and district levels, and improving the accuracy of consumption data to reflect actual need at the facility level. With the placement of Regional Logistics Officers at the RMS level and the interim parallel private storage and scheduled distribution system for USAID, PMI and Global Fund commodities, there continues to be improvements in data visibility at the regional level through the monthly stock reports, better National Program oversight of commodity deliveries and overall efficiency.

PMI has been supporting post-marketing surveillance monitoring for antimalarial medicines, promoting the implementation of regulatory measures to safeguard public health, and providing limited technical assistance to the GH-FDA and for improvements in Good Manufacturing Practices for local manufacturers.

The antimalarial medicines quality monitoring program in Ghana, which is in its sixth round, has led to the identification of several counterfeit and substandard medicines which has prompted the GH-FDA to recall several batches of antimalarial medicines from the market as well as referring illegal activities to law enforcement agencies. The recalled antimalarial medicines included both imported and locally-produced batches. The overall failure rate for antimalarials decreased from 7.7% in 2012, to 4% in 2013, but increased to 5.4% in 2014. The presence of monotherapies and non-recommended antimalarials increased from 8.9% in 2012, to 10.6% in 2013, but then decreased to 4.7% in 2014. Private pharmacies and OTCMS accounted for 56% of the failed antimalarial samples while private hospitals, clinics and maternity homes accounted for 33%. Private sector facilities together accounted for a total of 89% of all the antimalarials that failed the confirmatory test.

PMI also supported trainings and provided technical assistance to GH-FDA laboratory staff on the Risk Based Approach to Drug Evaluation as a means to streamline medicines registration in order to reduce delays. As a result, in 2014, the GH-FDA lab received an internationally renowned ISO/IEC 17025 accreditation, allowing the GH-FDA to test medicines (imported and funded by international donors) in-country rather than having to send them out to other accredited laboratories in South Africa or elsewhere. Furthermore, the GH-FDA is able to test medicines for other countries that do not have accredited laboratories. After a routine audit in May 2015, GH-FDA has officially been granted maintenance of its ISO 17025 accreditation for another year in June 2015.

Capacity building of the local manufacturing industry is an ongoing activity that is supported by PMI. It involves the training of the local pharmaceutical manufacturing industry on stability

studies, process validation, batch manufacturing records development and specifications, analytical method validation, labeling and variation filing.

*Plans and justification*
PMI will continue to strengthen supply chain, logistics and pharmaceutical management including forecasting, quantification, training, supervision, and monitoring stocks. PMI will work with the NMCP, MOH, and appropriate partners on supply chain reform to ensure that essential life-saving drugs and commodities, including ACTs and RDTs, reach the end user. Support to the GOG in delivering malaria drugs and commodities to the Regional Medical Stores will continue. PMI will also contribute to strengthening the Logistics Management Information System for better data availability and use for decision making and to improve warehousing of malaria commodities at the district level.

Furthermore, PMI will continue to support the drug quality monitoring activities and activities toward maintaining GH-FDA's ISO 17025 accreditation.

*Proposed activities with FY 2016 funding: ($1,440,000)*

- *Support supply chain system strengthening:* Provide technical assistance for strengthening logistics, warehousing, and distribution to improve availability of malaria commodities, in accordance with the national Supply Chain Master Plan. Activities will focus on addressing bottlenecks in finance, management, forecasting, transportation and reporting systems. Support quarterly end user verification activities to avoid future stock outs. *($940,000)*

- *Strengthen the regional and district level supply chain system:* Strengthen the overall supply chain management capacity nationally and down to the district and facility levels within the five priority regions. . Facilities in the districts will receive supportive supervision on supply chain management which will focus on reviewing logistics records (stock cards, logistic management information system), assessing stock status of commodities, conducting physical inventory, and assessing the storage conditions. Continuous on-the-job training will be provided and action plans will be developed to improve supply chain management. *($350,000)*

- *Strengthen drug quality monitoring capacity:* Provide support for the strengthening of anti-malaria drug quality monitoring in collaboration with the GH-FDA, consolidate the recent expansion of the post-market surveillance. Support to GH-FDA for increased enforcement capacity and education to heighten responsiveness to counterfeit and substandard medicines will continue. In addition, GH-FDA will be supported for the routine audits to keep its ISO 17025 accreditation. *($150,000)*

## 5. Health system strengthening and capacity building

PMI supports a broad array of cross-cutting health system strengthening activities, such as training health workers, supply chain management, health information systems strengthening, drug quality monitoring, and NCMP capacity building.

*NMCP/PMI objectives*
Although much progress has been made, the MOH continues to have significant gaps in its capacity for program management, commodity and supply chain management, and M&E. PMI's top health systems strengthening priority is to strengthen supply chain management, while also building capacity for quality assurance and supportive supervision, with a goal of sustainable and equitable health systems.

*Progress since PMI was launched*
Over the last few years PMI has undertaken significant capacity development for malaria control. PMI has supported the NMCP with computers and other information communication technology equipment to facilitate the timely compilation and transfer of malaria data from districts and regions to the national data center. As a result of this investment and other capacity building activities, Ghana has seen improvements in data reporting through the DHIMS2. PMI support of the NMCP has extended to the training of an entomologist, assisting the NMCP attend important malaria meetings overseas and funding technical malaria program meetings. To support programmatic management, PMI also supports a WHO National Professional Officer to provide technical guidance to the NMCP in malaria control and prevention interventions.

PMI has invested considerable funds to support supply chain reforms aimed to improve efficiency and curtail chronic stockouts of health commodities.With the expansion of the country's health insurance scheme, an increased number of people have access to health care, yet they do not always obtain required medicines. PMI has therefore supported the quantification of malaria commodities to ensure availability of malaria products.

*Progress during the last 12-18 months*
PMI continued to focus on building the NMCP's capacity to better manage malaria commodities through participation in quantification training, integrated supportive supervision, improvements to the logistics management information system, and the end-use verification survey. National quantification exercises for malaria RDTs, ACTs, and severe malaria medicines have been undertaken for the public health facilities and CHPS compounds.

PMI supports the School of Public Health at the University of Ghana "malaria track" within the existing Field Epidemiology Laboratory Training Program. During the last 18 months, PMI has supported four residents in the malaria track of the program. Residents conducted advanced classroom and practical training in field epidemiology, focusing on priority issues in malaria surveillance and operational research identified by the NMCP and PMI. Ongoing projects include an evaluation of the malaria surveillance system in Adenta Municipality, Accra; factors influencing the utilization of ITNs in Agona East District, Central Region; factors influencing severe malaria among children under five years in the South Tongu District; and the prevalence of submicroscopic malaria infections among asymptomatic populations in Northern Ghana.

PMI supports the Peace Corps "Stomping out Malaria in Africa" initiative to implement malaria prevention and control activities. Peace Corps Volunteers utilize small grants to facilitate promotion activities in their communities such as behavior change communication activities aimed at improving use of ITNs and promote early health seeking behavior. During the 2014 Anemia and Parasitemia monitoring survey, volunteers were instrumental in providing supportive supervision and conducting data validation audits of questionnaires. This year volunteers were also engaged in World Malaria Day events and supported long-lasting insecticide treated bed net distributions, hanging demonstration events at clinics and aided in the distribution of malaria BCC materials.

NHIA continues to expand access to, and utilization of, services. With outpatient visits increasing 35-fold, in-patient service use by 29-fold since 2005 and malaria being the most frequently diagnosed disease condition. An effective and well-functioning NHIA reimbursement system remains critical to reducing malaria- related mortality in Ghana. During the last 12 months, PMI with other earmarked USAID funding, has continued to work with the NHIA to improve their efficiency through the scale-up of a primary health care capitated package of services; analysis to start refining diagnostic related groups to cut costs and as a tool to monitor clinical performance; and support ongoing strategy and policy development including reviewing benefits package and other key policy topics to ensure the continued sustainability of the NHIA.

PMI supported building the capacity of GHS regional and district health staff to improve program planning, management and quality of service delivery. This has been instrumental in developing regional capacity to manage USG funds directly. In addition, PMI supports Ghana's regional health management teams to fund supportive supervision for malaria case management all ten regions.

*Plans and justification*
PMI will continue to support capacity building throughout the health care system within the NMCP, including entomology training and limited support for international and/or regional technical meetings.

*Proposed activities with FY 2016 funding: ($975,000)*

- *Build management capacity at NMCP, GHS and other GOG partners:* Continue to provide support to the NMCP, GHS, and GOG for technical capacity building and improved malaria control systems. This activity will support: 1) attendance in malaria-specific trainings, conferences by select NMCP, GHS, and GOG employees to further build in-country capacity; 2) assisting NMCP with organizing meetings that are important for planning and management of malaria prevention and control activities; and 3) supporting limited information technology investments, such as computers, laptops, internet connection at the GHS's Regional Health Directorate level to ensure timely data reporting to DHIMS2. *($100,000)*

- *Ensure sustainability of NHIA to increase access to appropriate malaria diagnosis and treatment by appropriately incentivizing reimbursement: ($400,000)* Co-funded with non-malaria funds, this activity will provide support to NHIA to increase efficiency and sustainability to improve access to health services in general and quality malaria treatment by:
    - Providing technical assistance to the scale-up of a primary health care capitated package of services to three additional regions; Improve provider incentives to ensure appropriate case management services by working with key stakeholders to identify examples of best practices, real time data analysis, and communication materials to address the incentive constraints introduced with the preferred provider system
    - Refinement of diagnostic related groups to cut costs and as a tool to monitor clinical performance; strengthening claims management and drug payment and drug supply management to ensure the continued sustainability of the NHIA.

- *Support NHIA capitation roll out:* Support communication efforts to facilitate NHIA capitation roll out to additional regions, with the goal of promoting enrollment in NHIA and informing the public about how to access NHIA-accredited facilities among the general population. It is anticipated that this investment will contribute towards strengthening the overall program, increase enrollment and ensure sustainability of NHIA. Activities will include developing communication materials including print, radio and television messaging; procuring radio, air, and TV time and local community engagement activities to promote active enrollment in NHIA and access to NHIA-accredited facilities among the general population, with a focus on high burden rural areas. *($350,000)*

- *Strengthen the role of civil society in malaria advocacy:* Build the capacity of local Ghanaian non-governmental organizations and civil society organizations to monitor the quality and ease of access to health services, with a focus on malaria diagnostics and treatment. Strengthen community structures for advocating for patients' rights and client-centered care, including the availability of malaria commodities. The activity will train and support local non-governmental organizations and civil society organizations in monitoring health services and advocating for improved services as warranted, with a focus on supporting government, community, and service provider dialogues to improve the quality and responsiveness of health services and promote a customer service orientation among health providers. Emphasis will be placed on civil society involvement in monitoring access to quality ACTs and diagnostics. PMI estimates that approximately 20 local community groups in five regions will be supported through this activity. These groups will monitor the quality of health services and help to identify areas for improvement. FY 2016 funds are not needed, as there is sufficient pipeline to continue work during the implementation period. *($0)*

- *Support Peace Corps Malaria Program*: Support Peace Corps Volunteers through the "Stomping out Malaria in Africa" initiative. Peace Corps Volunteers based in Ghana will be able to apply for small grants from PMI to engage in malaria control and prevention

activities such as community mobilization for BCC, ITN distribution, and (as needed) operational research data collection. *($10,000)*

- *Support to WHO National Professional Officer (NPO):* The National Professional Officer will continue to give technical assistance to the NMCP for guidance on a variety of malaria activities such as strengthening monitoring and evaluation activities, the implementation of integrated community case management (iCCM), and pharmacovigilance issues. ($40,000)

- *Support long-term field epidemiology and laboratory training:*
  Support long-term training of individuals to build capacity at the NMCP or GHS in epidemiology, M&E, or other malaria program management functions as needed through the Field Epidemiologic and Laboratory Training Program, which was established with USG support at the University of Ghana's School of Public Health in collaboration with the GHS. *($75,000)*

### 6. Behavior change communication

*NMCP/PMI objectives*

The NMCP National Malaria Behavior Change Communication Strategy (2010-2015) was developed with support from PMI in 2010. The plan provides strategic direction to guide the development, implementation, and monitoring of the communication, social, and behavior change component of malaria prevention and control efforts. It defines communication and behavior change objectives, key target groups, messages, channels, and communication interventions. The strategy aims to guide the development of interventions and activities that raise awareness about malaria and address the key determinants of behavior for malaria prevention and control interventions, with the ultimate goal of a long-term normative shift in behaviors among the key target groups nationwide. The National Malaria Communication Committee is the body charged with oversight of the implementation of the strategy. Officially a subcommittee of the MICC, the Malaria Communication Committee is a working group with responsibility for reviewing, approving, and initiating the development of communications materials for malaria. PMI is an active member of the National Malaria Communication Committee.

In April 2014, NMCP held a workshop to start revising the National Malaria Behavior Change Communication Strategy and, at the time of this MOP writing, the revision was in progress. PMI participated in the workshop and anticipates being actively involved in the development of new communication strategies.

*Progress since PMI was launched*

Since its launch, PMI has nationally supported integrated mass media and interpersonal communication activities, the development of BCC materials, and the training of community volunteers in malaria prevention and control. BCC has been implemented as a cross-cutting activity across all PMI-supported intervention areas, and has been used to target health workers and the general public in the promotion of correct and consistent use of ACTs, adherence to RDT

test results, early presentation at ANC, full adherence to IPTp, prompt and timely diagnosis and care seeking, and acceptance of IRS.

Opportunities for national and targeted behavior change communication campaigns using mass media continue to grow due to Ghana's developing and expanding media infrastructure, which has grown from five television stations in 2010 to 18 in 2015 (four of which have a national reach) and private sector communication agencies. Over 200 local radio stations are distributed throughout the country and can be found in almost all districts, with heavier concentrations in urban areas. Local radio stations broadcast in a number of predominant local languages providing opportunities for targeted communications. However, most local stations broadcast over a limited geographic area, and thus, reaching national coverage through radio requires agreements with many different stations. PMI has supported radio jingles, live presenter mentions, and radio live discussions for all four primary interventions—ITNs, IRS, malaria in pregnancy, and case management. The print media is not as well developed, and only a few news publications are national in scope.

While awareness about malaria transmission has increased, some misconceptions about malaria continue to persist, with cleanliness often cited as an important way of preventing malaria. Additionally, "being too hot or uncomfortable" continue to resurface as a major reason for non-use of nets. It has been reported that, in some parts of the country (e.g. Northern Region), significant amounts of outdoor sleeping occurs, undermining the effectiveness of malaria prevention efforts.

Fever is often synonymous with malaria, and high rates of presumptive treatment of malaria based on fever contribute to the confusion that all or most febrile illness is malaria. In Ghana, about 40% of all cases of febrile illness suspected to be malaria are treated at home, and care takers' treatment seeking behavior for their children needs to be improved. Specific BCC messaging geared towards OTCMS and pharmacies have been employed to encourage OTCMS and pharmacies to test clients before treating. Additionally, a mass media campaign targeting the general public encouraging them to request a test—at an OTCMS, pharmacy, or public clinic—was aired in 2014. OTCMS and pharmacies are important sources of malaria treatment and although rates of RDT testing have improved, provider adherence to negative RDT test results continues to be a challenge and calls for health provider-specific BCC messaging at the interpersonal level.

GHS's Health Promotion Department is responsible for all social and behavior change communication activities in Ghana and needs significant support to provide leadership for BCC in Ghana. Currently, they assist with the pre-testing of communication materials. PMI supports the Health Promotion Department with the express purpose of building the department's capacity to become a resource center for BCC, ensuring appropriate material development and messaging for malaria BCC in Ghana, and working together with the NMCP and National Malaria Communication Committee.

*Progress during the last 12-18 months*

An evaluation of "*Aha Ye De*," a comprehensive mass media and interpersonal communication campaign conducted in 2014, found a significant increase in total number of nets owned by all participating households (60% at baseline vs. 78% at end line). Additionally, exposure to *"Aha Ye De"* was associated with increased use of ITNs ($p<0.001$) and with sleeping under a net the previous night ($p<0.01$). Three-fourths of those who reported sleeping under a net the previous night stated that they have heard *"Aha Ye De"* messages. There was significant association between exposure to malaria campaign spots and children under five sleeping under the net. More than half (56%) of respondents who heard these spots reported that the children in their households always slept under a net compared to 45% of participants who were not exposed to this campaign ($p=0.04$).

In 2014, a qualitative formative study on outdoor sleeping and nighttime activities was conducted in the Upper West and Northern Regions. In addition to outdoor sleeping, a variety of outdoor nighttime activities were documented, and overall ITN use was observed to be low (see the Operational Research section below, for further discussion). The findings reinforce the need for BCC messaging that underscores the importance of sleeping under a net every night, all night.

PMI continued to support mass media and interpersonal communication messages in 2014. The mass distribution of ITNs in Eastern and Volta regions were supported with messages on the importance of sleeping under a net every night for the duration of the night. In December, national promotion of ITN use messages were aired through 137 spots on four television stations and 742 radio placements in 20 radio stations covering 10 regions. Newspaper advertisements were also placed in the three most popular daily newspapers in Ghana.

On World Malaria Day 2015, PMI supported the publication and dissemination of the Ghana Malaria Action Alert, a quarterly newsletter. PMI also supported mass communication messages promoting the activities of World Malaria Day 2015. In April 2015, PMI supported a program design and development workshop with stakeholders and community leaders for an innovative new activity called Peers for Regular Use of Nets (Peers RUN) to promote net use at the community level.

In March 2015, PMI supported a Materials Review Workshop, which brought together fifty malaria and BCC stakeholders to review all of the BCC materials developed under the umbrella campaign. Specifically, the *"Aha Ye De" and "GoodLife. Live it Well"* campaign materials were reviewed. The stakeholders decided that the theme is well-recognized as a brand in Ghana and should be continued. Out of 39 malaria-related TV, radio and print materials reviewed, 10 were retained, 12 were retained with modifications, and 17 were retired. The campaign will also be expanded with the development of new materials based on new evidence to prevent message fatigue. At the time of the MOP visit, a media plan was being developed for intensive broadcasting of the existing malaria-related radio and TV spots between June and September 2015. A revision of other BCC materials based on current social and epidemiological information is underway.

Additionally, in 2015, PMI is supporting the development of a documentary to engage the Ghanaian corporate sector and Government of Ghana in malaria prevention and control financing

and activities. With PMI support, an advocacy plan and documentary will be ready for the NMCP in 2015 to help operationalize the NMCP's *Resource Mobilization Plan for National Malaria Control Strategy 2014 – 2020.*

*Plans and justification*

To sustain the investments PMI has made in the NMCP's malaria prevention and control program, PMI will continue to support malaria BCC activities in Ghana. PMI will build on previous PMI/Ghana and USAID/Ghana investments in BCC and branding of the *Good Life* integrated social and behavior change communication campaign. There is an urgent need to continue delivering key BCC messages, so PMI will support the development, dissemination, and implementation of national and targeted mass communications campaigns, community mobilization activities, and interpersonal communication activities to:

- Encourage a social shift in the correct and consistent use of ITNs;
- Promote prompt and timely care-seeking behaviors for febrile children;
- Increase knowledge about the signs and symptoms of malaria, malaria-carrying mosquitos' activity and habit (e.g. night biting, indoor resting), and the protection provided by ITNs;
- Increase threat perception (e.g. malaria being the primary killer for children under five, severe malaria causes disability) for prompt and proper care-seeking behaviors;
- Increase knowledge that every febrile illness is not malaria and that the caretakers and the general public should request RDTs before accepting malaria treatment;
- Increase health worker knowledge, attitudes, and practices regarding RDT use and facilitate adherence to negative RDT results; and
- Strengthen the capacity of GHS/Health Promotion Department to take the lead on implementing BCC activities together with NMCP, the National Malaria Communications Committee, and other implementing partners.

PMI will continue to promote the integration of facility- and community-level BCC messaging to strengthen the role of health workers as active promoters of ITNs, IPTp, and ACTs. The effectiveness of BCC activities will be assessed through routine monitoring and evaluation. Local media monitoring organizations will be used to monitor the number of spots aired on radio and television.

In addition, PMI will support communication efforts to facilitate NHIA capitation roll out to additional regions. Activities will include developing communication materials including print, radio and television messaging to promote active enrollment in NHIA and access to NHIA-accredited facilities among the general population, with a focus on high burden rural areas.

*Proposed activities with FY 2016 funding: ($1,400,000)*

In FY 2016, PMI will support national mass media and facility- and community-based interpersonal communication activities targeting key behaviors linked to correct and consistent use of ITNs, ACTs, adherence to RDT test results, early presentation at ANC to increase full adherence to IPTp, prompt and timely diagnosis and care seeking, and acceptance of IRS. Please refer to the HSS section for additional activities related to NHIA capitation. Specifically, PMI will:

- *Provide national-level support for malaria communication activities:* Provide national-level coordination and technical assistance, develop new malaria-specific communication materials, and facilitate dissemination of malaria-related messages, especially mass media communication efforts. Technical assistance will be provided to the NMCP, the National Malaria Communications Committee as well as to the GHS/Health Promotion Unit. *($650,000)*

- *Implement facility and community ,interpersonal behavior change communication activities:* Operating as PMI/Ghana's principle community mobilization activity, this work will include supporting facility-level outreach to promote correct and consistent uptake of both preventative and curative malaria interventions. It will also work with CHWs to improve their skills to engage with communities and promote malaria-related health seeking behaviors. BCC activities related to malaria case management, IPTp, and ITN use will be integrated with MCH messages, as appropriate. *($550,000)*

- *Support community-based communication efforts to promote correct and consistent use of ITNs:* Enhance the effectiveness of ITN continuous distribution efforts (via schools and facilities) through interpersonal and community based communication activities that specifically promote correct ITN use and correct care practices. Targeted ITN-specific technical assistance will be provided to the National Malaria Control Program to ensure that overall ITN messages throughout Ghana remain state of the art. Support will also include community-level promotion of net use in schools and engagement of community volunteers and community leaders through the Peers RUN program, which is described in greater detail in the ITN section, above. *($200,000)*

## 7. Monitoring and evaluation

*NMCP/PMI objectives*

The *National Malaria Control Monitoring and Evaluation Plan (2014-2020)* guides the strategic framework for M&E in malaria control in Ghana. The plan was developed in conjunction with the revised national strategic plan by the NMCP with technical assistance from PMI, WHO, and other partners. The objectives of the M&E plan are to reinforce the health information systems and processes to provide timely, accurate, reliable, and valid data for programmatic planning, management, and decision-making.

*Progress since PMI was launched*

Ghana uses routine health management information system data as the main source of data for tracking and measuring programmatic progress. Managed by the GHS/NMCP, the updated DHIMS2 platform for reporting and analyzing district level data from health facilities was rolled out in April 2012, and is available in all 216 districts. PMI provided support towards the DHIMS2 upgrade, which includes a customized dashboard to report malaria-focused indicators. Health facilities use standard paper forms to manually summarize data from the registers, and report monthly to the district health officer, who then electronically enters the data into DHIMS2.

From 2008-2011, PMI supported 5 GHS sentinel surveillance sites, collecting patient-level and aggregate data on approximately 30 malaria indicators. Following an evaluation of the sites in 2011 that showed low testing rates and poor data use, PMI stopped providing financial and technical support. With support from the Global Fund and DFID, the NMCP established 30 sentinel sites for monitoring trends in malaria burden and other disease indicators in 2014. These sites are an expansion of the ten therapeutic efficacy study sites, and were established to ensure quality weekly and monthly reporting to DHIMS2 of multiple disease indicators including malaria. For malaria, these sites provide data on number of suspected cases, number of suspected cases tested, and number of tested who are positive. Thick and thin stain smears are also performed on every third suspect case.

PMI has supported three national malaria household surveys, the 2008 DHS, 2011 MICS (with a full malaria component), and the 2014 DHS. All were conducted during the peak malaria season — late rainy season from August to December—with the latter two surveys including a malaria module that tested for anemia and parasitemia. The 2008 DHS serves as the baseline estimate for all PMI coverage indicators. In 2016, the NMCP will be in the third year of its current M&E strategic framework, providing optimal timing for the Global Fund to support a Malaria Indicator Survey to continue to measure progress of malaria control and prevention interventions in Ghana. With baseline and follow-up estimates of all-cause under-five mortality, these nationally represented surveys will serve as the key data sources for the 2016 Impact Evaluation.

There are currently ten Global Fund-supported therapeutic efficacy study sites, operated by Noguchi Institute for *in vivo* drug efficacy monitoring throughout the ten regions of Ghana. PMI, WHO, and Naval Medical Research Unit No. 3/Department of Defense have also provided support for monitoring efficacy of the two first-line ACTs used for the treatment of uncomplicated malaria since the launch of PMI. Efficacy studies are typically conducted biennially. In 2015, Global fund supported therapeutic efficacy studies in ten sites, one in each region – five testing only artemether-lumefantrine and the other five testing only artesunate-amodiaquine.

In collaboration with other partners, such as AGAMal and Noguchi, PMI also continues to support entomological monitoring of IRS activities. Table K summarizes the different M&E activities that have been supported by PMI as well as other partners.

**Table K. Monitoring and Evaluation Data Sources 2008 – 2017**

| Data Source | Survey Activities | Calendar Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| National-level Household surveys | Demographic Health Survey (DHS) | X | | | | | | X** | | | |
| | Malaria Indicator Survey (MIS) | | | | | | | | | X* | |
| | Multi-Indicator Cluster Survey (MICS) | | | | X** | | | | | | |
| Health Facility and Other Surveys | Health facility survey | | | | | | | | | X* | |
| | EUV survey | | | X | X | X | X | X | X | X | X |
| Malaria Surveillance and Routine System Support | Support to malaria sentinel surveillance system | X | X | X | X | | X* | X* | X* | X* | X* |
| | Support to HMIS | X | X | X | X | X | X | X | X | X | X |
| Therapeutic Efficacy monitoring | In vivo efficacy testing | | | | | | X* | | X* | | X* |
| Entomology | Entomological surveillance and resistance monitoring | X | X | X | X | X | X | X | X | X | X |
| | Entomological bio-monitoring | | | | | | | | X*** | | |
| Other malaria-related evaluations | Anemia and Parasitemia Monitoring (Northern Ghana) | | | | | | X | X | | | |
| | Baseline and midline survey to assess malaria control activities related to HSS | | | | | | | | X | | X |
| Other Data Sources | Malaria Impact Evaluation | | | | | | | | | X | |

*Not PMI funded; **Included a full malaria module; ***PMI core-funded

*Progress during the last 12 – 18 months*

Accurate and timely data collection is one of the NMCP's most immediate challenges. During the last 12 – 18 months, PMI worked with the NMCP and other partners to improve the quality of data and build capacity for evidence-based decision making. Support was at the national, regional, and district/sub-district levels and included:

- Data coaching visits conducted in 20 districts across five regions (Northern, Volta, Greater Accra, Central, and Western). A total of 309 health facilities received coaching on data collection and reporting from a team comprised of five representatives from all health levels (A national level representative from the Policy, Planning, Monitoring and Evaluation Division, the regional health information officer, district head nurse, district health information officer and the malaria focal point person from the implementing partner);
- Trained 185 health information officers in supportive M&E supervision (surpassing the annual target of 175 officers trained);
- Trained 107 newly-posted health information officers and records staff (exceeding the original target of 70 staff members) on malaria data reporting, standard operating procedures in health information management, and DHIMS2;
- Conducted clinical OTSS data utilization training for 90 health information officers and clinicians from the district and regional levels (reaching 78% of targeted officers);
- Through the first round of clinical OTSS, M&E supportive supervision visits were conducted to 997 health facilities, reaching over 90% of the targeted facilities, with 6,100 staff supervised;
- Through the third round of clinical OTSS:
    - 88% of records staff trained in malaria data reporting;
    - 68% of persons in charge of DHIMS trained on DHIMS2;
- Conducted data quality improvement/DHIMS2 training for 385 hospital and district health information officers (and surpassed the annual target of 175 health officers trained);
- Supported M&E technical working group activities and regional level review meetings;
- Supported the development of the NMCP M&E Plan;
- Conducted training on clinical OTSS data review and data utilization.

PMI's investments in strengthening the routine information management system have improved timeliness and completeness of monthly reporting of malaria morbidity indicators from outpatient disease registers at health faculties. Timeliness of reporting malaria morbidity data to DHIMS2 increased from 60% in January 2013 to 84% in March 2015. Likewise, completeness of reports increased from 88% in 2013 to 98% in 2015. The routine M&E system has enhanced the capacity of health information officers in data analysis, interpretation and use, provided coaching on data validation at facility levels, and helped to clarify malaria indicator definitions and data sources for facility level staff.

In 2015, PMI supported the design and implementation of a USAID-sponsored nationwide cross-cutting baseline survey to assess all programmatic areas related to health systems strengthening including HIV, TB and MCH and malaria. In collaboration with other health funds (such as HIV and maternal and child health), the baseline survey consisted of quantitative and qualitative

components. The baseline survey was planned so that the data collection tools and analysis will provide optimal and consistent comparison for all USAID/Ghana investments across the health sector over time. The quantitative component assessed approximately 20 malaria program indicators collected and reported by multiple implementing partners conducting various malaria prevention and control activities. The qualitative component collected data on client satisfaction and stakeholders from the community, sub-district and district levels. At the time of writing this MOP, 210 qualitative interviews were completed in Central, Greater Accra, Western, Northern, and Upper East Regions; 597 health facilities and 288 CHPS compounds were surveyed. A complete analysis and report will be available in August 2015. The midterm and final surveys will be conducted in subsequent years to assess the overall programmatic and health system strengthening contributions PMI has made since 2007.

*Plans and justification*

With Ghana's increased resources and investments to improve malaria control methods, the Global Fund will support a nationally representative health facility survey in late 2016/early 2017. Using the Service Availability and Readiness Assessment, the survey will monitor the health service's availability and readiness to manage malaria cases assess malaria quality of care indicators in a representative sample of health facilities throughout Ghana. PMI will continue to support the implementation of end-use verification (EUV) surveys to provide information on the status of malaria pharmaceutical supplies and quantification of malaria medications.

PMI has begun to support the design and implementation of a national database that will ultimately contain entomological and insecticide resistance data for all ten regions of Ghana. Contributors to the database will be NMCP, PMI, AGAMal, Labiofam, and any other partners collecting entomological data and willing to participate. The data will provide an overview of current and longitudinal trends in entomological and insecticide resistance, a crucial component in monitoring the impact of malaria control interventions and the selection of future vector control components. All engaged partners have participated in database training and are working together to select the final database format. During the second half of 2015, a consultant will begin development of the database.

PMI is committed to working with the NMCP to support the implementation of the national malaria M&E plan. The Global Fund's recently supported national data quality assessment revealed widely inconsistent use of source data forms, application of data quality assurance mechanisms, data quality documentation, and adherence to data submission protocols. Therefore, PMI will support monitoring data quality collected through DHIMS2, starting with data verification at the facility level, to ensure the programmatic and technical needs of NMCP are met. This will be accomplished by: 1) improving supportive supervision and training at all health levels to ensure proper data collection, reporting and interpretation (which will also focus on the private sector); 2) continuing to support regional malaria data review workshops (which will include the private sector) to discuss DHIMS2 data use and programmatic implications; and 3) work with the NMCP on the integration of DHIMS2 data with OTSS and other health facility data.

Given the changing epidemiology of the *Anopheles* mosquito, the rotation of insecticides used and the duration of IRS spraying, PMI recognizes the importance of enhanced monitoring of insecticide resistance and will continue to support this activity in FY 2016.

*Proposed activities with FY 2016 funding:($1,005,000)*

- *Strengthen and support routine M&E systems at peripheral levels in five focus regions:* Support GHS/NMCP to strengthen routine systems at the health facility and district levels for malaria M&E in the Northern, Volta, Greater Accra, Central, and Western Regions. Strengthening activities in each of the five regions will include: providing integrated data coaching visits for health facility data management staff to validate and audit data collection, analysis and reporting to improve data quality; supporting regional mid-year review meetings that focus on improved analysis and data use; supporting the Policy, Planning, Monitoring and Evaluation Division's Center for Health Information Management boot camp meetings to routinely assess and discuss malaria data – these meetings will reinforce ownership, use and feedback of the data; integrated supported supervision by GHS in 109 districts to improve collection and reporting of data from the health facility up to the district level; and limited computer hardware and software to fill gaps. These activities will complement additional national-level M&E activities, described in more detail below, and will be conducted under the auspices of Ghana's M&E TWG. *($570,000)*

- *Strengthen and support routine M&E system at the national level: ($375,000)* Support strengthening the routine M&E system at the national level in three distinct areas, namely: M&E capacity building of other implementing partners, conducting targeted research activities, and conducting mid-line and end-line surveys. Specific activities include:
    - Continuing support to the digitalization of DHIMS2 for standardization of electronically reported data to strengthen the quality of the system to ensure reliable malaria data reports.
    - Drawing from baseline and research symposium findings, develop national strategies to improve M&E support and inform NMCP decisions and programmatic direction. Support the national midline survey in 2017 to assess malaria control activities related to health systems strengthening.

- *Nationwide insecticide resistance monitoring:* In collaboration with other partners and national research institutions, continue to support routine insecticide resistance monitoring at a network of sites nationwide. PMI will provide technical assistance, equipment, training, and funding for routine data collection. These resources will leverage other vector-control partner resources for entomological monitoring activities and will help fill gaps to ensure national coverage. *($50,000)*

- *Provide M&E technical assistance:* Support for a technical assistance visit from the CDC PMI M&E team. Technical assistance will include working with the NMCP to support strengthening M&E and health management information system activities. *($10,000)*

## 8. Operational research

*NMCP/PMI objectives*

The Strategic Plan for Malaria Control in Ghana, 2014-2020, reinforces operational research (OR) as a means to mobilize resources and inform programmatic direction. Operational research activities in Ghana have become an integral strategy to measure impact of malaria control and prevention activities, and to identify gaps and weaknesses to improve program implementation. The OR studies implemented and proposed for PMI support are identified jointly by the NMCP and have focused on assessing the impact of vector control activities on malaria infection.

*Progress since PMI was launched*

Since 2008, PMI has conducted IRS in nine districts in northern Ghana. The Northern Region is an important focus for the GOG because of high malaria transmission rates, less healthcare resources, and lower economic development compared to other regions of the country.

During 2010-2012, an operational research "Anemia and Parasitemia Study" was conducted to compare the impact of annual vs biannual pyrethroid IRS in Bunkpurugu Yunyoo District in the Northern Region of Ghana. Bunkpurugu Yunyoo District has a peak malaria season in September-November, at the end of its single rainy season, and a low malaria season in March-April at the end of its dry season. For this study, half of Bunkpurugu Yunyoo District was sprayed once a year prior to the rainy season and the other half was sprayed prior to both the rainy and dry seasons. IRS impact was measured by peak and low season parasitemia surveys among children under five years, starting with the pre-IRS peak and low seasons as baselines. For all anemia and parasitemia surveys conducted from 2010-2013, the same methodology was used: sampling of a community within the district was done proportional to size, compounds within the community were chosen randomly, all children under five in the compound were recruited, and informed consent was obtained. The study also included the administration of a questionnaire to the child's caregiver, which covered family demographic and socio-economic characteristics, nutrition, access to malaria care, malaria interventions (i.e. IRS, ITNs, and IPTp), and child-specific questions about recent fever, illnesses, hospitalizations, and medications. The survey also included the administration of an RDT, with treatment to those who tested positive and had a recent history of fever (within 24-48 hours prior to survey). Children with other illnesses were provided appropriate referrals based on signs and symptoms of illness, or were transported to the primary referral hospital in the area if they exhibited symptoms of serious illness. Although there was a decline in parasitemia in both areas, there was is no consistent evidence that IRS with pyrethroid insecticide applied twice a year was more effective than once a year in this district.

In Bunkpurugu Yunyoo District overall, there was a modest, but significant decline in parasitemia prevalence between 2010 and 2012 among children under five, from 52.4% to 47.7%

(p=0.005). Other health indicators also showed significant but not dramatic decreases at endline, as compared to baseline. The percent of children with an RDT-positive result decreased from 69.9% to 66.0% (p=0.01), while the percent of children with anemia decreased from 77.7% to 67.8% (p<0.001). However, the percent of children with fevers had a greater decrease, from 69.4% to 43.9% (p<0.001). ITN use was approximately 95% in 2010 and 2012, but decreased to 82.2% in 2011. Throughout the anemia and parasitemia study the entomological inoculation rate showed a dramatic, near linear decline from 0.35 infective bites/person/night in 2010 to 0.021 in 2012 (p=0.018).

*Progress during the last 12-18 months*

Despite the implementation of IRS and distribution of ITNs, malaria infection in northern Ghana remains high. In 2014, a qualitative formative study on outdoor sleeping and nighttime activities was conducted in the Upper West and Northern Regions. In-depth interviews and night time observations were used to document outdoor sleeping and a variety of social, cultural, and economic activities that occur during night time. Outdoor sleeping due to heat was reported and observed frequently among household members of all ages. Outdoor sleeping at some point during the night was reported in 42% of the study population.[6] Insecticide-treated net use was observed to be low irrespective of whether people slept indoors or outdoors, in both regions. In addition to outdoor sleeping, a variety of outdoor nighttime activities were documented including cooking and other household chores, socializing both within the household compound and elsewhere, and studying both within the household compound and at night school classes. Funerals emerged as a common large-scale nighttime event with participants reporting that they attended funerals up to once a week.

Documenting and understanding human-vector interaction and its effect on malaria control is essential. Findings from the outdoor-sleeping study suggest that human outdoor exposure to malaria vectors may limit the impact of indoor-oriented vector control measures and epidemiological and entomological research is needed to quantify the relative risk of the different night-time activities described in this study. The limitations of this study were that it was conducted during dry season when malaria transmission is low and lacks sufficient vector data. As a result, PMI proposes to examine the roles that human and vector behavior play in outdoor exposure to malaria transmission during the high transmission season in Northern Ghana

Although the proposed objectives are still being finalized and approved, they may include: 1) classifying and quantifying human outdoor behaviors by age during the peak malaria transmission season to measure potential exposure during Anopheles biting; 2) measuring *Anopheles* biting and resting behaviors to quantify biting time, location and intensity using human landing collections; 3) measuring *Anopheles* resting behaviors to quantify biting times, location to provide information about mosquitoes that successfully fed but evaded treated rooms and/or nets by resting elsewhere; and 4) overlapping human and mosquito behaviors with infection status to determine importance of human outdoor exposure and how it correlates with infected mosquito biting time, location and resting sites. Data collection would also include

[6] Monroe A, Asamoah O, Lam Y, Koenker H, Psychas P, Lynch M, et. al. Outdoor-sleeping and other night-time activities in northern Ghana: implications for residual transmission and malaria prevention. *Malaria Journal* 2015, 14:35-46

blood meal source, parity, and infection status of collected mosquitoes. CDC is collaborating closely with NAMRU-3 and Noguchi Institute to develop this OR project.

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

| **Completed OR Studies** | | | |
|---|---|---|---|
| **Title** | **Start date** | **End date** | **Budget** |
| Prevalence of *Plasmodium falciparum* parasitemia and anemia in children under five years of age at baseline and following annual versus biannual indoor residual spraying (IRS) in Bunkpurugu-Yunyoo District, northern Ghana | April 2011 | April 2013 | $480,000 |
| Outdoor-sleeping and other night-time activities in northern Ghana: implications for residual transmission and malaria prevention | February 2014 | March 2014 | $70,322 |
| **Ongoing OR Studies** | **Start date** | **End date** | **Budget** |
| **Title** | | | |
| *No PMI-supported OR is ongoing* | | | |
| **Planned OR Studies FY 2016** | | | |
| **Title** | **Start date (est.)** | **End date (est.)** | **Budget** |
| The effect of outdoor human behavior during peak vector biting times on malaria infection | June 2016 | October 2017 | $225,000 |

*Plans and justification*

Increased exposure to outdoor vector biting by participation in night-time outdoor activities may pose a threat to the effectiveness of existing vector control interventions. The OR topic proposed with FY 2015 funds is no longer an NMCP priority, and will be reprogrammed to address the immediate need to quantify the effect of outdoor human activities during peak vector biting times on risk of malaria infection. Contingent upon approval of FY 2015 reprogrammed funds to conduct the anticipated OR topic, FY 2016 funds will support year two of data collection, data analysis and report writing.

*Proposed activities with FY 2016 funding: ($135,000)*

- *Support Implementation of a malaria vector related operational research activity:* PMI will support year two of this research study to quantify the effect of human outdoor activities on the risk of malaria infection. *($125,000)*

- *Technical assistance for operational research:* Support for one technical assistance visit from CDC to support the implementation of the proposed operational research project. *($10,000)*

## 9. Staffing and administration

Two health professionals serve as resident advisors to oversee PMI in Ghana, one representing CDC and one representing USAID. In addition, two 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 resident advisor 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 professional staff work together to oversee all technical and administrative aspects of the 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 to PMI 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 resident advisors, 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. The technical expertise housed in Atlanta and Washington guides PMI programmatic efforts.

The two PMI resident advisors are based within the USAID health office and are expected to spend approximately half their time sitting with and providing technical assistance to the national malaria control programs and partners.

Locally-hired staff to 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 US Global Malaria Coordinator.

*Proposed activities with FY 2016 funding: ($1,741,000)*

- *In-country staff and administrative expenses:* To support the coordination and management of all in-country PMI activities including support for salaries and benefits for two resident advisors and local staff, office equipment and supplies, and routine administration and coordination expenses. *($1,741,000)*

**Table 1: Budget Breakdown by Mechanism**

**President's Malaria Initiative – GHANA**

**Planned Malaria Obligations for FY 2016**

| Mechanism | Geographic Area | Activity | Budget ($) | | % |
|---|---|---|---|---|---|
| IRS 2 TO 6 | 5 IRS Districts | IRS implementation and management | $5,000,000 | **$5,050,000** | 18.04% |
| | National | Nationwide insecticide resistance monitoring | $50,000 | | |
| Communicate for Health | National | Support mass media communication efforts to promote ITN ownership and use, IPTp uptake, and improved care seeking behavior | $650,000 | **$650,000** | 2.32% |
| CDC IAA | National | TA to support entomologic monitoring for IRS | $29,000 | **$819,000** | 2.93% |
| | | Provision of supplies to support entomologic monitoring for IRS | $10,000 | | |
| | | Technical assistance for diagnostics | $10,000 | | |
| | | Support long-term field epidemiology and laboratory training | $75,000 | | |
| | | Provide M&E technical assistance | $10,000 | | |
| | | Technical assistance for operational research | $10,000 | | |
| | | In-country staff and administrative expenses | $675,000 | | |
| Evaluate for Health | National | Strengthen and support routine M&E system at the national level | $375,000 | **$500,000** | 1.79% |
| | | Support implementation of an operational research activity | $125,000 | | |
| GEMS | National | TA for Enhanced Environmental Monitoring and Compliance | $30,000 | **$30,000** | 0.11% |
| G2G GHS/CLU | National | Strengthen quality of malaria microscopy capacity in laboratories | $300,000 | **$300,000** | 1.07% |
| G2G NHIA - Clinical | National | Support NHIA to implement clinical audits | $325,000 | **$325,000** | 1.16% |
| G2G NHIA | National | Support NHIA capitation roll | $350,000 | **$350,000** | 1.25% |

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| Communications | | out | | | |
| HFG | National | Ensure the sustainability of NHIA to provide access to appropriate malaria treatment | $400,000 | **$400,000** | 1.43% |
| MalariaCare | National | Strengthen quality of malaria microscopy capacity in laboratories | $100,000 | **$1,190,000** | 4.25% |
| | | Provide technical assistance to improve malaria case management at the national and health facility levels | $850,000 | | |
| | | Support pre-service training for health care workers and physicians to improve malaria case management capacity | $140,000 | | |
| | | Build management capacity at NMCP, GHS and other GOG partners | $100,000 | | |
| MCSP | National | Support pre-service training for health care workers | $250,000 | **$500,000** | 1.79% |
| | | Support pre-service training for health care workers and physicians to improve malaria case management capacity | $250,000 | | |
| Peace Corps SPA | National | Support Peace Corps Malaria Program | $10,000 | **$10,000** | 0.04% |
| SHOPS (Bilateral Associate Award) | National | Strengthen the malaria case management capacity of OTCMS and pharmacies | $400,000 | **$400,000** | 1.43% |
| Systems for Health | 5 USAID focus regions | Strengthen provision of malaria prevention tools through ANC clinics | $550,000 | **$3,270,000** | 11.68% |
| | | Support implementation of iCCM in priority areas | $300,000 | | |
| | | Strengthen the provision and quality of malaria case management at health facilities | $950,000 | | |
| | | Strengthen the district level supply chain system | $350,000 | | |
| | | Implement interpersonal and facility- and community-level behavior change and interpersonal communication activities | $550,000 | | |
| | | Strengthen and support routine M&E systems in 5 focus | $570,000 | | |

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| | | regions | | | |
| TBD (Supply Chain Contract) | National | Procurement of ITNs | $5,950,000 | **$11,150,000** | 39.82% |
| | | Procurement of RDTs | $1,500,000 | | |
| | | Procurement of Microscopes | $80,000 | | |
| | | Procurement of ACTs | $2,380,000 | | |
| | | Procurement of severe malaria treatment | $300,000 | | |
| | | Support supply chain system strengthening | $940,000 | | |
| TBD (People for Health) | National | Strengthen the role of civil society in malaria advocacy | $0 | **$0** | 0.00% |
| TBD (G2G ICD) | National | Provide technical assistance to improve malaria case management at the national and regional levels | $300,000 | **$300,000** | 1.07% |
| USAID/Ghana | National | In-country staff and administrative expenses | $1,066,000 | **$1,066,000** | 3.81% |
| USP-PQM | National | Strengthen drug quality monitoring capacity | $150,000 | **$150,000** | 0.54% |
| VectorWorks | National | Distribution of ITNs, including support for local ITN distribution activities and strengthening the supply chain | $1,300,000 | **$1,500,000** | 5.36% |
| | | Support correct and consistent use of ITNs through school-based distribution efforts | $200,000 | | |
| WHO Umbrella PIO Grant | National | Support to WHO National Professional Officer (NPO) | $40,000 | **$40,000** | 0.14% |
| **Total** | | | | **$28,000,000** | **100.00 %** |

**Table 2: Budget Breakdown by Activity**

**President's Malaria Initiative – GHANA**

**Planned Malaria Obligations for FY 2016**

| Proposed Activity | Mechanism | Budget | | Geographic Area | Description |
|---|---|---|---|---|---|
| | | Total $ | Commodity $ | | |
| **PREVENTIVE ACTIVITIES** | | | | | |
| **Insecticide Treated Nets** | | | | | |
| Procurement of ITNs | TBD (Supply Chain Contract) | $5,950,000 | $5,950,000 | National | Procure approximately 1,400,000 long-lasting ITNs to support continuous channels to contribute towards maintaining universal coverage of ITNs. |
| Distribution of ITNs, including support for local ITN distribution activities and strengthening the supply chain | VectorWorks | $1,300,000 | $0 | National | Support the continuous distribution of ITNs through schools and health facilities (ANCs and CWCs) with support to the GHS/NMCP and Ghana Educational Service/School Health Education Program. Funds will support the costs of training, planning, supervision, operations, and M&E. Additional support will be provided for mass distribution, as needed. |
| **SUBTOTAL ITNs** | | **$7,250,000** | **$5,950,000** | | |
| **Indoor Residual Spraying** | | | | | |

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| IRS implementation and management | IRS 2 TO 6 | $5,000,000 | $1,500,000 | 5 IRS Districts | Support IRS implementation and programmatic evaluation in five districts in the Northern Region. Funding will support entomological monitoring, spray operations, data collection, environmental assessment and compliance monitoring, BCC activities including community mobilization, procurement of insecticide and equipment; support for supervision ; and collaboration with partners. Programmatic evaluation includes the M&E activities that measure the performance of IRS. |
| TA for Environmental Monitoring and Compliance | GEMS II | $30,000 | $0 | National | Conduct environmental monitoring, environmental assessments, and risk mitigation in IRS districts. |
| TA to support entomologic monitoring for IRS | CDC IAA | $29,000 | $0 | National | Provide technical assistance and quality assurance, through two visits by a CDC entomologist, for ongoing entomologic monitoring of the PMI-funded IRS program |
| Provision of supplies to support entomologic monitoring for IRS | CDC IAA | $10,000 | $10,000 | National | Support the procurement of entomologic supplied to continue monitoring insecticide resistance and assess factors that may limit IRS impact in the Northern Region. |
| **SUBTOTAL IRS** | | **$5,069,000** | **$1,510,000** | | |
| **Malaria in Pregnancy** | | | | | |
| Strengthen provision of malaria prevention tools through ANC clinics | Systems for Health | $550,000 | $0 | 5 USAID focus regions | Support ANC clinics at the health center and, where available, at CHPS compounds to effectively deliver a package of malaria prevention services to pregnant women, including supportive supervision, on-site training, provision of IPTp at every ANC visit, ensure distribution of an ITN to every pregnant |

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| | | | | | woman at first ANC visit. |
| Support pre-service training for health care workers | MCSP | $250,000 | $0 | National | Provide technical pre-service training for nurses, midwives, and medical assistants in prevention and treatment of malaria in pregnancy. |
| **Subtotal: Malaria in Pregnancy** | | **$800,000** | **$0** | | |
| **SUBTOTAL: PREVENTIVE ACTIVITES** | | **$13,119,000** | **$7,460,000** | | |
| **CASE MANAGEMENT** | | | | | |
| **Diagnosis and Treatment** | | | | | |
| Procurement of RDTs | TBD (Supply Chain Contract) | $1,500,000 | $1,500,000 | National | Procure approximately 2,500,000 RDTs, to fill identified gaps and ensure that health facilities maintain capacity to test fevers and diagnose malaria cases. |
| Procurement of Microscopes | TBD (Supply Chain Contract) | $80,000 | $80,000 | National | Procure approximately 40 microscopes, as well as limited diagnostic supplies (e.g. microscopy kits/reagents) to fill identified gaps and ensure that health facilities maintain capacity to test fevers and diagnose malaria cases. |
| Procurement of ACTs | TBD (Supply Chain Contract) | $2,380,000 | $2,380,000 | National | Procure approximately 1.3 million ACTs, to meet the estimated commodity needs for 2017. |
| Procurement of severe malaria treatment | TBD (Supply Chain Contract) | $300,000 | $300,000 | National | Support the national commodity needs for severe malaria: procure approximately 110,000 ampules of injectable artesunate (60 mg/1ml). Procure an estimated 30,000 tablets of artesunate suppositories. |
| Strengthen quality of malaria | Malaria Care | $100,000 | $0 | National | Conduct malaria diagnostic refresher training at the national level quarterly. |

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| microscopy capacity in laboratories | G2G GHS/CLU | $300,000 | $0 | National | Conduct quarterly laboratory OTSS and malaria diagnostic refresher training nationwide, at the national level to support continued quality improvements to malaria microscopy and RDT use and scale up, including improvement of coordination between laboratory staff and prescribers |
| Support implementation of iCCM in priority areas | Systems for Health | $300,000 | $0 | Targeted areas in 2 regions | Provide support for strengthening iCCM activities in 150 prioritized hard-to-reach catchment areas in Northern and Volta Regions. Support will include in-service training and facilitating supportive supervision to the community-based volunteers by the designated CHPS point of contact. Provide CHPS nurses with targeted supervision and mentorship in district and regional hospitals. |
| Strengthen the provision and quality of malaria case management at health facilities | Systems for Health | $950,000 | $0 | 5 USAID focal regions | Support the district hospitals, health centers, and CHPS compounds to provide high quality malaria case management through routine clinical OTSS Malaria focused health system strengthening will also be employed to support improved cases management. |
| Provide technical assistance to improve malaria case management at the national and health facility levels | Malaria Care | $850,000 | $0 | National | In the five non-USAID focus regions, support the regional and district facilities to provide high quality malaria case management. This support will be provided through routine clinical OTSS visits Support national-level case management work with GHS and NMCP. |

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| Provide technical assistance to improve malaria case management at the national and regional levels | TBD (G2G ICD) | $300,000 | $0 | National | Provide financial support to GHS to support national supportive supervision policy and guideline development, and to develop or adapt tools to facilitate implementation. Support will also include implementation of clinical OTSS regional teams. Assist the regional OTSS teams with improved management, leadership, data management and supervision. PMI will support Regional Health Management Teams to integrate iCCM services into the GHS supervision system. |
| Support pre-service training for health care workers and physicians to improve malaria case management capacity | MCSP | $250,000 | $0 | National | Support pre-service training for general nurses, midwives, and medical assistants to improve competencies in knowledge, skills, and practices for malaria diagnosis and case management in compliance with GHS guidelines and protocols. Support implementation of revised school curricula. |
| | Malaria Care | $140,000 | $0 | National | Support pre-service and/or continuing medical education training for physicians and revision of medical school curricula to improve competencies in knowledge, skills, and practices for malaria diagnosis and case management in compliance with GHS guidelines and protocols. |
| Strengthen the malaria case management capacity of OTCMS and pharmacies | SHOPS (Bilateral Associate Award) | $400,000 | $0 | National | Support activities to build the capacity of licensed chemical sellers and pharmacists to comply with GHS malaria diagnosis, treatment and referral guidelines. Address issues related to for-profit, business motivations to comply with GHS guidelines. |
| Support NHIA to implement clinical audits | G2G NHIA - Clinical | $325,000 | $0 | National | Continue support for NHIA to conduct clinical audits to improve treatment standards and the quality of service provision among accredited providers, to ensure adherence to standard protocols, and to check against fraud and abuse. |

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| Technical assistance for diagnostics | CDC IAA | $10,000 | $0 | National | Provide technical assistance for lab OTSS, proficiency testing, microscopy quality assurance, and RDT proficiency and scale-up. |
| **Subtotal: Diagnosis and Treatment** | | **$8,185,000** | **$4,260,000** | | |
| **Pharmaceutical Management** | | | | | |
| Support supply chain system strengthening | TBD (Supply Chain Contract) | $940,000 | $0 | National | Provide technical assistance for strengthening logistics, warehousing and distribution to improve availability of malaria commodities, in accordance with the national Supply Chain Master Plan. Activities will focus on addressing bottlenecks in finance, management, forecasting, transportation and reporting systems. Support quarterly end user verification activities. |
| Strengthen the district level supply chain system | Systems for Health | $350,000 | $0 | 5 USAID focal regions | Strengthen the supply chain management capacity within the five priority regions at the district and facility levels. Facilities in the districts will receive supportive supervision on supply chain management which will focus on reviewing logistics records (stock cards, laboratory management information system), assessing stock status of commodities, conducting physical inventory, and assessing the storage conditions. Continuous on-the-job training will be provided and action plans will be developed to improve supply chain management. |
| Strengthen drug quality monitoring capacity | USP-PQM | $150,000 | $0 | National | Provide support for the strengthening of anti-malaria drug quality monitoring in collaboration with the Ghana FDA, consolidate the recent expansion of the post-market surveillance. Support to Ghana FDA for increased enforcement capacity and education to heighten |

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| | | | | | responsiveness to counterfeit and substandard medicines will continue. Support Ghana FDA for routine audits to keep its ISO 17025 accreditation. |
| **Subtotal: Pharmaceutical Management** | | **$1,440,000** | **$0** | | |
| **SUBTOTAL: CASE MANAGEMENT** | | **$9,625,000** | **$4,260,000** | | |

| **HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING** | | | | | |
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| Build management capacity at NMCP, GHS and other GOG partners | MalariaCare | $100,000 | $0 | National | Continue to provide support to the NMCP, GHS, and GOG for technical capacity building and improved malaria control systems. This activity will support: 1) attendance in malaria-specific trainings, conferences by select NMCP, GHS, and GOG employees to further build in-country capacity; 2) assisting NMCP with organizing meetings that are important for planning and management of malaria prevention and control activities; and 3) supporting limited information technology investments, such as computers, laptops, internet connection at the GHS's Regional Health Directorate level to ensure timely data reporting to DHIMS2. |

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| Ensure the sustainability of NHIA to provide access to appropriate malaria treatment | HFG | $400,000 | $0 | National | Provide technical assistance to the scale-up of a primary health care capitated package of services to three additional regions; Improve provider incentives to ensure appropriate case management services by working with key stakeholders to identify examples of best practices, real time data analysis, and communication materials to address the incentive constraints introduced with the preferred provider system<br><br>Refinement of diagnostic related groups to cut costs and as a tool to monitor clinical performance; strengthen claims management, drug payment and drug supply management to ensure the continued sustainability of the NHIA |
| Support NHIA capitation roll out | G2G NHIA Communications | $350,000 | $0 | National | Support communication efforts to facilitate NHIA capitation roll out to additional regions, with the goal of promoting enrollment in NHIA and informing the public about how to access NHIA-accredited facilities among the general population. It is anticipated that this investment will contribute towards strengthening the overall program, increase enrollment and reduce the risk of insolvency. |
| Strengthen the role of civil society in malaria advocacy | TBD (People for Health) | $0 | $0 | National | Build the capacity of local Ghanaian non-governmental organizations and civil society organizations to monitor the quality and ease of access to health services, with a focus on malaria diagnostics and treatment. Strengthen community structures for advocating for patients' rights and client-centered care, including the availability of malaria commodities. |

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| Support Peace Corps Malaria Program | Peace Corps SPA | $10,000 | $0 | National | Support Peace Corps Volunteers through the "Stomping Out Malaria in Africa" initiative. Peace Corps Volunteers based in Ghana will receive small grants from PMI to engage in malaria control and prevention activities such as community mobilization for BCC, ITN distribution, and (as needed) operational research data collection. |
| Support to WHO National Professional Officer (NPO) | WHO Umbrella PIO Grant | $40,000 | $0 | National | The National Professional Officer will continue to give technical assistance to the NMCP for guidance on a variety of malaria activities such as strengthening monitoring and evaluation activities, the implementation of integrated community case management (iCCM), and pharmacovigilance issues |
| Support long-term field epidemiology and laboratory training | CDC IAA | $75,000 | $0 | National | Support long-term training of individuals to build capacity at the NMCP or GHS in epidemiology, M&E, or other malaria program management functions as needed through the FELTP, which was established with USG support at GHS in collaboration with the University of Ghana's School of Public Health. |
| **SUBTOTAL: HSS & CAPACITY BUILDING** | | **$975,000** | **$0** | | |
| **BEHAVIOR CHANGE COMMUNICATION** | | | | | |
| Support mass media communication efforts to promote ITN ownership and use, IPTp uptake, and improved care seeking behavior | Communicate for Health | $650,000 | $0 | National | Provide national-level coordination and technical assistance, develop new malaria-specific communication materials, and facilitate dissemination of malaria-related messages, especially mass media communication efforts. Technical assistance will be provided to the NMCP, the National Malaria Communications Committee as well as to the GHS/Health Promotion Unit. |

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| Support correct and consistent use of ITNs through school-based distribution efforts | Vector Works | $200,000 | $0 | National | Enhance the effectiveness of ITN continuous distribution efforts (via schools and facilities) through interpersonal and community based communication activities that specifically promote correct ITN use and correct care practices. Targeted ITN-specific technical assistance will be provided to the National Malaria Control Program to ensure that overall ITN messages throughout Ghana remain state of the art. |
| Implement interpersonal and facility- and community-level behavior change and interpersonal communication activities | Systems for Health | $550,000 | $0 | 5 USAID focal regions | Operating as PMI/Ghana's principle community mobilization activity, this work will include supporting facility-level outreach to promote correct and consistent uptake of both preventative and curative malaria interventions. It will also work with CHWs to improve their skills to engage with communities and promote malaria-related health seeking behaviors. |
| **SUBTOTAL: BCC** | | **$1,400,000** | **$0** | | |
| **MONITORING AND EVALUATION** | | | | | |
| Strengthen and support routine M&E systems in 5 focus regions | Systems for Health | $570,000 | $0 | 5 USAID focal regions | Support GHS/NMCP to strengthen routine systems at the health facility and district levels for malaria M&E. Strengthening activities will include: providing integrated data coaching visits to health facility data management staff to validate and audit data collection, analysis and reporting to improve data quality; supporting regional mid-year review meetings that focus on improved analysis and data use; supporting the Policy, Planning, Monitoring and Evaluation Division's Center for Health Information Management boot camp meetings to routinely assess and discuss malaria data – these meetings |

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| | | | | | will reinforce ownership, use and feedback of the data; integrated supported supervision by GHS in 109 districts to improve collection and reporting of data from the health facility up to the district level; and limited computer hardware and software to fill gaps. |
| Nationwide insecticide resistance monitoring | TBD (G2G Noguchi) | $50,000 | $0 | National | In collaboration with other partners and national research institutions, continue to support routine insecticide resistance monitoring at a network of sites nationwide. PMI will provide technical assistance, equipment, training, and funding for routine data collection. These resources will leverage other vector-control partner resources for entomological monitoring activities and will help fill gaps to ensure national coverage. |
| Strengthen and support routine M&E system at the national level | Evaluate for Health | $375,000 | $0 | National | Support strengthening the routine M&E system at the national level in three distinct areas, namely: M&E capacity building of other implementing partners, engaging the research community, and conducting mid-line and end-line surveys |
| Provide M&E technical assistance | CDC IAA | $10,000 | $0 | National | Support for a technical assistance visit from the CDC PMI M&E team. Technical assistance will include working with the NMCP to support strengthening M&E and health management information system activities. |
| **SUBTOTAL: M&E** | | **$1,005,000** | **$0** | | |
| **OPERATIONAL RESEARCH** | | | | | |
| Support implementation of a malaria vector-related operational research activity | Evaluate for Health | $125,000 | $0 | National | Support operational research to evaluate the effect of outdoor human behavior during peak vector biting times on malaria infection. PMI will support year two of this research study. |

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| Technical assistance for operational research | CDC IAA | $10,000 | $0 | National | Support for one technical assistance visit from CDC to support the implementation of the proposed operational research project. |
| **SUBTOTAL OR** | | **$135,000** | **$0** | | |
| **IN-COUNTRY STAFFING AND ADMINISTRATION** | | | | | |
| In-country staff and administrative expenses | USAID/Ghana | $1,066,000 | $0 | National | To support the coordination and management of all in-country PMI activities including support for salaries and benefits for two resident advisors and local staff, office equipment and supplies, and routine administration and coordination expenses. |
| In-country staff and administrative expenses | CDC IAA | $675,000 | $0 | National | |
| **SUBTOTAL: IN-COUNTRY STAFFING** | | **$1,741,000** | **$0** | | |
| **GRAND TOTAL** | | **$28,000,000** | **$11,720,000** | | |