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 2013 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.

USAID
FROM THE AMERICAN PEOPLE

PRESIDENT'S MALARIA INITIATIVE

PRESIDENT'S MALARIA INITIATIVE

Ghana

Malaria Operational Plan FY 2013

Table of Contents

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AGA	AngloGold Ashanti Mining Company
AMFm	Affordable Medicines Facility - Malaria
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
AL	Artemether-lumefantrine
BCC	Behavior change communication
BCC strategy	National Behavior Change Communication Strategy
BCS	Behavior Change Support Project
BEST	Best practices at scale in the home, community and facilities
CBA	Community-based agent
CCM	Country Coordinating Mechanism
CDC	Centers for Disease Control and Prevention
CHIM	Center for Health Information Management
CHPS	Community-based Health Planning and Services
CHV	Community Health Volunteer
CMS	Central medical stores
DfID	Department for International Development, UK
DHAP	Dihydroartemisinin-piperaquine
DHIMS	District Health Information Management System
DHIS2	District Health Information System
DHS	Demographic and Health Survey
EPA	Environmental Protection Agency, Ghana
FBO	Faith-based organization
FDB	Food and Drugs Board
FELTP	Field Epidemiologic and Laboratory Training Program
FRHP	Focus Region Health Project
FSN	Foreign Service National
FY	Fiscal Year
GHI	Global Health Initiative
GHS	Ghana Health Service
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GMP	Good Management Practices
HCW	Health care worker
HIV/AIDS	Human immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICCM	Integrated community case management
IDSR	Integrated disease surveillance and response system
IEC	Information, education and communication

IMaD	Improving Malaria Diagnostics project
IPTp	Intermittent preventive treatment of pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated net
LCS	Licensed chemical sellers
LLIN	Long-lasting insecticide-treated net
MaVCOC	Malaria Vector Control Oversight Committee
M&E	Monitoring and evaluation
MICS	Multiple Indicator Cluster Survey
MIP	Malaria in pregnancy
MOH	Ministry of Health
MOP	Malaria Operational Plan
NHIS	National Health Insurance Scheme
National Strategic Plan	Strategic Plan for Malaria Control in Ghana 2008-2015
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NMIMR	Noguchi Memorial Institute of Medical Research
OTSS	Outreach Training and Supportive Supervision
PEPFAR	President's Emergency Plan for AIDS Relief
PMI	President's Malaria Initiative
PPME	Policy, Planning, Monitoring and Evaluation
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
RFA	Request for Applications
SP	Sulfadoxine-pyremethamine
TA	Technical assistance
UNICEF	United Nations Children's Fund
USG	United States Government
USP	United States Pharmacopeia
USAID	United States Agency for International Development
WHO	World Health Organization

I. EXECUTIVE SUMMARY

Malaria prevention and control is a major foreign assistance objective of the U.S. Government (USG). In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the United States will help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children.

The President's Malaria Initiative (PMI) is a core component of the GHI and follows the core principles of GHI: encouraging country ownership and investing in country-led plans and health systems; increasing impact and efficiency through strategic coordination and programmatic integration; strengthening and leveraging key partnerships, multilateral organizations, and private contributions; implementing a woman- and girl-centered approach; improving monitoring and evaluation; and promoting research and innovation.

PMI was launched in June 2005 as a 5-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos-Hyde Act, funding for PMI has now been extended through FY 2014 and, as part of the GHI, the goal of PMI has been adjusted to reduce malaria-related mortality by 70% in the original 15 countries by the end of 2015. This will be achieved by continuing to scale up coverage of the most vulnerable groups — children under five years of age and pregnant women — with proven preventive and therapeutic interventions, including artemisinin-based combination therapies (ACTs), insecticide-treated nets (ITNs), intermittent preventive treatment of pregnant women (IPTp), and indoor residual spraying (IRS).

Ghana became a PMI country in December 2007. Malaria is endemic and perennial in all parts of the country, with seasonal variations that are more pronounced in the north. Ghana's entire population of 24.2 million (2010 Census) is at risk of malaria infection, but children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity. Transmission tends to be less intense in large urban centers.

The PMI/Ghana strategy has been refined in the fiscal year (FY) 2013 Malaria Operational Plan (MOP), based on collaboration with the Government of Ghana (GOG), National Malaria Control Program (NMCP), and other development partners; analysis of malaria control data and trends; and lessons learned over four years of PMI implementation. The 2011 Multiple Indicator Cluster Survey has provided data on point prevalence of parasitemia as well as information on trends in malaria control interventions. In FY 2013 PMI will continue to support all four prevention and treatment interventions and prioritize procurement of RDTs and pediatric formulations of ACTs; support for large scale prevention activities in regions with relatively high population and high

parasite prevalence; and targeting major interventions based on epidemiological information and data. The FY 2013 planned budget is $27 million.

The LLIN strategy will shift from mass campaigns to support for routine LLINs distribution. PMI will procure 1.1 million LLINs; support the GOG to implement and strengthen the routine LLIN distribution system; and implement LLIN promotion activities. PMI will also support an evaluation of the routine LLIN distribution system to develop evidence to improve the system in Ghana and in other malaria endemic countries.

PMI technical support for IRS and related entomological monitoring continues to be important to the vector control stakeholders in Ghana. However, evidence indicating that PMI's well-implemented IRS activity in the Northern Region is not having the intended effect on parasite prevalence and malaria morbidity is building. Therefore, PMI is considering scaling back IRS activities in the north following the LLIN universal coverage campaign, continuing intensive epidemiologic and entomologic monitoring in the Northern Region, and scoping a new location for the PMI IRS activities in the middle forest or coastal zone.

The PMI strategy for IPTp will be to solidify the knowledge, skills, and practices of healthcare workers at antenatal clinics (ANC) and expand IPTp capacity at peripheral healthcare facilities and services. PMI will support activities to promote ANC and IPTp services among women of reproductive age. PMI will emphasize support for IPTp in regions where the IPTp rate is lagging.

In FY 2013, PMI will significantly increase support for malaria case management. PMI will procure approximately 4.75 million RDTs and 4.5 million treatments of pediatric ACTs. Support from PMI will solidify the knowledge, skills, and practices of healthcare workers who have received malaria case management training in the past and expand malaria case management capacity to CHPS and peripheral healthcare facilities. The PMI strategy includes a private sector approach to increase pharmacy and licensed chemical seller (LCS) compliance with Ghana Health Services (GHS) malaria case management guidelines. PMI activities will strengthen the connections between these private sector health services providers with the GHS and support activities to address incentives for malaria case management compliance.

The FY 2013 PMI plans also include capacity building among Ghanaian partners and support for monitoring and evaluation (M&E). The technical interventions supported by PMI are designed to build the capacity of GHS and other GOG routine systems to sustain gains. PMI also supports capacity building with assistance for GHS staff to attend trainings and technical conferences and support for the NMCP to conduct supportive supervision. PMI activities will support strengthen routine M&E systems, targeted assessments, and entomological monitoring.

II. STRATEGY

INTRODUCTION

Global Health Initiative

Malaria prevention and control is a major foreign assistance objective of the U.S. Government (USG). In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the United States will help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns and children. The GHI is a global commitment to invest in healthy and productive lives, building upon and expanding the USG's successes in addressing specific diseases and issues.

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

President's Malaria Initiative

The President's Malaria Initiative (PMI) is a core component of the GHI. PMI was launched in June 2005 as a 5-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos-Hyde Act, funding for PMI has now been extended through FY 2014 and, as part of the GHI, the goal of PMI has been adjusted to reduce malaria-reduced mortality by 70% in the original 15 countries by the end of 2015. This will be achieved by continuing to scale up coverage of the most vulnerable groups – children under five years of age and pregnant women – with proven preventive and therapeutic interventions, including artemisinin-based combination therapies (ACTs), insecticide-treated nets (ITNs), intermittent preventive treatment of pregnant women (IPTp), and indoor residual spraying (IRS).

Ghana was selected as a PMI country in FY 2007. The Ghana Health Services (GHS) began large-scale implementation of ACTs and IPTp in 2008 and has progressed rapidly with the scale up of interventions with support from PMI and other partners. Artemisinin-based combination therapies and IPTp are now available and being used in most public and private health facilities nationwide. The NMCP is leading activities to scale up long-lasting insecticide-treated net (LLIN) ownership and use and supports scale up of IRS to cover one third of Ghana's 170 districts.

This FY 2013 Malaria Operational Plan presents a detailed annual implementation plan for Ghana, based on the PMI Strategy and the National Malaria Control Program's (NMCP's) 7-Year Strategy. It was developed in consultation with the NMCP and with the participation of national and international partners. The activities that PMI is proposing to support build on investments made by PMI and other partners to improve and expand malaria-related services, including the 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 if the targets of the NMCP and PMI are to be achieved, and provides a description of planned FY 2013 activities.

MALARIA SITUATION IN GHANA

Malaria is endemic and perennial in all parts of Ghana, with seasonal variations that are more pronounced in the north. Ghana's entire population of 24.2 million (2010 Census) is at risk of malaria infection, but children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity. Transmission tends to be less intense in large urban centers.

According to GHS health facility data, malaria is the number one cause of morbidity and mortality in children under five years of age, accounting in recent years for 33% of hospital deaths in children under five years and about 38% of all outpatient illnesses and 36% of all admissions. Between 3.1 and 3.5 million cases of clinical malaria are reported in public health facilities each year, of which 900,000 cases are in children under five years and 3,000-4,000 result in inpatient deaths. The WHO recently estimated total malaria-attributable child deaths at 14,000 per year in Ghana (WHO World Malaria Report 2008). The verbal autopsy component of the 2008 DHS household survey found that roughly half of the deaths in children under five occurred at home – which helps to explain the discrepancy between facility versus total deaths.

The normal duration of the intense malaria transmission season ranges from approximately 6-7 months in the northernmost part of the country (May-October), up to 10-11 months in the forest zone. Peak levels of malaria infection and malaria associated anemia in the population persist for two-three months into the dry season.

Plasmodium. falciparum accounts for 85-90% of all infections. *Plasmodium malariae* is also found and more rarely *P. ovale* (0.15%). The major vectors are *Anopheles gambiae* species complex and *An. funestus*. These species generally bite late in the night, are indoor resting, and are most common in the rural and peri-urban areas. Outdoor biting is common in the northern savannah (e.g. >50% outdoor biting pre-IRS was documented at several monitoring sites in Northern Region). *Anopheles melas* is found in the mangrove swamps of the southwest and *An. arabiensis* in savannah areas of northern Ghana.

Northern Ghana can be stratified roughly into three malaria epidemiologic zones: the northern savannah; the tropical rainforest; and the coastal savannah/mangrove swamps. Although the

boundaries of these zones have not been defined precisely, the demarcations used by the Ghana Statistical Service (GSS) in its periodic living standards surveys since 1998 provide a close approximation (See Figure 1). Malaria surveillance is not adequate to permit a robust subnational stratification. However, the *Ghana MICS with Malaria Biomarker Survey*, conducted from mid-September to mid-December 2011 (i.e. the late rainy season), provides a rough snapshot of regional and zonal differences in parasitemia malaria prevalence (Table 1).

Figure 1. Map of Ghana's Ecological Zones and Regions (Source: Ghana MICS 2011, Ghana Statistical Service, based on U. Ghana Center for Remote Sensing demarcations, 1998)

Table 1. Prevalence of malaria parasitemia (age 6-59 months), Sept-Dec 2011, by administrative region, ecological zone and urban vs. rural residence

(Source: *2011 MICS with Malaria Biomarker Survey*, GSS/UNICEF/GHS/PMI, preliminary data)

	REGIONS										ECOLOGICAL ZONES			RESIDENCE		Total
AREA	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West	N. Savannah	Forest	Coastal	Urban	Rural	
Microscopy Prevalence	36.2	32.2	4.1	17.3	21.6	22.3	37.3	48.3	44.0	51.2	43.5	27.5	13.6	13.1	38.8	27.5

HEALTH SYSTEM DELIVERY STRUCTURE AND MINISTRY OF HEALTH ORGANIZATION

The Ministry of Health exercises oversight and control over policy formulation and monitoring and evaluation (M&E) of progress in achieving targets. The 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 (NHIS), implemented since 2006, represents a major development in health system financing and has increased attendance at health facilities. The GHS has initiated an updated electronic District Health Information Management System (DHIS2). The GHS has led the process of recruiting development partners to fund various aspects of the DHIS2 and leads regular stakeholder coordination meetings.

The GHS operates at four levels: national, regional, district, and sub-district. Policies and major aspects of program design are developed at the national level by the central leadership and programs, such as the National Malaria Control Program, while implementation and management of health services is primarily the responsibility of the decentralized Health Management Teams at the regional, district, and sub-district levels. As of 2011, the human resources within the health sector stands at approximately 40,000 healthcare staff and approximately 5,000 new recruits. The ratio of 1.1 skilled healthcare workers (doctors, nurses, and midwives) per 1,000 population falls short of the WHO minimum of 2.3 per 1,000 population needed by countries to achieve the millennium development goals. There are over 343 hospitals, 760 health centers, 1,200 clinics, and 379 private maternity homes in the country. Of these, 83 percent are in the public sector and 9 percent are faith-based institutions, most of which are closely integrated with the GHS. The remaining 8 percent of facilities in the private sector are located primarily in the larger cities.

The penetration of the GHS services at the community level is variable. The GHS is expanding the innovative Community-Based Health Planning and Services (CHPS) program which provides access to community health nurses in communities of 6,000 people. The CHPS program has grown from 300 to 1,654 CHPS zones between 2009 and 2012. In many rural areas, networks of government-trained community health volunteers (CHVs) promote public health services.

The malaria control program is managed at the national level by the NMCP. 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 Health Management Teams (RHMTs) and District Health Management Teams (DHMTs).

NATIONAL MALARIA CONTROL PLAN & STRATEGY

In the past two decades, Ghana's strategies for malaria control have evolved to take advantage of improved control methods, increasing resources, and revised international technical standards. In 2002-04, Ghana adopted artemisinin-based combination therapies (ACTs) as first-line antimalarial drugs. In 2003-04, IPTp using sulphadoxine-pyrimethamine (SP) was adopted as the national policy, to be implemented by the Reproductive Health Division in collaboration with the NMCP. From 2003, international support for malaria control increased sharply, as Ghana benefitted from a succession of Global Fund grants, the launch of PMI in 2007, and significant additional support from DFID, UNICEF, Japanese Government, the World Bank, China, and Cuba. Beginning in 2005, IRS was implemented on a district-wide scale by the AngloGold Ashanti mining company in Obuasi, Ashanti Region.

The availability of unprecedented external resources encouraged the NMCP to pursue aggressive scale-up of proven malaria control methods, as captured in the *National Malaria Control Strategy 2008-2015*. The plan calls for a 75% reduction in malaria (morbidity and mortality) by the year 2015, using 2006 as the baseline. The key targets of the national strategy include:

1. **Universal coverage with insecticide-treated nets (ITNs).** Targets: One ITN available per two persons by 2013; 100% household ownership by 2015 85% of children under five years of age and pregnant women, and 80% of the general population, sleeping under an ITN by 2015.
2. **Rapid scale up of indoor residual spraying (IRS)** to cover one third of the country. Target: 90% of all structures in targeted districts are sprayed.
3. **Universal coverage of pregnant women with intermittent preventative treatment (IPTp)** using the drug sulphadoxine-pyrimethamine (SP). Target: 100% of pregnant women receiving at least two doses of IPTp by 2015.
4. **Early diagnosis of malaria using microscopy or rapid diagnostic test (RDT).** Target: originally allowed for empiric diagnosis in children under five years old, but amended in 2009 to aim for universal testing as soon as practicable.

5. **Prompt and effective treatment with Artemisinin-Based Combination Therapies (ACTs)**. Target: 90% of patients with uncomplicated malaria will be correctly treated using ACTs at public and private facilities by 2015.

The plan also calls for strengthening monitoring and evaluation systems and research; strengthening health systems at all levels; and creating and sustaining partnerships for malaria control. A *Malaria Control Communications Strategy* was released in May 2010.

In 2009, the national Malaria Vector Control Oversight Committee (MaVCOC) was established, with PMI support, to ensure safe and effective implementation and management of malaria vector control operations, in accordance with WHO guidelines and local EPA pesticides regulation requirement

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. The program has reported to MaVCOC that it regularly monitors and treats more than 1,120 anopheline breeding sites.

INTEGRATION, COLLABORATION & COORDINATION

Funding

The PMI program in Ghana has traditionally been designed to provide technical assistance and fill funding and commodity gaps in support of the country's malaria control program. Ghana is currently implementing the first year of an expanded IRS program using Global Fund grant financing that was designed based in part on PMI's pilot of IRS in the Northern Region. Ghana will be applying for Phase 2 of its Round 8 and Rolling Continuation Channel grants on case management and prevention of malaria in the second half of 2012. Due to procurement delays in implementing Phase 1 of these grants, Ghana's score has dropped to a C rating, which means that the country will only be eligible for a reduced percentage of their original funding application. The AMFm pilot will end in December 2012 and future financing for private sector ACTs is uncertain. PMI will work with the NMCP to plan for the most effective use of resources available through continuing Global Fund grants, and will seek to resolve potential issues of ACT shortages through advocacy for GOG budget contributions and direct procurement. PMI investments in laboratory systems will be harmonized with inputs from the Global Fund grant for tuberculosis, to coordinate microscopy equipment procurements and laboratory technician training and supervision.

Department for International Development (DFID) hopes to provide approximately £10 million (approximately $16 million) over five years beginning in 2013 to support malaria control in Ghana, including support for LLINs, malaria diagnostics, and malaria case management. The DFID and USAID have similar priorities and objectives for malaria control in Ghana. The USAID 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 organized under the NMCP, e.g. MaVCOC, the LLIN Coordinating Committee (LLIN Committee), and the National Malaria Communications Committee (NMCC). USG agencies are frequently asked to provide in-house expertise or consultants to help the MOH or its agencies perform program assessments, develop long-term strategies, or otherwise contribute to the national health agenda.

Private Sector

PMI will work to improve malaria diagnostics, treatment, and referrals in private sector, community businesses, such as pharmacies and Licensed Chemical Sellers. PMI will coordinate 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 LCS and pharmacies.

PMI also works with larger private sector companies involved in malaria control in Ghana. AngloGold Ashanti (AGA), as part of its corporate social responsibility program, established a Malaria Control Program in Obuasi in 2005 and has been implementing IRS, together with targeted larviciding and other interventions. In October 2009, Ghana secured a $138 million Global Fund Round 8 grant for scale up of IRS to at least 45 districts by 2015. AngloGold Ashanti Malaria Control, which is a non-profit organization set up by AGA, was chosen to be the grant's Principal Recipient, based on an application submitted by the Ghana CCM with the support of the MOH, GHS/NMCP, WHO and PMI. The PMI and AGA programs in IRS have collaborated frequently over the years in areas such as training and community mobilization, and continue to share best practices in operations, M&E, and procurement. As members of MaVCOC, each organization contributed to developing the country's first *Standard Operating Procedures for IRS (2011).*

Within USG

PMI functions within the GHI strategy and collaborates with other USG agencies supporting malaria control in Ghana such as Peace Corps, CDC, NAMRU, DOD, NIH, and State. Peace Corps volunteers are posted to USAID projects to support community mobilization and promote malaria control interventions. Peace Corps volunteers have been particularly supportive of the LLIN distribution campaigns and the PMI operational research in Northern Region. The DOD, NIH, and NAMRU support malaria vaccine research, surveillance of incidence and causes of fevers, laboratory system strengthening for infectious disease, and drug resistance monitoring. The CDC Malaria Branch (outside of PMI) supports antimalarial drug resistance monitoring and research on drug efficacy and acceptability in Ghana.

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. In three regions, covering one third of Ghana's population, USAID Ghana works 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-supported malaria programming has been integrated into these region-specific 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 LLINs and ACTs).

PMI supports USG efforts to strengthen health system commodity supply chains for LLIN distribution and management of pharmaceutical products nationwide, with additional support to the lower levels in the Greater Accra, Central, and Western Regions. PMI support is combined with USG funding under President's Emergency Plan for AIDS Relief and other GHI areas, as a concerted effort to improve supply chains for all pharmaceuticals and health commodities. PMI's technical assistance to IPTp is a component of Ghana's integrated ANC program; PMI's contributions will include 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 MCH programs.

PMI GOALS, TARGETS, AND INDICATORS

By the end of 2014, PMI will assist Ghana to achieve the following targets in populations at risk for malaria:

- >90% of households with a pregnant woman and/or children under five will own at least one ITN;
- 85% of children under five will have slept under an ITN the previous night;
- 85% of pregnant women will have slept under an ITN the previous night;
- 85% of houses in geographic areas targeted for IRS will have been sprayed;
- 85% of pregnant women and children under five will have slept under an ITN the previous night or in a house that has been sprayed with IRS in the last 6 months;
- 85% of women who have completed a pregnancy in the last two years will have received two or more doses of IPTp during that pregnancy; and
- 85% of government health facilities have ACTs available for treatment of uncomplicated malaria.

EXPECTED RESULTS – YEAR SIX

Prevention

- Procure and distribute approximately 1.1 million LLINs through the routine system

- Protect a population of approximately 500,000 residents through indoor residual spraying in select Northern districts and potential Forest zone districts.

Treatment

- Procure and support distribution of approximately 4.7 million Rapid Diagnostic Tests
- Support the supervision of approximately 405 laboratories annually and on the job training for at least 500 laboratory personnel.
- Procure and support distribution of approximately 4.5 million treatments of pediatric ACTs.

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 four such surveys since 2003, each implemented by the Ghana Statistical Service and partners, and each conducted during the late rainy season, albeit during different months and in some case employing slightly different methods. The 2003 DHS was conducted in July-October and the 2006 Multiple Indicator Cluster Survey (MICS) in August-October. The 2008 Demographic and Health Survey (DHS), conducted September-November 2008, provides the baseline for key PMI indicators.

The 2011 MICS incorporated a full malaria module and was conducted in September-December 2011. Called the *2011 Ghana MICS4 with Malaria Biomarkers*, this latest survey was led by Ghana Statistical Service and UNICEF, with PMI and the NMCP supporting a robust malaria module through technical assistance, funding, and oversight. Although the 2003 and 2008 DHS included anemia testing, a new feature in the 2011 MICS is the inclusion of malaria prevalence data (both microscopic and RDT-based). The survey provides a unique nationwide snapshot of peak season malaria point-prevalence in children age 6-59 months (Table 1). The Navrongo Health Research Center (Navrongo) was contracted to implement the anemia and parasitemia components.

Ghana has achieved steady gains in many of the key malaria intervention indicators, as indicated in Table 2. Between the 2003 and 2011, ITN ownership and use, uptake of IPTp, and treatment with ACTs have all increased.

Table 2. Recent Estimates of Malaria Indicators				
Indicator	**2003 DHS**	**2006 MICS**	**2008DHS‡**	**2011 MICS**
Proportion of households with one or more ITN	3%	19%	42%	49%
Proportion of children under five years old who slept under an ITN the previous night	4%	22%	39%	39%
Proportion of pregnant women who slept under an ITN the previous night	3%	NA	27%	33%
Proportion of women who received two or more doses of IPTp during their last pregnancy in the last two years*	0	28%	44%	65%
Proportion of children under five years old with fever in the last two weeks who received treatment with ACTs**	NA	3%	12%	18%†

*ACTs were adopted in 2004; SP was adopted for IPTp in 2003

† The 2011 MICS did not distinguish adequately between responses for "Amodiaquine" (23.6%) and "Artesunate-Amodiaquine," (AS/AQ) which was counted along with Arthemeter-Lumefantrin, DHAP as "any ACT" (18%). Thus the true figure may lie somewhere between 18% and an estimated 36%. In popular speech, AS/AQ is often called "Amodiaquine."

‡ Reflects the Measure DHS project's corrected figures for ITN coverage in Ghana. Due to a coding error, the DHS 2008 has reported usage of 28% for under 5s and 20% for pregrant women.

CHALLENGES, OPPORTUNITIES, THREATS

Ghana has a technically sound and well-reasoned national strategy and strong leadership from the NMCP. With support from PMI, the Global Fund and other partners, Ghana has established strong malaria control guidelines and trained more than 13,000 healthcare workers throughout the country in case management and malaria in pregnancy. Ghana has the resources, through the Global Fund, to expand IRS to cover up to a fourth of districts in the country. The gains from these activities can be seen in improved malaria control indicators detailed in the Progress on Coverage/Impact Indicators to Date section of this document. National surveys indicate that Ghana has made significant progress over the past few years to increase LLIN ownership and use and to increase IPTp uptake. Progress in prompt case management with ACTs has progressed more slowly.

Malaria prevalence data from the 2011 MICS highlight divergent aspects of malaria epidemiology in Ghana, such as low parasite prevalence in urban Accra (4% in Greater Accra Region) and high prevalence in the northern savannah zone (e.g., over 50% in the highly rural Upper West Region).

The extensive LLIN distribution campaigns dramatically increased LLIN ownership at the regional level. For example, the percentage of households with at least on ITN increased from 43% in the 2008 DHS to 85% in the 2011 MICS. (Of note, seven out of ten regional campaigns were completed after MICS 2011 data collection.) The GHS is now poised to sustain those gains through a revised and enhanced routine LLIN distribution system and the LLIN promotion activities can now build on the high volume of LLINs in communities. The routine distribution includes school-based distribution, which has the potential to contribute significantly toward sustaining universal coverage, and targeting children when the LLINs they received through EPI have worn out. Ghana is a pioneer in developing school based distribution. In future years the routine system will be required to distribute over 4 million LLINs per year to sustain universal coverage. To address these challenges, PMI is providing financial assistance and extensive technical assistance to strengthen the routine LLIN distribution system (additional detail in the PMI Support Strategy section).

The PMI IRS activity in Northern Region, despite evidence of high quality implementation, has not yet demonstrated epidemiological impact, according to preliminary analysis of several types of epidemiologic data detailed in the IRS technical section. Disturbingly high rates of outdoor biting, low availability of ACTs, and practices of sleeping both indoors and outdoors have been noted in the targeted areas. Although no conclusions can yet be drawn, the available evidence raises important questions about the optimal targeting of IRS in Ghana. The PMI team is working collaboratively with stakeholders to ensure information sharing across PMI- and Global Fund-financed IRS operations and to share recommendations on the best way forward.

Based on data from the MICS, Ghana has made tremendous gains in IPTp coverage over the past few years, and Ghana benefits from very high ANC attendance and little resistance to SP administration. Establishing strong and regular supportive supervision has the potential to sustain and expand these gains. It is possible that most of the "low hanging fruit" has been covered, and reaching the final target of 85% of women taking at least two doses of IPTp will require more extensive efforts. For example, one reason that has been identified as a barrier to increased IPTp uptake is that some sub-populations reportedly hold cultural and religious beliefs that restrict women from revealing their pregnancy until after the pregnancy is visually obvious. To address this challenge, PMI will focus community mobilization and intensive IPTp support in regions and districts with low IPTp coverage rates.

Prompt case management with ACTs has not made as much progress in Ghana as have other malaria control interventions. Access to skilled care in rural areas and the quality of care and compliance with GHS malaria case management guidelines at lower-level and peripheral health care facilities appears to be the most significant cause of low rates of prompt treatment with ACTs. Consistent access and availability to RDTs and quality ACTs is another challenge. Program monitoring has revealed evidence of public sector procurements (MOH, district, and facility) of ACTs from manufacturers who have not been WHO pre-qualified.

The NMCP conceived and developed the community-based care program through the Global Fund Round 8 grant to address rural access to appropriate malaria case management. However, the community-based care program has lacked the strong foundation within the GHS that is needed for it to function effectively and efficiently. The GHS at central and local levels has not embraced the program as an extension of the GHS system and therefore the program has struggled to establish structured supervision and pharmaceutical supply systems.

Another important source for malaria treatment in Ghana is the numerous private sector pharmacies and LCS. High quality ACTs are increasingly available at LCS and pharmacies, particularly in urban areas; however, most of these facilities also stock and sell non-approved malaria treatments. These businesses have received training in the GHS treatment guidelines, but the fundamental profit motivations of these businesses have not been adequately addressed to ensure that clients receive a GHS-approved treatment.

To address these case management challenges, PMI will be building on opportunities presented by the extensive training already conducted and focus future activities on solidifying practices at higher level facilities, intensifying improvements at CHPS and peripheral facilities, and improving compliance with malaria case management guidelines at private sector pharmacies and LCS.

The threat of emerging resistance – by the vector to insecticides and by the parasite to artemisinin-based drugs – hangs over Ghana as indeed over all malarious zones. Resistance to multiple classes of pesticides is well known in southern Ghana (associated with intensive pesticide use in cocoa production and other farming activities) and elsewhere in West Africa. PMI has taken measures such as changing pesticide class in the IRS program; incorporating enhanced testing for resistance in the 2012 IRS work plan; promoting the rational use of ACTs; sponsoring periodic *in vivo* drug efficacy studies; and detecting sub-standard and counterfeit drugs in the country. The NMCP has identified an insecticide resistance management strategy as a priority.

Knowledge about malaria transmission and prevention among the general population continues to be a significant challenge for malaria control in Ghana. According to the 2011 MICS, 86% of Ghanaians know that malaria is transmitted though mosquito bites. However, well over 50% of Ghanaians (55% of women and 58% of men surveyed) think malaria is also caused by dirty surroundings. Other frequently mentioned causes of malaria included standing or working in the sun (sited by 44% of men in the Volta Region) and eating contaminated food (sited by 24% of women in the Central Region). A high percentage of Ghanaians identified keeping the environment clean as protective against malaria (60% of men and 58% of women).

PMI SUPPORT STRATEGY

The PMI/Ghana strategy includes all of the major interventions supported by PMI. The emphasis and level of support for each of the interventions takes into consideration the contributions from

the GOG, Global Fund, DFID, and other stakeholders to ensure priority interventions are scaled up, to fill gaps and avoid duplication, and to target interventions to address regional variations in malaria epidemiology and progress to-date. The NMCP's Global Fund grant Phase 1 ends in December 2012 and negotiations for Phase 2 will begin in mid to late 2012. The DFID planning for 2013 and beyond will also begin in mid to late 2012. Therefore, the NMCP provided some general priorities but plans to build their Global Fund Phase 2 grant request around PMI plans.

With the Global Fund and AMFm situation somewhat uncertain, and recognizing the limited progress on prompt treatment with ACTs, the FY 2013 MOP priorities are to procure pediatric formulations of ACTs and procure RDTs. The PMI strategy will also take a more targeted approach to implementing interventions based on new information from the MICS parasite prevalence and malaria control intervention data, as well as the anemia and parasitemia study in an IRS district. For example, expensive prevention efforts, such as door-to-door ITN distribution and media campaigns, will be a lower priority for PMI in Greater Accra Region, which has the lowest parasite prevalence (4%) and the highest rate of disposing of ITNs in less than two years (87%) of the ten regions, compared to Northern Region with an estimated 48% parasite prevalence and moderate LLIN use (38% among pregnant women and 42% among children under five years old). In contrast, investing in universal confirmatory testing to promote rational use of ACTs assumes a higher priority in Greater Accra (11% confirmatory testing) than Upper East Region with an estimated 44% parasite prevalence and 36% confirmatory testing.

The LLIN strategy will shift from mass campaigns to support for routine LLIN distribution. Malaria stakeholders have implemented universal coverage campaigns in seven of the ten regions and will have covered all regions by December 2012. Sustaining the gains made through the campaigns is now the priority. Thus, PMI is supporting redesign, implementation, and evaluation of the routine LLIN distribution system along with LLIN procurements to fill the distribution requirements for the first one to two years and fill approximately 30% of the gap in out years. PMI will concentrate community mobilization and communications to promote LLIN use in regions where the need is greatest (e.g. large rural population and high parasite prevalence) and the potential for gains is highest (e.g. low existing net use and high population size).

Evidence indicating that PMI's well-implemented IRS activity in the Northern Region is not having the intended effect on parasite prevalence is building while the Global Fund IRS program is simultaneously scaling up. When the Global Fund IRS program is at full scale, it will be much larger in scope than the PMI IRS program. The PMI technical support for IRS and related entomological monitoring continues to be important to the vector control stakeholders in Ghana, and PMI can continue to make valuable contributions to future IRS scale-up by maximizing program learning and capacity building. PMI will not withdraw from IRS as an intervention, but may scale back IRS activities in the north following the LLIN universal coverage campaign, continue intensive epidemiologic and entomologic monitoring in the Northern Region, and scope a new location for the PMI IRS activities in the middle forest zone. Monitoring activities, in

addition to previously-funded, ongoing operational research, will contribute to increased understanding of the reasons underlying and options for addressing the high parasite prevalence in Northern Region.

PMI has been the NMCP's lead partner supporting malaria prevention during pregnancy and will continue to provide technical assistance for IPTp. The GOG or other development partner resources should be sufficient to procure SP. The IPTp activities will solidify gains through supportive supervision and will focus on integrated ANC support, ANC outreach, and community mobilization and behavior change activities in regions where the IPTp rate is lagging, such as the Volta Region.

In FY 2013, PMI is significantly increasing the proportion of the budget supporting malaria case management and ACT procurements. Drawing on concerns about adequate supplies of quality pediatric formulations of ACTs, past stockouts of RDTs, and uncertainty about the future Global Fund grant, PMI will considerably increase procurement of ACTs and RDTs. PMI will also contribute to the integrated USAID activity to reform the GOG pharmaceutical procurement and supply system. The PMI strategy will solidify the gains from training healthcare workers in the malaria case management guidelines through supportive supervision and quality improvement while shifting the emphasis for new activities to rural and peripheral healthcare services. The PMI strategy will support expansion of the CHPS program and enhance the quality of the malaria case management services provided. PMI will support training, supervision, and capacity building at existing and newly created CHPS services. As the GHS CHPS program grows, community health nurses can be positioned as the link for integrating the community case management program into the GHS system and PMI will provide technical assistance to facilitate this integration. The PMI strategy will also include a private sector activity to enhance pharmacy and LCS compliance with GHS guidelines.

TECHNICAL SECTIONS

INSECTICIDE-TREATED NETS (ITN)

NMCP/PMI Objectives

The NMCP objective for ITNs is universal coverage of the entire population, defined as one LLIN for every two people (adjusted to 1.8 people to account for households with odd number of occupants). The distribution strategy includes door-to-door distribution campaigns and routine distribution. The campaigns are conducted region-by-region on a rolling basis. The routine distribution system, when fully implemented, will include ANC, EPI, school, NGO, and private sector. NMCP also supports communication and community mobilization activities to promote consistent ITN use, with a target of 85% of pregnant women and children under five years of age sleeping under an ITN every night.

Progress During the Last 12 Months

Over the past year, the NMCP and partners have conducted door-to-door, universal coverage campaigns in seven of the country's ten regions and plans to conduct campaigns in the remaining three regions by December 2012. The door-to-door distribution campaigns began in April 2010 and have distributed more than 8.6 million LLINs to seven regions. The GHS and communities organize volunteers to register households, carry LLINs door-to-door, and hang the nets over sleeping spaces. The initial campaign in Northern Region in May 2010 targeted children under five years old and pregnant women, while the follow-up campaign launched in August 2012 Northern Region aimed for universal coverage. The 2011-12 campaigns in Eastern, Volta, Western, Central, Ashanti, Brong Ahafo, Upper West, and Upper East Regions have targeted the entire population to achieve universal coverage. Rural areas of Greater Accra Region (GAR) had been slated for a campaign in July-August 2012, but the NMCP modified plans for covering the urban areas of Greater Accra. Due to low prevalence and operational challenges, NMCP is considering use of routine distribution systems in lieu of the door-to-door campaign format in the urban areas of GAR.

PMI has procured more than 5.8 million LLINs for Ghana; provided technical leadership to launch the door-to-door distribution strategy and organize campaigns in each of the regions; and supported training of over 25,000 GHS staff and volunteers over the past year to conduct pre-campaign household registration, logistics management, and campaign implementation. The Global Fund and DFID have each provided 4.3 million LLINs for the campaigns and financial assistance for distribution. PMI has provided community mobilization and mass media (radio and television) to reinforce the campaigns and promote LLIN use, reaching over 2 million people (in addition to the door-to-door LLIN hang-up activities) with LLIN promotion messages in the past year.

Over the past year, PMI technical assistance has supported the GOG to redesign their routine LLIN distribution system which will roll out in 2012. The routine system includes distribution at ANCs during the first visit, at EPI clinics at the time children receive their second measles booster (approximately 18 months old), and at schools to students entering grades two and six. PMI is supporting the Eastern Region to initiate the ANC, EPI, and school-based distribution components of the routine system in 2012. Assessing the routine distribution system will be critical to determine the effectiveness of the system to sustain universal coverage and to refine and improve the system. To facilitate the assessment, a baseline survey was conducted in Eastern Region in April 2012, prior to introduction of the routine system. ANC and EPI distribution will be expanded nationwide over the next year and national school distribution will pick up in September-October 2013. Public sector distribution will be supplemented with NGO-led distribution, social marketing, and private sector sales beginning in 2015.

The MICS data indicates that the LLIN mass distribution strategy is successfully increasing LLIN ownership and use. The data collection took place in late 2011, after LLIN distribution

campaigns had been conducted in Northern, Eastern, and Volta regions. The following table indicates the gains in LLIN ownership and use from the 2008 DHS and the 2011 MICS, with the Volta Region included as an example of the estimated gains achieved through the LLIN distribution campaign. ITN ownership in Eastern Region also increased from 36% in 2008 to 78% in 2011 following the LLIN distribution campaigns.

	National ITN ownership	National <5 ITN use	National Pregnant Women ITN use	Volta ITN ownership	Volta <5 ITN use	Volta Pregnant Women ITN use
MICS 2011	49	39	33	85	71	58
DHS 2008	42	39	--	43	44	--

Challenges, Opportunities and Threats

The distribution campaigns are achieving high household ownership of LLINs and combined with LLIN promotion activities are establishing a culture of LLIN use. The distribution campaigns have required a massive effort from the NMCP, GHS staff at local levels, local organizations, and development partners. Through the remainder of 2012, the NMCP will continue to be overstretched by the campaigns and is depending on PMI to provide technical leadership for reintroducing the routine system. PMI will support technical assistance, behavior change, and supply chain logistics aspects of the routine system. The routine LLIN distribution redesign has benefited from a study tour to Kenya organized by PMI partners, guidance from international experts, and use of the NetCALC tool. Maintaining LLIN stock at healthcare facilities has been a challenge in the past and will require significant technical assistance to improve the system going forward. Ghana is pioneering school-based distribution, which presents an opportunity for sustaining LLIN coverage and challenges for implementing a new activity with a new cadre of GOG staff.

LLIN Gap Analysis

By the end of 2012, the majority of LLINs procured between 2010 and 2012 will have been distributed through LLIN campaigns and Ghana will have approached universal coverage, with a potential surplus in the Northern Region. Reintroduction of the routine LLIN distribution system will require surplus LLINs in the system to provide initial and buffer stock and to account for the tendering and delivery timeline, which ranges from six to twelve months. The routine distribution system will scale up to cover all ten regions in 2013. In 2013, PMI estimates that 860,000 LLINs will be distributed through ANC, 660,000 LLINs through EPI, and 1,070,000 through schools. In 2014, approximately 900,000 LLINs will be distributed through ANC, 700,000 LLINs through EPI, and 1,110,000 LLINs through schools.

The NMCP guideline for routine LLIN distribution recommends procuring LLINs in bulk to benefit from economies of scale, with shipments twice a year containing a six-month supply. The LLIN shipments will be divided and transported to regional medical stores upon receipt at the

Central Medical Stores (CMS). According to the guidelines, ANC and EPI clinics will initially receive a two-month supply of LLINs, and thereafter will request monthly shipments based on consumption during the previous month, maintaining a one-month buffer. The PMI FY 2011 and FY 2012 procurements should be sufficient to establish the buffer stock and supply routine distribution into 2014. A significant gap in LLINs will develop in 2014 unless other development partners or the GOG procure additional LLINs.

LLIN Requirement	2011	2012	2013	2014	2015
LLIN Campaigns	4,100,000	8,000,000	0	0	0
Routine LLIN System	0	600,000	1,220,000	2,810,000	3,815,000
Total Need	4,100,000	8,600,000	1,220,000	2,810,000	3,815,000
LLINs Distributed/Committed					
Global Fund RCC	0	4,300,000	unknown	unknown	unknown
DFID	2,300,000	2,000,000	unknown	unknown	unknown
PMI-MOP FY10-11	2,000,000	1,600,000			
PMI-MOP 2012			1,520,000		
PMI-MOP 2013				1,100,000	unknown
Surplus (gap), previous year		200,000	(500,000)	(200,000)	(1,910,000)
Total distributed or committed	4,300,000	8,100,000	1,020,000	900,000	(1,910,000)
LLIN SURPLUS (GAP) AT END OF YEAR	**200,000**	**(500,000)**	**(200,000)**	**(1,910,000)**	**(5,725,000)**

Plans and Justification

PMI will procure LLINs for distribution through routine systems and will provide technical and financial support for the GHS and Ghana Education Service (GES) to train staff and implement the routine LLIN distribution system. PMI will continue to support community mobilization and mass media campaigns to reinforce the remaining mass distribution campaigns, to create awareness about routine LLIN distribution, to create awareness about LLIN care, and to promote ITN use. The PMI team estimates that the planned routine LLIN distribution system will be sufficient to maintain universal coverage of LLIN (one LLIN for every two people in the country) at or above 90% through 2016. Using NetCALC as a planning and modeling tool the routine system would increase coverage at or above 100% in 2013 and 2014, decrease to 97.5% in 2015, and 90.4% in 2016 but remaining above the national target of 90% universal coverage.

Community and retail distribution is planned to begin in 2014 to supplement the ANC, EPI, and school-based distribution. Community distribution will be targeted at hard to reach communities and areas with low ANC, EPI, and school attendance. Retail sales will be targeted in urban areas. The need for future campaigns will be revisited in 2014.

Proposed Activities with FY 2013 Funding ($7,900,000)

- Procure and transport LLINs: ($5,500,000)

  Procure approximately 1,100,000 LLINs at an average cost of $5.00 per LLIN (including the cost of transporting LLINs to distribution points) for distribution through the routine system.

- Technical assistance for LLIN distribution and supply chain: ($1,900,000)

  PMI will provide technical assistance to GHS at the regional and district level, as well as GES staff, to implement and refine the routine LLIN distribution through ANC, EPI, and schools. This will include training healthcare workers at ANC and EPI to distribute and document distribution of nets. Work with Ghana Education Services and schools throughout the country to distribute and promote nets through the school based distribution channel. Conduct an evaluation of the effectiveness of the routine distribution system to sustain universal coverage. Support NGO, FBO, or other local organization to distribute LLINs to hard-to-reach communities. Initiate planning for social marketing and/or private sector sales.

- Behavior Change Communications: ($500,000)

  PMI will support community mobilization, radio and television spots, and communications materials to increase awareness about the routine LLIN distribution system and to promote LLIN use, care and repair.

INDOOR RESIDUAL SPRAYING (IRS)

NCMP/PMI Objectives

Ghana's National Strategic Plan for Malaria Control (2008-2015) calls for rapid scale up of indoor residual spraying (IRS), based on the positive experience of the AGA program in Obuasi municipality in the forest zone since 2005. 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 during 2007 and early 2008, Northern Region was selected due to its high malaria burden, its underserved and vulnerable populations, and its relatively short transmission season (which presumably allows for one spray campaign per year).

In the first years, a key objective was to demonstrate that IRS can be scaled up quickly and safely in Ghana with public sector support, even in the more remote and deprived rural areas of

the country. By 2011, in collaboration with the Ghana Health Service (GHS), the project was implementing IRS to a high standard in nine target districts. In 2008, the program reached 601,000 people in 5 districts. By 2011, coverage was over 926,000 people in 9 districts. In 2012, the objective shifted from scale-up to maintenance of high quality operations, with a focus on efficacy monitoring.

Progress During the Last 12 Months

The 2011 spray operations reached 926,699 people in 9 districts. Teams operating from 31 operational sites sprayed 354,207 structures, exceeding the target of 90% coverage. The program provided seasonal employment to over 1,100 people from local communities in 2011. A cumulative total of over 2500 IRS implementers have been trained, and management capacity continued to be built at district, regional and national levels.

The program continues to mature as it enters its fifth spray round, with increasing emphasis on evaluation, monitoring, and quality control. Enhanced entomologic monitoring, undertaken in collaboration with the University of Ghana (Noguchi Institute) has demonstrated residual killing effects of more than 7-8 months, and the desired shift to a younger *Anopheles* population, with drops in infected bite rates (EIRs) of 140 to 10-60 at the various monitoring sites. Testing showed adequate susceptibility of local vectors to the pyrethroid products used, as well as emerging resistance to certain pyrethroid products after two years. The database for tracking IRS operations has been upgraded, additional entomologic monitoring sites have been added, and a number of research activities are being undertaken.

PMI is supporting operations research, conducted by the CDC and the Noguchi Institute, to help answer the question of whether a single spray round provides adequate protection in the northern savannah zone, and conversely, whether the extra costs of a second spray round are justifiable. Baseline surveys of malaria and anemia prevalence in children were conducted in a study district during the peak and trough transmission seasons in 2010-11. Half the district was to be sprayed once annually in 2011 and 2012, and half the district twice annually. Two post-IRS surveys have been conducted, and preparations are underway for the final two surveys.

Challenges, Opportunities and Threats

Early signs of pyrethroid resistance in 2010-11 prompted a change in insecticide class for the 2012 spray round. A long-acting organophosphate (pirimiphos-methyl/Actellic 300 CS) was selected for once yearly use in the six districts which had been sprayed since 2008-09. Due to limited availability of the product from the manufacturer at the last minute, three of the districts had to defer the class change and continued to use pyrethroids (alpha-cypermethrin).

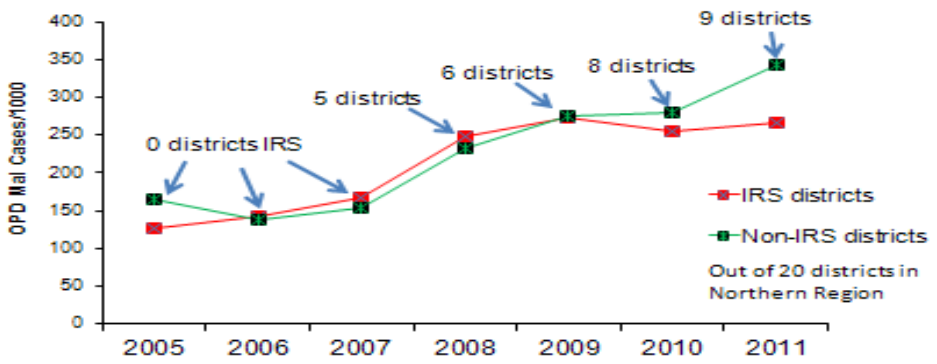
In addition to the remote terrain and poor roads characteristic of Northern Region, limited local demographic and geographic data sources hampered planning and monitoring. Compensating for this has been remarkably strong human capacity, with locally hired and effective spray teams,

managers, district and regional officials, community health volunteers, and traditional leaders, etc. Early hints of "spray fatigue" (waning enthusiasm for participation as the novelty of IRS wears off) have been identified in 2011 in some communities, leading to slightly reduced coverage rates. These have been addressed through community outreach programs.

The IRS program's most significant challenge is that epidemiologic data collected from several sources has yet to demonstrate a clear impact on malaria morbidity, namely:

- Routine GHS district reports. Northern Region public health authorities are concerned that they do not see IRS impact in their routine (DHIMS) data. Analysis of their data on outpatient malaria cases 2005-2011 showed similar trend lines for IRS vs. non-IRS districts for three years post IRS, with a small separation in the fourth year (See Figure 2). The value of these data is limited by well-known data quality issues, including incompleteness and largely empiric diagnosis.

Figure 2. Ghana Health Service Routine Data
OPD Malaria Cases/1000 Population in IRS vs. Non-IRS Districts Northern Region (2005-2011)



- Rapid Impact Assessment. Retrospective data from four district hospitals in the IRS area failed to show a clear reduction in malaria burden indicators. The best-quality, highest-volume data set was from Nalerigu Baptist Medical Center in East Mamprusi District (>85% pediatric malaria cases from IRS districts; 29,068 admissions; 99,555 slides). A published review of six years of Nalerigu data showed plausible fluctuations with rainfall, but no lessening in annual malaria admissions, proportion of malaria admissions, positive slides, or slide positivity rates in the post-IRS years (see Figure 3 and 4).

Figure 3. Monthly U5 malaria admissions and malaria proportion of all U5 admissions, Nalerigu, 5/2006 to 2/2012 (n=29,608)

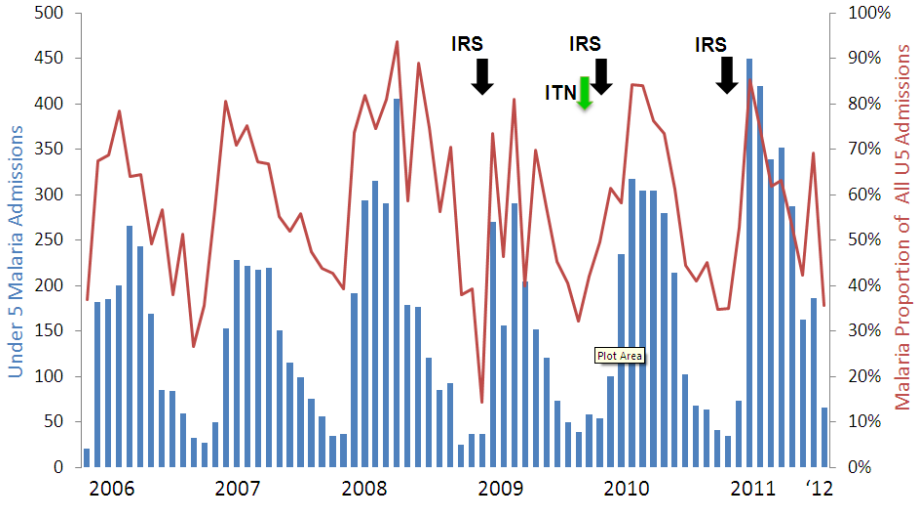
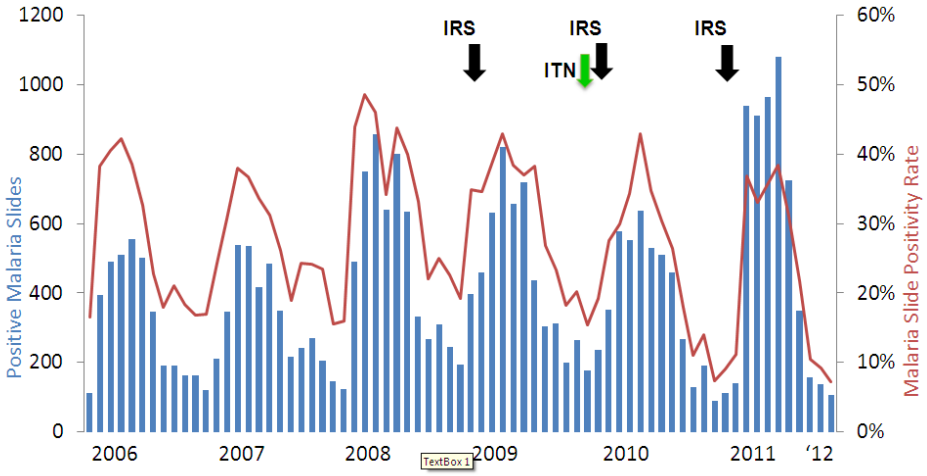


Figure 4. Monthly positive malaria slides and slide positivity rates, Nalerigu, 5/2006 to 3/2012, all ages (n=99,555)



- Cross-sectional household surveys. The PMI and the NMIMR conducted household surveys of anemia and parasitemia rates during the 2010-11 and 2011-12 high and low transmission seasons. Microscopic readings of samples from over 1,900 children per survey revealed baseline prevalence of malaria parasites of 52% in the peak season, and 35% in the trough season. Post IRS the prevalence was minimally reduced, at 50% and 33%, respectively. Rainfall was lower in the second year. The study will continue into 2012-13 to collect an additional year of post-IRS data, and analysis is ongoing.

There are little recent epidemiologic data on IRS in the West African savannah for comparison. However, going back to the late 1960s and early 1970s, the famous WHO Garki

project in northern Nigeria sprayed propoxypur (a carbamate) three times per year for two years in a rural savannah environment. Vectorial capacity (risk of transmission), which was "very high indeed…was reduced by about 90%, but the prevalence of *P. falciparum* was reduced only by about 25%." Due to high rates of outdoor biting and resting, a significant fraction of the vector population (largely *An. gambiae*) "avoided exposure altogether and has a normal longevity." Based on their findings, and on the "poor results" obtain in earlier IRS pilots in Cameroon, the Bobo-Dioulasso area of Upper Volta (Burkina Faso), and Western Sokoto, the Garki authors concluded that "in the rural areas of the Sudan savanna residual spraying is not to be recommended as a malaria control method." Although three decades have passed and local factors in northern Ghana are not fully comparable, this well-documented WHO study does raise important questions. It lends support to the enhanced epidemiologic and entomologic investigations which PMI Ghana proposes, as well as to the increasing attention to IRS targeting which is planned.

Data collection and analysis is ongoing. If the initial findings are borne out, the explanation may lie in the profile of the target area. Key aspects of malaria ecology in the rural northern savannah may be far less conducive to IRS than Obuasi (Table 2).

Table 3. Contrasting profiles of the two main IRS target areas in Ghana, 2005-12

	Obuasi area – Conducive Factors?	**Northern Region – Less Conducive Factors?**
Vector behaviors	Forest varieties (>indoor biting & resting)	Savannah varieties (>outdoor biting & resting)
Sleeping habits*	Outdoor sleeping uncommon	Outdoor sleeping very common**
Housing	Improved construction, closely spaced	<Improved construction, dispersed
Access to other interventions	Larviciding, >access to prompt ACTs. Low ITN coverage through 2/2012.	No larviciding, <access to ACTs. High ITN coverage since May 2010.
Larviciding	Done consistently. Breeding sites few, fixed, findable	Not done. Breeding sites not few, fixed nor findable
Baseline transmission	Less intense	Highly intense

* Sleeping habits vary with local safety perceptions, climate, housing structure, cultural traditions, etc.
**Anecdotal data collected by Peace Corps volunteers from 32 communities in the north in 2011-12 suggest that children under 5 sleep >2 hours outside on >150 nights per year.

Plans and Justification

Given that serious questions have been raised, yet definitive answers are not yet available, PMI is considering scaling back on the IRS program in the northern zone and shifting resources to the

forest or coastal zones. PMI would continue to spray and conduct enhanced epidemiologic and entomologic monitoring in select northern zone districts. Out of the nine districts in the Northern Region where spraying is currently ongoing, IRS will continue in at least three where monitoring capacity is greatest (the study district, the entomologic monitoring district, and East Mamprusi). The AGA/Global Fund program in Upper West will also generate monitoring data on IRS in the north. Of note, the PMI-supported ITN campaign in Northern Region launched in August 2012 is expected to achieve universal ITN coverage in these districts prior to cessation of IRS. In order to answer efficacy and resource allocation questions, there is a need to: 1) continue entomologic and epidemiologic monitoring in the Northern Region to document the efficacy of IRS in the northern savannah and identify local factors which may be undermining efficacy; and 2) demonstrate flexibility and a commitment to the overall PMI goals of reducing the malaria burden by attempting to determine whether IRS might have a more significant impact in another ecologic zone. To ensure stakeholders are fully engaged and to inform decision-making, PMI Ghana will support two planning exercises in the latter half of 2012: (1) A "scoping exercise" will be conducted in July-August, to identify target areas in the forest or coastal zones which would have increased potential for IRS impact; (2) A technical review of IRS experience and strategies will be conducted in October-November, as was suggested by GHS during MOP week, and would take place under the aegis of Ghana's active National Malaria Vector Control Oversight Committee. A final decision on the 2013 spay season would then be made, latest by January 2013.

The scoping exercise would apply refined targeting criteria (both technical and programmatic) to identify an optimal target area in the forest or coastal zones, covering perhaps one or two districts (estimated population is 110,000 per district in forest zones). It will likely require twice-annual spraying, as has been the practice in Obuasi. Baseline studies and cost-effective enhanced entomologic and epidemiologic studies will be conducted to guide implementation.

The decision to potentially target roughly half of PMI's IRS investment to the forest or coastal zones in 2013-14 is based on the theory that vector and human behaviors, and other factors, there may be more conducive to IRS than the northern savannah environment. Shifting to a different zone may increase IRS efficacy and the corresponding studies will provide maximum learning opportunities to inform future IRS scale-up in Ghana by all partners. The PMI Ghana team recognizes that the planned activities are not necessarily targeting IRS to where the malaria control need is greatest in relative terms (highest EIR, highest prevalence, lowest coverage rates); however the plan is consistent with the best evidence to date.

According to current plans, entomological and epidemiologic monitoring will be funded from the current IRS implementing partner work plan (on the entomologic side) and from the CDC RA and TDY activities (on the epidemiologic side). Specifically: routinely available DHIMS data from all nine affected districts will continue to be monitored. In addition, four districts have a baseline of facility-based data which was established in the 2010 rapid impact assessment

exercise. Three districts have entomologic monitoring sites which can remain active. These data sources will permit comparison of entomologic and epidemiologic trends in districts where IRS will be continued versus districts where IRS will be withdrawn.

- Support for IRS program implementation: ($4,570,000)
  In collaboration with GHS, and with continued focus on capacity building, support IRS implementation and programmatic evaluation in targeted Northern Region districts and potentially a targeted area in the forest or coastal zones. Support the continued implementation of the IRS program in three targeted districts in Northern Region, to cover a population of approximately 345,000. Following a scoping study for optimal targeting and stakeholder consultations, potentially launch a modest new IRS program in the forest or coastal zones, to cover a population size to be determined. All IRS programs will encompass entomological monitoring, spray operations, data collection, environmental assessment and compliance monitoring, BCC activities including community mobilization, and logistics support. Activities will include continued support for procurement of insecticide and equipment; support for supervision by GHS, EPA, and NMIMR personnel; and collaboration with the NMCP, the Malaria Vector Control Committee, the Global Fund/AGA IRS program, and other partners. The projected budget takes into account the ongoing costs associated with an anticipated change of pesticide class from a pyrethroid to an organophosphate in the north.

- CDC expert TDY visit and provision of supplies to support entomologic monitoring for IRS: ($34,000)
  Provide technical assistance and quality assurance, through two visits by CDC vector control personnel, for ongoing entomologic monitoring of the PMI-funded IRS program. To include further assessment of entomologic factors that might be limiting IRS impact in the north, as well as technical assistance to establish of entomologic monitoring in any new zone program. This includes limited funding for test equipment and supplies. In addition, assist MaVCOC in implementing a new network of sites for insecticide resistance monitoring nationwide.

- Environmental Monitoring: ($30,000)
  Support for enhanced environmental monitoring, preparation of environmental documentation and risk mitigation in IRS districts.

MALARIA IN PREGNANCY

NMCP/PMI Objectives

The NMCP objective is to increase the percentage of women receiving at least two doses of IPTp to 100% (PMI target is 85%). The GHS policy is to administer up to three doses of IPTp with SP under direct observation. The first dose is administered after quickening (approximately 16

weeks of pregnancy) with each following dose administered at least one month apart and with the last dose administered before 32 weeks of pregnancy.

Progress During the Last 12 Months

During the past 12 months, PMI and the NMCP have completed training of more than 13,000 healthcare workers to increase knowledge and skills of the GHS malaria in pregnancy guidelines. PMI trained 8,000 healthcare workers over the past year and over 13,000 since the inception of the initiative. PMI has also supported post-training follow-up visits to approximately 30 percent of the trainees and has trained 361 district and regional GHS staff in supportive supervision skills. Through this work, widespread errors at facility and district level in calculations of IPTp rates were identified and similar errors in the DHIMS. The PMI projects have designed a job aid to facilitate IPTp distribution, provided healthcare workers with refresher training through the supportive supervision activities, and made corrections to the DHIMS calculation of IPTp rates. To sustain gains, PMI supports an integrated USAID activity to improve the knowledge, skills, and practices of the tutors and preceptors at midwifery and community health nursing schools in the GHS malaria prevention and case management guidelines. To encourage early and regular ANC visits by pregnant women, PMI-trained community mobilizers and community organizations have reached 800,000 people with IPTp promotion messages.

The 2011 MICS data indicate that Ghana has made significant progress on IPTp rates in the past three years. Nationally, the percentage of women reporting that they receive at least two doses of IPTp during their most recent pregnancy in the past two years increased from 44% in 2008 (DHS) to 64% in 2011 (MICS). Regional disparities still exist, with the Volta Region estimate of 40.5% of pregnant receiving at least two doses of IPTp. The Northern Region, by comparison, showed a dramatic increase from 28% in 2008 (DHS) to 74% in 2011.

Challenges, Opportunities and Threats

The significant gains over the past few years and the high ANC attendance in Ghana present an opportunity to achieve an important NMCP and PMI outcome objective. However, it is likely that the low-hanging fruit has been covered and further increases in hard-to-reach communities and populations may be challenging. For example, some populations in Ghana cling to traditional and/or religious beliefs that prevent women from attending ANC early in their pregnancy. Reaching these populations will require intensive community mobilization activities. The GHS guidelines for IPTp prohibit administration of SP after the 32nd week of pregnancy, which is a missed opportunity for completing IPTp. Changing the policy will require a long-term consultative process.

SP Gap Analysis

The GHS procured a large quantity of SP in 2010 and PMI anticipates that GOG resources will be sufficient fill any SP gaps in 2013-2014.

Plans and Justification

Sustaining and building on the gains in IPTp rates will be a priority for the next few years. PMI will continue to strengthen ANC services, maintain support for pre-service training, and to continue to promote early and regular ANC attendance. The significant gains in IPTp combined with the reported 96% of pregnant women attending ANC four or more times (MICS 2011) put Ghana on track to achieve IPTp targets over the next few years.

Proposed Activities with FY 2013 Funding ($1,300,000)

- Technical Assistance to strengthen ANC and IPTp services: ($900,000)
  Support the GHS to improve healthcare worker capacity to effectively deliver a package of malaria prevention and care services to pregnant women. PMI support will include supportive supervision, on-site training as needed, outreach services, and quality improvement to increase administration of all three IPTp doses.

- Support pre-service training for malaria in pregnancy: ($200,000)
  Technical assistance to strengthen the knowledge, skills, and practices in prevention of malaria in pregnancy of tutors and preceptors at pre-service training schools for nurses, midwives, medical assistants and general nursing.

- Support for BCC to Promote IPTp: ($200,000)
  Technical assistance and implementation of community mobilization and mass media to promote IPTp and to encourage women to attend ANC early and regularly during their pregnancy. Incorporate MIP messages into national health promotion and maternal and child health BCC activities.

CASE MANAGEMENT

Malaria Diagnosis

NMCP/PMI Objectives

Throughout Ghana, over 50 percent of all clinic visits are due to febrile illnesses. Reliable malaria testing – whether through microscopy or rapid diagnostic test kits (RDTs) – is essential to providing appropriate care to these patients, as well as to providing reliable surveillance. The National Malaria Control Program (NMCP) advocates parasitological confirmation of all malaria cases, with priority given to patients older than five years.

In late 2009, the NMCP/GHS began promoting a policy of universal malaria diagnosis (microscopy or RDTs) in all age groups consistent with the new WHO guidelines. Since then, the focus has been on improving the quality microscopy at the higher-level facilities and scaling up the use of RDTs in peripheral settings including CHPS zones.

Progress During the Last 12 Months

PMI has been working closely with NMCP, the National Public Health Reference Lab, and the GHS Clinical Laboratories Unit to improve the quality and scale up of malaria diagnosis in Ghana. PMI has been supporting the Outreach Training and Supportive Supervision (OTSS) program, which consists of periodic rounds of structured supervisory visits to clinical laboratories by regional technical specialists in the Ghana Health Service. A formalized checklist is used to assess infrastructure, personnel and efficiency.

The Outreach Training and Supportive Supervision program has been rolled out systematically across Ghana. To date, seven rounds have been completed, reaching a total of 302 health facilities. By the end of 2012, all 405 health facilities with a lab (as counted in a 2008 assessment) will be enrolled into the OTSS program. Since the program began, the percentage of laboratories with agreement with supervisor (gold standard) on malaria parasite detection by microscopy >85% improved from 73% in the second visit to 81% by the fourth visit. Refresher training for district supervisors has been ongoing and supported through the dissemination of a WHO CD-ROM on malaria microscopy for self-practice. PMI is also supporting the creation of a National Archive of Malaria Slides to support training and quality control purposes.

PMI has also supported the scale up of RDTs through the procurement of RDTs and training of health workers on diagnosis and case management. Over the last 12 months, 9,315 health workers have been trained. In response to reports of RDT stockouts, PMI procured 2.7 million RDTs scheduled to arrive in two shipments in the second and third quarter of 2012.

Challenges, Opportunities and Threats

Ensuring sufficient financial resources and averting stockouts of RDTs has been a persistent challenge since 2010. Based on the gap analysis below, it is unclear whether there will be sufficient financing to ensure sufficient availability of RDTs to fulfill the public sector need. In that case, RDTs would likely need to be prioritized to areas with low pre-test probability rates year-round, such as Greater Accra Region. Diagnostic testing continues to have a suboptimal impact due to persistent RDT stockouts, patient flow bottlenecks in facilities, and lack of provider adherence to test results. Many patients still seek care in the private sector through Licensed Chemical Shops that are not trained nor have access to RDTs.

A major challenge for continued OTSS program scale up is that the number of clinical labs is growing rapidly, especially in Ghana's thriving private sector, and now exceeds 600. Based on recent experience, limitations in qualified supervisors are likely to pose the greatest constraints to scale up. This is being addressed through continued investments in training and certification.

Plans and Justification

PMI will continue to support the OTSS program and seek mechanisms to further integrate management of this program into the GHS Clinical Laboratory Unit, including exploration of direct funding agreements. Refresher training on microscopy and regular supervisory visits will

continue. PMI plans to continue 4 rounds of OTSS per year, each round would cover 205 labs in 10 regions and provide on the job training to at least 500 lab personnel.

PMI will also continue to support the scale up of RDTs with a specific focus on peripheral health facilities and CHPS zones. This will include pre-service and in-service training, and a focus on improving provider compliance and patient demand for diagnostics. PMI will also support piloting the use of RDTs in the private sector through Licensed Chemical Shops. At the time of this writing, Ghana was still negotiating the Phase 2 renewal of its Round 8 grant. Therefore, funding for the procurement of RDTs beyond 2012 through other donor sources remains unknown. PMI will provide funding to support the procurement of approximately 4.7 million RDTs:

RDT Gap Analysis Estimate-May 2012[1]

	2012	2013	2014
National Public Sector Requirement	11,857,000	10,928,600	11,148,800
Global Fund/Other Funders	(6,000,000)	Unknown	Unknown
PMI	(2,700,000)	(4,750,000)	N/A
Gap	3,157,000	6,178,600	

Proposed Activities with FY 2013 Funding

- Procure RDTs: ($2,850,000)
  Support procurement of 4,750,000 RDTs and fill 44% of the estimated public sector gap.

- Strengthen quality of microscopy and RDT use at laboratory level: ($500,000)
  Continue to support continued quality improvements to malaria microscopy at the laboratory level, building upon and scaling up the successful OTSS program. The emphasis will be on extending the reach of the quality assurance program to include supervisory field visits and on the job training including proficiency testing using the recently developed slide archive. Provide technical assistance and financing for supportive supervision and on-the-job training of laboratory personnel, complemented by refresher training for lab supervisors. The aim is to increasingly transfer management responsibility to the Ghana Clinical Laboratory Unit.

[1] RDT gap analysis was calculated using a series of assumptions including: number of people seeking care in the public sector, cases of fever, % of cases tested via microscopy vis a vis RDT, etc. The number of RDTs procured in any given year will be driven by actual consumption and need. PMI-funded procurement deliveries will be timed accordingly across all three years.

- Scale-Up RDT use in clinical settings: ($900,000)
  Accelerate collaborative efforts with the NMCP and with GHS at all levels to achieve high rates of parasitological testing, with a focus on scaling up RDT use in clinical settings. Support identification and removal of operational, financial, policy, and other bottlenecks to the use of RDTs. Support capacity building to ensure consistent availability and RDT of use at public health facilities, particularly at the CHPS facilities. Building on recent GHS pilot projects and operations research, PMI will support the roll-out of RDTs to community based agents, LCS and pharmacies. PMI will support linkages with National Health Insurance to improve testing rates.

- Provide technical assistance in diagnostics: ($12,000)
  CDC will provide technical assistance to support implementation of microscopy, quality assurance for diagnostics, and RDT implementation.

Treatment

NMCP/PMI Objectives

The NMCP strategy calls for widespread, prompt access to ACTs. Ghana first adopted AS/AQ as a first-line therapy for uncomplicated malaria in 2004. Artemether lumefantrine (AL) and DHA-PPQ are officially endorsed as alternative treatments, and malaria treatment guidelines reflecting this policy were revised in 2008/2009. PMI continues to urge adoption by the MOH of a single first-line ACT, to permit greater efficiency in training, procurement and monitoring, and the NMCP is moving in this direction. ACTs have been classified as over-the-counter medicines since 2009. The current treatment guidelines call for oral quinine for treatment in the first trimester of pregnancy with either oral quinine or ACTs in the second or third trimester. Intravenous artesunate is being considered to replace quinine as the first-line treatment for severe malaria. Rectal artesunate is endorsed for pre-referral use but is available and used very sporadically.

The NMCP has led efforts to improve access to ACTs through training, supervision, and ensuring the NHIA insurance policies for reimbursing ACT treatments are consistent with the national guidelines. Ghana was also designated as an AMFm pilot country, which has enabled subsidized ACTs to become widely available through the private sector LCS.

The NMCP has also been supporting scale up of case management at peripheral levels through the CHPS facilities and a UNICEF-supported pilot of community case management of malaria through community health workers. Although progress was made in developing guidelines and training materials for the CCM program, training, supervision and integration with management of acute respiratory illness and diarrhea has not yet occurred at a broad scale.

Progress During the Last 12 Months

Given that the AMFm pilot had ostensibly covered most of the ACT needs for Ghana's public and private sectors, PMI's support primarily focused on training and supervision of health care

workers. Most first-line health workers have received training or orientation on the malaria case management guidelines through PMI, NMCP, and Global Fund support. In the last 12 months, an additional 427 health workers were trained on malaria case management and 361 district level supervisors were provided training on supportive supervision. A total of 2,945 community-based agents were trained to support the home management of malaria. PMI continued to provide support to pre-service training in 32 public health schools (community health nursing, public health nursing, and midwifery schools).

Challenges, Opportunities, Threats

Ongoing challenges in improving case management include late presentation of patients; limited geographic access to skilled care; inconsistent supplies of ACTs; public sector procurements (MOH, district, and facility level) of ACTs that have not been WHO pre-qualified; health workers that have not yet been trained on the standard treatment protocols (largely in lower level facilities, CHPS and hard to reach facilities); and pockets of health workers that cling to outdated or unapproved treatment regimens. The 2011 MICS found that 50% of reported fever cases were not brought to medical attention. At the community level, the roll out of the NMCP's integrated community-based case management of fever (iCCM) program has been very slow, has experienced technical and management challenges, has not received support to treat respiratory infections and diarrhea, and has not been well integrated into the GHS system.

Outside the public health care system, ACTs are increasingly available, particularly at LCS and pharmacies that have access to the low-cost AMFm ACTs and received NMCP/Global Fund malaria case management training. The majority of these treatments are in adult presentations however it is unclear to what extent children under five are being served through this channel. Many, if not most, of these facilities also sell non-approved malaria treatments.

Plans and Justifications

PMI will continue to support training, supervision, and quality improvement in overall case management primarily focusing efforts on the CHPS and rural facilities. Given the uncertainty of funding around Global Fund, AMFm and the challenges in scaling up the CCM program, PMI decided to focus its funding on improving the quality of malaria case management at the CHPS level. This is also aligned with the GHS strategy to support the CHPS platform to expand reach at the community level. The CHPS system, which targets underserved rural areas, continues to expand. In 2010, there were 1,034 CHPS zones covering 18.7% of the total population (GHS Annual Report 2010). In addition, PMI will provide support to improving case management through the private sector Licensed Chemical Shops. This activity will also support pharmacies and LCS to become certified to receive NHIA reimbursement for malaria diagnosis and treatment.

PMI will also increase funding for ACT procurement. Based on the gap analysis, PMI will prioritize ACT procurements on WHO Prequalified pediatric treatments given that the AMFm adult treatments are likely to remain in the Ghana supply chain for quite some time and that NHIA will continue to reimburse health facilities who supply adult ACT treatments through their

own budgets. It is important to note that this gap analysis only covers needs for the public sector.

ACT Gap Analysis Estimate-May 2012

	2012	2013	2014
National **Public Sector** Requirement	6,500,000	7,500,000	8,500,000
Global Fund/Other Funders	1,062,000	Unknown	Unknown
PMI[2]	1,200,000 (pediatric est.)	4,500,000 (pediatric est.)	N/A
Gap	3,938,000	3,000,000	8,500,000

In 2012, there have been renewed discussions with the Ghana National Health Insurance Agency on improving the quality of care and financial viability of the insurance scheme. The NHIA is committed to supporting the malaria diagnostic policy and is considering policy options to link reimbursement for malaria treatment to a confirmed parasitological diagnosis. PMI will be providing support to NHIA to conduct clinical audits to assess compliance with the policy but also to ensure that the reimbursement policy creates incentives for appropriate case management and does "no harm," particularly given that stockouts of RDTs have been common. Financial incentives for over-diagnosis of malaria should be reviewed, such as paying less for a diagnosis of undifferentiated "febrile illness," even when a parasitological test is negative.

PMI will provide support for pre-service training and BCC activities to address the issues of provider compliance and confidence in malaria RDTs and improve treatment seeking behavior, including demand for diagnostics.

Proposed Activities with FY 13 Funding

- Procure ACTs and severe malaria medication: ($3,450,000)
  PMI will support the procurement of ACTs, with a heavy emphasis on pediatric presentations of ACTs, and severe malaria medication, as needed.

- Support to pre-service training: ($365,000)
  PMI will continue to support pre-service training for nurses, midwives, and medical assistants in malaria diagnosis and case management guidelines and treatment protocols. In addition, PMI will support the revision of the medical school curricula to support the new guidelines on diagnosis prior to treatment.

[2] The number of RDTs procured in any given year will be driven by actual consumption and need. PMI-funded procurement deliveries will be timed accordingly across all three years.

- Support improved malaria case management at health facilities: ($1,100,000)
  PMI will collaborate with GHS at all levels to improve compliance with national guidelines for the management of both uncomplicated and severe malaria in health facilities. PMI will provide technical assistance and financial support for supportive supervision, on-the job and class room training, and quality improvement among health workers, with an emphasis on CHPS staff. PMI will support training, supervision, and other measures to link diagnosis to treatment, including promotion of provider adherence to test results.

- Support to improve case management through licensed chemical sellers: ($400,000)
  PMI will support activities to build LCS capacity for and compliance with GHS malaria diagnosis, treatment and referral guidelines; address issues related to for-profit, business motivations to comply with GHS guidelines; and support LCS to achieve NHIA accreditation, with emphasis on geographic areas with gaps in NHIS coverage.

- BCC to improve treatment seeking behavior: ($300,000)
  PMI will support community mobilization and improved demand for case management by targeting the general public to promote correct and consistent use of ACTs. Activities will promote community awareness of appropriate testing and treatment for malaria.

- Support to NHIA clinical audits: ($325,000)
  PMI will support NHIA to conduct clinical audits to reinforce and support NHIA's reimbursement policy that requires malaria treatment to a confirmed diagnosis prior to treatment. PMI's engagement is also intended to ensure that the reimbursement policy is not punitive in the event of documented RDT stockouts or severe cases requiring emergency pre-referral care.

Pharmaceutical Management and Drug Quality

MOH/PMI Objectives

In November 2011, the Ministry of Health (MOH) of Ghana identified the need for a comprehensive and coordinated strategic plan to strengthen the public sector's supply chain. A Technical Working Group (TWG) was formed by the MOH to guide the development of the Supply Chain Master Plan (SCMP) with members including staff and representatives of the Ministry of Health, Ghana Health Services, National Health Insurance Agency, and the private sector. The SCMP outlines a five-year strategy for a comprehensive revision to 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.

The Ghana Food and Drugs Board (FDB) is the national regulatory body within the Ministry of Health 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 FDB is responsible for providing the regulatory oversight and ensuring the quality, safety, and efficacy of malaria medicines in Ghana including the registration of locally produced and imported ACTs.

Progress During the Last 12 Months

In the last 12 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 end use verification. National quantification exercises for malaria RDTs, ACTs, and severe malaria medicines have been undertaken for the public health facilities and the CCM program. In addition, PMI investments have been supporting the MOH's Supply Chain Master Plan development to address the overall public sector supply challenges.

PMI's has continued to support the FDB to monitor the quality of antimalarial drugs. In the last 12 months, drug quality monitoring has continued the testing of 417 antimalarial samples from five sentinel sites. Out of the total tested through Minilabs or confirmatory testing, 6.3% failed (mostly syrups and liquids). Based on these results, FDB has been recalling substandard and counterfeit products from the market. Although the sentinel site samples are not nationally representative, the failure rate for antimalarials from the five sentinel sites dropped from 18% in 2010 to 6.3% in 2011. The number of chloroquine products found on the market (discontinued in 2005) dropped from 11 in 2010 to 1 in 2011. PMI is also supporting the Ghana FDB laboratory to achieve WHO or ISO/IEC17025:2005 accreditation.

Challenges, Opportunities, Threats

Despite evidence of progress, there continues to be a need to strengthen Ghana's pharmaceutical management system. Procurement of medicines 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. The local pharmaceutical sector in Ghana is very active and supplies many antimalarial medicines, many of which are known to be poor quality and inconsistent with global and national treatment guidelines. In 2012, the Central Medical Store provided fewer than 30% of pharmaceuticals required to support the health system. Procurement delays and lack of visibility of procurements through the Global Fund grants and AMFm, coupled with multiple first-line ACT treatments further confound the existing system.

Strengths of the system include the National Health Insurance Scheme (NHIS) which provides some financing to support affordable malaria treatment, a robust private sector manufacturing bases, and clear treatment policies promoting rational use of malaria medicines. NHIA is a key stakeholder that influences the functioning of the supply chain system. Mass enrollment in the

National Health Insurance Scheme (NHIS) since 2005 provides affordable access to malaria treatment but has placed a heavy fiscal burden on the MOH because the national levies anticipated to support the NHIS have not been sufficient to sustain the package of services provided. Health commodity costs have risen to almost 60% of NHIA's total expenditures, up from 15% a few years ago.

Despite these challenges, there are two significant opportunities for long term reform. The MOH is committed to foster an inclusive stakeholder driven process to reform the supply chain through the Supply Chain Master Plan. While 2011 proved to be a very challenging year for malaria procurements – including cancellations or delays in procurement of ITNs, ACTs, SP, and RDTs – the situation appears to be turning around in 2012 under the new MOH leadership. There have also been significant reforms underway at NHIA to address concerns about quality of care and financial sustainability including piloting a capitation financing approach, linking reimbursements for malaria treatment to diagnosis, and policy work on financing the cost of medicines. Both of these reform efforts are interlinked and represent opportunities to enact long term systemic changes that will lead to better malaria and health outcomes. As these reforms are implemented, the need for a strong, independent FDB to enforce quality standards for both local and imported pharmaceuticals becomes even more crucial.

Plans and Justifications

PMI will continue to support pharmaceutical management strengthening activities in the areas of quantification, Logistics Management Information Systems, supervision and end use verification. PMI will also contribute to the development and implementation of the Supply Chain Master Plan to ensure that PMI financed ACTs and RDTs are distributed and managed appropriately. PMI will also continue to provide support to FDB and the drug quality monitoring through the sentinel sites. The role of the FDB in ensuring safe, high quality antimalarials is crucially important as reforms underway through the Supply Chain Master Plan and NHIA take effect over the next few years.

Proposed Activities with FY 13 Funding

1. <u>Support to supply chain and pharmaceutical management</u>: ($550,000)
   PMI will provide continued support for strengthening Ghana's procurement, logistics, and supply chain system to improve the availability of malaria commodities (including malaria treatments, SP for IPTp, RDTs, and other commodities) throughout all levels of the system. Activities will build on investments made in previous and on Ministry of Health's supply chain reform efforts. The end use verification will also be funded through this activity.

2. <u>Strengthen drug quality monitoring capacity</u>: ($200,000)
   Support strengthened drug quality monitoring capacity in collaboration with the FDB by collecting data on antimalarial drug quality through the existing five sentinel sites. Increased emphasis will be placed on strengthening FDB enforcement capacity combined with support for activities that raise awareness among the public regarding counterfeit and substandard medicines identified in Ghana.

BEHAVIOR CHANGE COMMUNICATION (BCC)

PMI/NMCP Objectives

PMI BCC and community mobilization strategy aims to support PMI activities and complement the NMCPs effort to promote positive behaviors that support malaria control. The strategy is based on NMCP national malaria behavior change communication strategy objectives, namely, increasing demand for and use of effective malaria control tools such as LLINs, IPTp, IRS, and ACTs.

Priority BCC strategy objectives include: increasing household ownership of LLINs to 90% of households, and nightly utilization to 85% among children under five years and pregnant women and to 80% among the general population; increasing the percentage of children under five years of age with fever receiving an appropriate ACT within 24 hours of onset of fever and of all patients with uncomplicated malaria correctly managed at public and private health facilities using ACTs to 90%; reducing by 50% the proportion of the population that has common misconceptions about causes of malaria; increasing the percent of service providers who promote LLIN, SP and ACTs to clients to 90%; increasing percent of pregnant women who attend ANC during the first four months of pregnancy and receive their first dose of IPTp after quickening to 90%.

Progress during the last 12 months

Exposure to USAID-sponsored health campaigns in 2012 has reached 57% of the Ghanaian population on television (omnibus data). Over the past nine months PMI has run 4,027 radio spots in five languages reaching a total listenership estimated at 17 million. PMI developed new media spots to elevate awareness about serious complications related to severe malaria infections (e.g. anemia, child development, and brain damage from cerebral malaria), to dispel misconceptions, and to empower people to use ITNs and IPTp by portraying them as positive social norms that are part of a modern lifestyle. Community mobilization has been closely linked with BCC messaging to promote LLIN use, regular ANC attendance and IPTp uptake, and early diagnosis and treatment with ACTs. CHVs trained to support LLIN distribution and iCCM have been supported to promote the range of malaria control interventions in their communities using specially developed malaria flipcharts and interactive games. PMI community mobilization activities reached 8.7 million people with behavior change messages.

Challenges Opportunities and Threats

While awareness about malaria transmission has increased, many misconceptions persist. Common misconceptions about the cause of malaria identified in the 2011 MICS survey include: dirty surroundings (55%), eating contaminated foods (19%), and working in the sun (12%). In the 2011 MICS survey, more respondents identified keeping your surroundings clean (60.5%) as

a means of preventing malaria than those who identified sleeping under an ITN (52.6%). Moreover, among the general population, the word malaria is often used synonymously with fever and high rates of presumptive diagnosis of malaria based on fever contributes 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. The majority of these cases receive antimalarials from pharmacy shops or LCS. Most pharmacies and almost all chemical shops stock unapproved anti-malarials.

Ghana has a relatively well developed media infrastructure. There are 13 television stations, one of which has a national reach. Over 100 local radio stations are distributed throughout the country and can be found in almost all districts, with heavier concentrations in the urbanized areas. Local radio stations broadcast in the range of local languages providing opportunity for targeted communications. According to the 2008 DHS 54% of women and 60% of men watch television at least once per week, 76% of women and 88% men listen to radio at least once per week. However, most local stations broadcast over a limited geographic area and thus reaching national coverage through radio requires agreements with many different stations. The print media is not as well developed and only a few news publications are national in character.

Plans and justification

PMI will continue to support NMCP BCC efforts to promote ACTs as the drug of choice for treatment of malaria, IPTp for pregnant women, and regular use of ITNs for prevention of malaria. Radio and TV campaigns have proven to be effective in reaching a large proportion of the population with BCC messaging and will continue to be the primary means of communicating BCC messages to the general population.

Following the mass LLIN distribution and hang-up campaigns that have covered almost the entire population of the country, there is an urgent need to follow up with BCC messages to encourage the population to translate the high awareness that LLINs provide protection against mosquito bites into nightly use of LLINs.

As PMI scales up improved case management and IPTp, health workers will increasingly become important agents for promoting LLINs, IPTp, and ACTs. PMI will continue to support health workers to promote the use of high quality malaria health commodities at both facility and community level. PMI will also assess the effectiveness of the media campaign and revise and/or develop new radio spots as appropriate. Additionally, PMI will strengthen the integration of BCC messaging to strengthen the role of health workers as active promoters of LLINs, IPTp, and ACTs.

In addition to monitoring activities, the effectiveness of BCC activities will be assessed through analysis of the BCC components in the 2011 MICS, the assessment of the routine LLIN distribution system, and the 2013 DHS. Consistent with PMI guidelines, BCC activities will be evaluated for coverage and impact. Local media monitoring organizations will be used to

monitor the number of spots aired on radio and television. At the community level, placement of BCC message will be monitored using an independent monitoring organization, and implementation of community mobilization programs will be monitored through project reports.

Proposed activities are detailed in the technical sections. ($1,000,000)

CAPACITY BUILDING AND HEALTH SYSTEMS STRENGTHENING

NMCP/PMI Objectives

Although much progress has been made, the MOH continues to have significant gaps in its capacity for program management, field supervision, and malaria M&E. Within the NMCP, the priorities are to build capacity in entomology, pharmaceutical management, and monitoring and evaluation.

Progress During the Last 12 Months

As described in the technical sections above, PMI has supported capacity building and systems strengthening to redesign their routine LLIN distribution system; to build capacity of GHS staff for prevention of malaria in pregnancy, diagnosis, and case management; to strengthen the pharmaceutical supply chain; to improve systems for data collection and analysis; and to increase the knowledge and skills of community volunteers to promote malaria prevention.

In addition to capacity building around the specific technical interventions, PMI has, together with USAID Family Planning, Maternal-Child Health, and HIV programs, provided joint funding for an integrated health services project which is building the capacity of GHS regional and district health staff to strengthen their program planning and management capacity. With integrated funding, the project has provided leadership training for health management teams in the three southern regions. These activities have helped regions and districts to take charge of the specific challenges within their area and solve problems. Over the past 12 months, PMI projects have provided sub-agreements to nine of the ten regional health management teams. With the sub-agreement funds the regions have planned malaria control activities such as LLIN distribution, case management trainings, and supportive supervision visits. The PMI projects have also supported regions to manage the agreement resources, report on accomplishments, and submit auditable financial reports. This support is building regional capacity to receive direct USAID funding. PMI has provided financial support to the NMCP to conduct monitoring and supportive supervision visits to regions and districts.

PMI support to the NMCP has included embedding a senior M&E advisor and a senior logistician within the NMCP. Both advisors are supporting activities and providing capacity building in their areas of expertise to the NMCP staff. PMI has supported NMCP staff to attend international technical meetings and has supported a range of GOG staff to participate in a study tour on routine LLIN distribution systems. PMI has supported the School of Public at the University of Ghana to establish a “malaria track” within the existing FELTP program. From

2012, two candidates drawn from the Ghana Health Service will go through advanced classroom and practical training in field epidemiology, focusing on priority issues in malaria surveillance and operations research identified by the NMCP and PMI.

Plans and Justifications

PMI will continue to support regional and district health teams to build capacity for planning and managing malaria control activities. The PMI projects will continue to provide sub-agreements to regions and to support their management and reporting on sub-agreements with the intention that Regional Health Management Teams (RHMTs) will progress to direct funding from USAID. The regions will be encouraged and supported to analyze their specific conditions, parasite prevalence, and progress toward achieving malaria control targets. The regions will then be supported to tailor their activities to address their specific needs.

PMI will continue to support the NMCP with embedded advisors for M&E and logistics and will support other capacity building within the NMCP staff, including entomology training for one staff and limited support for international and/or regional technical meetings. PMI will support GHS staff to participate in the FELTP training. The NHIA, launched in 2006, has proven its ability to increase mass access to health care services.

The recent Multi-indicator Cluster Survey (MICS) conducted in November 2011 found that 60% of Ghanaian women and children reported being enrolled in the NHIS, with 40% able to produce a current NHIS card upon request. However, subscriptions lapse after one year, there is public confusion regarding coverage policies, and operational bottlenecks restrict access in rural areas where malaria burden in highest. Thus coverage remains below targets. Northern Region and the poorest quintile of household had the lowest coverage in the MICS, pointing to deficits in equitable access. In the context of new USG commitments to help the Ghana's NHIA reach its full potential for promoting access to health care services, PMI will provide technical assistance to increase coverage rates, especially in rural areas. The PMI supported activities will encourage the general population to maintain active coverage, and to seek care at NHIA accredited facilities when they develop malaria symptoms. Similar support will be provided by USAID programs in Family Planning, HIV, and Maternal-Child Health.

Challenges, Opportunities, Threats

The regional and district health teams that have demonstrated capacity to directly manage agreements present an excellent opportunity to use the GHS structure and support RHMTs to tailor activities to their specific needs.

Proposed Activities with FY 13 Funding

- <u>Build management capacity at NMCP, GHS and other GoG partners:</u> ($100,000) Continue to provide support to the NMCP, GHS, and GOG for technical capacity building and improved malaria control systems. Support limited IT investments to

enhance malaria program management at the national and regional levels. This also includes funding to support NMCP and GHS staff to attend trainings, conferences and workshops.

- Long term training – Field Epidemiology and Laboratory Training Program: ($75,000)
  Continue to support long term training of two individuals that builds capacity at GHS/NMCP in epidemiology, surveillance, monitoring and evaluation or other malaria program management functions as needed. To be implemented as a "malaria track" imbedded in the FELTP program this was recently established at the University of Ghana.

- Support supervisory visits: ($100,000)
  Provide support for supervisory visits and monitoring activities at regional and district level by public health officials, including NMCP and MOH/GHS staff, in support of NMCP efforts to strengthen overall malaria program management and supervision efforts.

- Encourage access to appropriate malaria treatment through the National Health Insurance Program: ($200,000)
  The activity has two main goals: increase enrollment and utilization of the NHIS by poor rural populations; and provide technical assistance to the NHIA's planned transition to capitation financing for primary health care reimbursement. The activity will be co-funded with other USAID health funding streams.

MONITORING AND EVALUATION

NMCP/PMI Objectives

The strategic framework for M&E in malaria control in Ghana is described in the *National Malaria Control Monitoring and Evaluation Plan (2008-2015),* which was developed by the NMCP with technical assistance from WHO, PMI and other partners.

The main objectives for M&E are:

- Systems will be strengthened and/or developed to collect, process, analyze and manage malaria transmission and disease burden data, including data on treatment and prevention programs.

- Management capacity will be enhanced so as to ensure that all strategic programs have been implemented as planned to ensure accountability and address problems that have emerged in a timely manner.

- Monitoring and evaluation systems will be capable of providing feedback to program implementers, RBM partners and relevant authorities to improve program planning, management, and accountability.

- The NMCP and partners will document on a timely basis the extent to which planned strategies and resource allocations have achieved expected outcomes and impacts.

Within the GHS, the Policy, Planning and M&E Division (PPME) is prioritizing efforts to strengthen routine data systems. Currently, their major thrust is upgrading Ghana's DHIMS (District Health Information Management System) by placing it on the platform of the web-based, internationally recommended "DHIS2" software. The new system came online in April 2012, and is expected to be fully implemented in all districts by the end of the year. Multiple partners, including the University of Oslo, have supported this expensive upgrading process, with PMI playing a more malaria-focused role to date. The NMCP expects to eventually rely on the DHIMIS data for most of its reporting needs. At present, due to the inaccessibility of the DHIMS data, the NMCP/GF maintains a parallel system of data collection at health facilities. Although this process permits the NMCP to meet reporting requirements in a timely manner, it improves little on the DHIMS in terms of ultimate completeness and accuracy of the facility data. PMI's objective is to help increase the completeness, accuracy, and accessibility of the malaria data in the DHIMS, so that it can provide reliable reports on all facility-based malaria indicators.

Progress During the Last 12 Months

PMI has continued to support a variety of malaria M&E capacity-building activities within the NMCP/GHS. An especially constructive contribution has proven to be the posting of an M&E team leader at the NMCP. This has enhanced efficiency in NMCP data reporting, provided in-house mentoring for the NMCP's M&E staff, and provided leadership in malaria surveys. Twenty analysts at the NMCP and GHS PPME staff were trained in STATA software use for data management and analysis; laptops were provided for NMCP officers. A malaria-track for two FELTP candidates was established (as described under the HSS section).

Recognizing the importance of routine information system data for programmatic purposes and for monitoring the impact of malaria control interventions, PMI has worked with the NMCP and other partners to improve the quality of data and build capacity for evidence-based decision making. Support has been at the national, regional and district/sub-district levels, largely through training, supervisory visits, improved forms and registers for data collection at facilities, and quarterly malaria data reviews. Selected highlights of PMI contributions include:

- Printed 7,500 copies of the revised consulting room registers for distribution to 1,700 health facilities in four selected regions. These registers were piloted with PMI assistance, and are designed to help facilities readily capture malaria diagnoses as provisional versus confirmed.
- Provided data storage equipment to strengthen HIMS at the district level, including 40 desktop computers to districts which lacked a computer.
- Supported GHS in the implementation of DHIS roll-out activities at various levels, including training 130 officers as trainers on revised registers and forms; development of

Standard Operating Procedures on forms and registers; and clarified definitions of indicators for improved consistency.

- Provided technical assistance and funding for regional quarterly reviews of malaria data, leading to improved malaria data reporting. For example, in Brong Ahafo, facility reporting improved from 21% in 2010 to 71% in 2011, and the general health data reporting in the DHIMS increased from 2% in 2010 to 67% in 2011. In Greater Accra Region, the proportion of districts consistently submitting monthly reports improved from under 20% to over 90% in one year.
- Supportive supervision on malaria M&E led to detection and correction of a systemic error that was depressing IPTp rate calculations nationwide. In the Upper West Region, for example, reported IPTp1 coverage for the period January to June 2011 increased from 20% to 76% when using the correct formula.

Collaborating closely with the NMCP and the Navrongo Health Research Center, PMI provided funding and technical assistance to incorporate a robust malaria module in the *2011 Ghana MICS*. This cross-sectional, nationally representative survey, with a sample size of 12,000 households, was conducted during the September-December rainy season under the overall leadership of the Ghana Statistical Service and UNICEF. Production of the survey report is expected in July 2012. All the elements of a standard malaria indicator survey (MIS) were incorporated, including anemia and parasitemia sampling. This approach, of essentially "piggy-backing" an MIS onto a MICS – provided a cost-effective means to obtain the data, while at the same time promoting harmonization of data gathering efforts among the major health donors and GoG stakeholders.

The high levels of ITN coverage and the growing using of IRS underscore the need to measure and manage insecticide resistance in *Anopheles* mosquito vectors throughout Ghana. In support of this goal, PMI has provided technical assistance to MaVCOC to draft a costed national insecticide resistance monitoring plan. Standardized monitoring and reporting is to be carried out at up to twenty sites in each of the ten regions, directed by the NMCP via the regional biologists. Any existing monitoring programs (such as conducted under IRS projects) would be incorporated into the network. PMI has committed to provide start-up funding to finalize the plan, train implementers on standard collection methods, and increase laboratory capacity for rearing and testing emerged adults. Members of MaVCOC expressing interest in contributing to the future network include NMIMR, AngloGold Ashanti and the Vestergaard-Frandsen company (which has recently opened an entomologic research facility at NMIMR).

Beyond these specialized M&E activities, PMI also supported extensive monitoring in the course of implementation activities covered elsewhere in this MOP. To cite just a few examples: real-time ITN distribution monitoring and post-campaign evaluation; drug resistance monitoring nationwide; intensive entomologic monitoring and epidemiologic surveillance in the IRS zone; and monitoring of commodity stock status. PMI Ghana staff have initiated evaluations on the

topics of: (1) community-based behavior change (comparing the effectiveness of NGO vs. GHS staff); and (2) effectiveness of vertical versus integrated malaria projects. These evaluations are currently in the planning stages.

Challenges, Opportunities and Threats

The upgraded DHIMS system promises to be much more "user-friendly," allowing the NMCP and others to generate reports on malaria indicators via pre-set templates more rapidly. Ghana now has an approach to generating regular malaria bulletins. PMI and the WHO country office are well placed to support regular publication of a malaria bulletin that reports national and sub-national trends on key malaria indicators, under the leadership of the NMCP. The bulletin may prove to be a powerful data feedback mechanism to identify and correct deficiencies at regional, districts, and facility levels over time.

The key challenge will be to improve the quality of malaria data which is fed into the DHIMS, especially in terms of completeness and accuracy. For example, there is an acute need to harmonize and promote consistent case definitions of malaria indicators across different health facilities. Moreover, implementation of complex software such as DHIS2 will require substantial resources in training, deployment, troubleshooting and supportive supervision.

The successful launch of regional malaria data review workshops has demonstrated that regional and district data managers appreciate the attention and the opportunity to present and discuss malaria data. This kind of workshop provides an excellent forum to encourage data mangers to follow good data management practices and for sharing experiences. Data manager knowledge gaps needs to be assessed more systematically and training opportunities provided.

The national Malaria M&E committee has become moribund after a promising start in early 2011, and needs to be periodically reconvened so as to provide strategic guidance on strengthening the reporting and use of malaria related routine systems data. The committee could play a useful role in advocacy at the MOH and GHS levels for consistent supply of data key reporting tools (Consulting Room Register, Inpatient Register and OPD Register), which in recent years have been sorely neglected.

Malaria sentinel surveillance activity in Ghana was stopped in 2011 after an evaluation. However, the need for high-quality facility-based longitudinal malaria data remains and the NMCP has expressed keen interest in developing a new system, preferably using a simpler and more robust methodology. Based on experiences from other countries and domestically, Ghana may propose new models for malaria surveillance. For example, selecting high-performing sites that are easily accessible or using temporary staff augmentation at a facility to obtain high-quality laboratory confirmed malaria case numbers may be considered. The AGA/Global Fund is

launching system in IRS districts that may prove promising. It involves testing all fever cases at selected facilities with RDTs one week per month.

Plans and Justification:
PMI support for routine information system strengthening continues to be guided by the findings of a joint PMI-WHO-RBM-GHS mission held in Ghana in 2010 to strengthen the capacity of DHIMS and the system's ability to capture quality malaria data. The mission resulted in a set of recommendations focusing on: (1) improving data quality supervision; (2) improving DHIMS, data use and feedback; and (3) improving facility data quality. A follow-up mission in February 2012 recommended that PMI Ghana should continue to monitor the roll-out of the DHIS2 platform and provide assistance where necessary. Planned activities include:

- Continue to second a qualified, energetic M&E team leader at the NMCP (posted in June 2011). Direct costs are approximately $30,000 per year.
- In close collaboration with GHS/NMCP, provide training and supportive supervision to at least 100 data managers at the national level, who are based in all 10 regions, the 40 new districts, and in additional target districts as feasible.
- Support implementation of DHIS2 software through training, deployment, troubleshooting and supportive supervision. Support the NMCP to extract and disseminate the data as periodic malaria bulletins.
- Work with GHS/NCP to address bottlenecks to increased confirmatory testing rates. For example, consider establishing protocols for use of RDTs on all fever cases during patient registration.

PMI will monitor the quality of malaria data collected through DHIS2 to ensure that the needs of NMCP are met; work with NMCP to resolve problems in a timely manner as they are identified; monitor whether DHIMS data are being used by the NMCP and provide necessary training to ensure that data are fully utilized; and investigate whether DHIS2 can be used for reporting data from community health workers. PMI Ghana will continue to provide training and supervision to appropriate staff at health facilities to ensure that the data capture and reporting are done accurately.

Proposed Activities with FY 2013 funding: ($369,000)

1. Strengthen routine M&E systems: ($300,000)
   Provide continued support for GHS/NMCP to strengthen routine systems for malaria M&E, including training and supportive supervision of district and regional staff on data collection, analysis and reporting; and limited computer hardware and software to fill gaps. Support strengthening of the quality of malaria data, including scaled-up dissemination of revised patients registers and implementation of a robust module in the DHIMS2. The target is for routine system to become reliable enough by 2013-14 to obviate the need for the NMCP to

conduct parallel data collection. By that time, regular malaria bulletins, using standardized indicators, will be produced and circulated to managers at all levels. The NMCP will be supported to increasing analyze and utilize data from routine systems to target malaria control programs, instead of having to rely on national surveys.

2. Nationwide insecticide resistance monitoring (under MaVCOC): ($45,000)
   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.

3. Technical assistance: ($24,000)
   Support for technical assistance from CDC. Technical assistance will include working with the NMCP to guide planning and implementation of a malaria surveillance systems, continued support for the implementation and evaluation of the DHIS2 at all levels of the system, and support for IRS epidemiologic monitoring.

STAFFING AND ADMINISTRATION

Two health professionals serve as Resident Advisors to oversee PMI in Ghana, one representing CDC and one representing USAID. In addition, one USAID Foreign Service National (FSN) malaria program specialist and one USAID FSN malaria program management assistant work as part of the PMI team. All PMI team members in Ghana are part of a single inter-agency 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, management of collaborating agencies, and supervision of 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 all 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 PMI, including project design, implementing malaria prevention and treatment activities, M&E of outcomes and impact, and reporting results. Both resident advisors and other PMI staff members report to the USAID Mission Director's designee, the USAID Health Population and Nutrition Team Leader. The CDC staff person is supervised by CDC, both technically and administratively. The USAID advisor supervises the PMI FSN staff. All technical activities are undertaken in close coordination with the MOH, the NMCP and other national and international partners, including the WHO, UNICEF, the Global Fund, World Bank, and the private sector.

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 must be approved by the USAID Mission Director and Controller.

Table 1: FY 2013 Budget by Mechanism				
Partner	**Geographical Area**	**Budget ($)**	**% of Total**	**Activity**
DELIVER	**National**	**12,650,000**	**48%**	Procure LLINs for routine distribution and mass campaigns; procure antimalarial medications and laboratory equipment; strengthen logistics and supply chain systems
IRS IQC TO4	**Northern Region**	**4,600,000**	**18%**	Provide TA, procure pesticides, conduct spraying operations in support of IRS implementation.
Malaria Bilateral RFP	**National**	**2,500,000**	**10%**	Strengthen malaria diagnosis, treatment and MIP, and support the national M&E strategy; strengthen NGO capacity and support NMCP management and supervision
BCC Bilateral	**National**	**1,000,000**	**4%**	Support malaria BCC activities for all programs focused on vulnerable groups
Integrated Health Bilateral	**Central, Western and Greater Accra**	**300,000**	**1%**	Provide TA to improve systems and facilities; improve planning and logistic management; improve CM and support M&E,
NetWORKS	**National**	**1,600,000**	**6%**	Support ITN distributions and promotion
TBD	**National**	**465,000**	**2%**	Pre-service training for nurses, midwives, medical assistants
GHS Clinical Labs Unit	**National**	**300,000**	**1%**	Support implementation of the malaria laboratory policy, OTSS
Peace Corps	**National**	**20,000**	**1%**	Activities related to PMI-Peace Corps initiative volunteers
USP	**National**	**200,000**	**1%**	Strengthen drug quality monitoring
NHIA	**National**	**325,000**	**1%**	Strengthen systems for enforcing compliance with GHS malaria case management guidelines
Other GOG entities	**National**	**45,000**	**1%**	Noguchi $170,000 for entomological monitoring, Noguchi $150,000 for drug efficacy monitoring
CDC	**National**	**145,000**	**1%**	Provide TA for ento monitoring, for CM including laboratory diagnosis; and for malaria M&E ($70,000). Support malaria track in the FELTP program at Univ. Ghana ($75,000).

TBD	**National**	**600,000**		Improve malaria case management in LCS (400,000). Support NHIA clinical audits to strengthen malaria case management ($325,000)
Admin		**1,350,000**	**5%**	
Total		**26,100,000**	**100%**	

Table 2: FY 2013 Budget by technical area				
ITNs				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Procure and transport LLINs	DELIVER	5,500,000	National	Procure a minimum of 1,100,000 LLINs at $5 per LLIN (estimated 30% of national need) to replace expired LLINs and to maintain LLIN universal coverage. Budget includes transportation of LLINs to distribution points.
TA for LLIN distribution and supply chain	DELIVER	300,000	National	Technical assistance to GHS, GES, and other stakeholders to strengthen routine LLIN distribution planning, logistics, supply chain management, training, and end-user distribution systems. Conduct assessments of net distribution as appropriate.
	NetWORKS	1,600,000		
BCC and community mobilization to promote LLIN ownership and use	BCC Bilateral	500,000	National	Support development and implementation of community mobilization and communications activities to promote LLIN ownership and use, including malaria specific BCC and incorporating ITN messages into national health promotion BCC. Employ evidence-based approach to communications. Provide Technical assistance to the NMCP and the National Malaria Communications Committee.
SUBTOTAL ITNs		**7,900,000**		

IRS				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Implement IRS activities, include procurements and TA	IQC TO4	4,570,000	Northern Region/ TBD	In collaboration with GHS, and with continued focus on capacity building, support IRS implementation and programmatic evaluation in targeted Northern Region districts as well as targeted areas in the forest or coastal zones.
TA to support entomological monitoring for IRS	CDC	34,000	Northern Region and National	Technical assistance and quality assurance for entomologic monitoring, including insecticide resistance management. Budget includes 2 entomology visits plus equipment and supplies.
TA for Enhanced Environmental Monitoring and Compliance	GEMS	30,000	Northern/TBD	Enhanced environmental monitoring, environmental assessments, and risk mitigation in IRS districts.
SUBTOTAL IRS		**4,634,000**		
Malaria in Pregnancy				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Strengthen ANC services and in-service training	New Malaria RFP	600,000	National	Support the GHS to improve health worker capacity to effectively deliver a package of malaria prevention and care services to pregnant women. PMI support will focus on supportive supervision, on-site training as needed, quality improvement to increase HCW administration of all three IPTp doses, and support for updating GHS guidance.
	Integrated Health Bilateral	300,000	TBD	

Support pre-service training	TBD	200,000	National	Provide technical pre-service training for nurses, midwives, and medical assistants in prevention of malaria in pregnancy. Expand activities to general nursing schools as applicable.
Support BCC to promote IPTp	BCC Bilateral	200,000	National	Support to development communications materials to improve administration of IPTp by healthcare workers. Support community mobilization and communications materials (print and mass media) to promote IPTp with a particular focus on geographic areas and/or cultural groups with low IPTp rates. Integrate with MCH BCC activities as appropriate.
SUBTOTAL MIP		**1,300,000**		
Case Management – Diagnosis				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Procure RDTs and other lab supplies	DELIVER	2,850,000	National	Procure approximately 4,750,000 RDTs (approximately $0.60/RDT) to meet 40-50% of national RDT need and to procure limited microscopy kits to fill gaps.
Strengthen quality of microscopy and RDT use at Laboratory level	New Malaria RFP	200,000	National	Support continued quality improvements to malaria microscopy at the laboratory level, building upon and scaling up the successful OTSS program. Provide supportive supervision and on-the-job training of laboratory personnel, complemented by refresher training for lab supervisors, with an emphasis increasingly transferring management responsibility to the GHS Clinical Laboratory Unit.
	GHS Clinical Laboratories Unit	300,000		

Scale-Up RDT use in Clinical Settings	New Malaria RFP	900,000	National	Collaborate with GHS/NMCP to achieve high rates of parasitological testing, with focus on scaling up RDT use in clinical settings. Identify and remove operational, financial and policy barriers to increased RDT use. Support capacity building to ensure consistent availability and use of RDTs at public health facilities, esp. CHPS. Support the roll-out of RDTs to community based agents, LCS and pharmacies.
TA for diagnostics	CDC	12,000	National	Provide TA for microscopy QA and to realize full potential of RTDs at all levels
SUBTOTAL CM - Diagnosis		**4,262,000**		
Case Management – Treatment				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Procure malaria medication	DELIVER	3,450,000	National	Procure ACTs in quantities sufficient to cover pediatric ACT requirements. Procure adult ACT formulations, rectal artesunate, severe malaria drugs, and SP for IPTp as necessary to fill gaps and prevent stockouts.
Support pre-service training	TBD (nursing)	265,000	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 revision of school curricula. Develop training for managing cases with negative malaria test results.

	New Malaria RFP	100,000	National	Support pre-service 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. Fill gaps in other pre-service training as appropriate.
TA to Improve Malaria Case Management at Health Facilities	New Malaria RFP	1,100,000	National	Collaborate with GHS to improve compliance with national guidelines for management of uncomplicated and severe malaria in health facilities. Provide technical assistance and financial support for supportive supervision, on-the job and class room training, and quality improvement among health care workers, with an emphasis on CHPS staff. Promote provider adherence to test results.
Support Licenced Chemical Sellers	TBD	400,000	National	Support activities to build LCS capacity for and compliance with GHS malaria diagnosis, treatment and referral guidelines. Address issues related to for-profit, business motivations to comply with GHS guidelines. Support LCS to achieve NHIA accreditation, with emphasis on geographic areas with gaps in NHIS coverage.
Support BCC to improve malaria-related care/treatment seeking behavior	BCC Bilateral	300,000	National	Support community mobilization and communications to increase prompt and appropriate care seeking behavior for malaria symptoms. Activities should promote clinic attendance at first sign of fever, particularly for children under five years old and pregnant women, and promote correct and complete use of ACTs. Integrate activities with MCH activities as appropriate and provide TA to the NMCP and NMCC.

Support to clinical audits to align financial incentives with appropriate treatment	NHIA	325,000	National	Support NHIA to implement clinical audits to confirm clinical compliance with GHS malaria diagnosis and case management guidelines. NHIA emphasis on confirmatory testing to accompany majority of malaria treatment reimbursements.
SUBTOTAL CM - Treatment		**5,940,000**		
Case Management - Pharmaceutical Management				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Strengthen logistics and supply chain systems	DELIVER	550,000	National	Provide TA for strengthening logistics/supply chain to improve availability of malaria commodities including SP, RDTs, and other commodities. Activities will focus on addressing bottlenecks in finance, management, forecasting, transportation and reporting systems. Support end use verification activities. Implement Supply Chain Master Plan to reform health commodity procurement and supply.
Strengthen drug quality monitoring capacity	USP	200,000	National	Support the strengthening of drug quality monitoring in collaboration with the FDB. Activities to include the expansion of sampling sites and increased enforcement of capacity to raise awareness regarding counterfeiting and substandard medicines.
SUBTOTAL CM - Pharm Mgm't		**750,000**		

Case Management Subtotal		**10,952,000**		
Capacity Building and Health System Strengthening				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Build management capacity at NMCP, GHS and other GoG partners	New Malaria RFP	100,000	National	Continue to provide support to the NMCP, GHS, and GOG for technical capacity building and improved malaria control systems. Support limited IT investments to enhance malaria program management.
Long term Training – Field Epidemiology and Laboratory Training Program	CDC	75,000	National	Continue to support long term training of two individuals from GHS/NMCP in epidemiology, surveillance, monitoring and evaluation. To be implemented as a "malaria track" imbedded in FELTP program at the U. Ghana.
Support Supervisory Visits	New Malaria RFP	100,000	National	Provide support for supervisory visits and monitoring activities at regional and district level by public health officials, including NMCP and MOH/GHS staff, in support of NMCP efforts to strengthen overall malaria program management and supervision efforts.
Assure mass access to appropriate malaria treatment through National Health Insurance	TBD (PMI Project)	200,000	National	Provide TA to assure mass access to appropriate malaria treatment through NHIA program. Promote active enrollment in NHIA and access to NHIA-accredited facilities among the general population, with a focus on high burden rural areas.

SUBTOTAL - Capacity / HSS		**475,000**		
Communication and Coordination with other Partners				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Integration with other USG programs	Peace Corps	20,000	National	Build on previous activities to continue Peace Corps activities through "Stomping Out Malaria" program
Subtotal - CC with Partners		**20,000**		
Monitoring and Evaluation				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
Strengthen routine systems for malaria M&E capacity.	New Malaria RFP	300,000	National	Support GHS/NMCP to strengthen routine systems for malaria M&E, including training district and regional staff on data collection, analysis and reporting; and limited computer hardware and software to fill gaps. Support strengthening the quality of malaria data, including dissemination of revised patients registers and implementation of a robust malaria module within DHIS2.
National insecticide resistance surveillance	Noguchi/ PD&L	45,000	National	In collaboration with other partners and research institutions continue to support routine insecticide resistance monitoring at a network of sites.
Technical assistance	CDC	24,000	National	Support for technical assistance from the CDC PMI M&E team
SUBTOTAL – M & E		**369,000**		

Staff and Administration				
Proposed Activity	**Mechanism**	**FY 13**	**Geographical area**	**Description**
In-country staff and administrative expenses	ADMIN	1,350,000		Coordination and management of all in-country PMI activities including staff salaries and benefits
SUBTOTAL In-Country Staff		**1,350,000**		
GRAND TOTAL		**27,000,000**		

Table 3: Budget by Intervention		
Intervention	Budget ($)	Percent of Total
ITNs	7,900,000	29%
IRS	4,634,000	17%
IPTp	1,300,000	5%
CM Diagnostics	4,262,000	16%
CM Treatment	5,940,000	22%
CM Pharmaceutical Management	750,000	3%
Capacity Building & HSS	495,000	2%
M&E	369,000	1%
Staff & Admin	1,350,000	5%
TOTAL	27,000,000	100%