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

PRESIDENT'S MALARIA INITIATIVE

Malaria Operational Plan – FY08

GHANA

Final Version November 02, 2007

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EXECUTIVE SUMMARY

In December 2006, the United States Government announced that Ghana had been selected as one of the final eight countries in a five-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions in high-burden countries in sub-Saharan Africa. The goal of the President's Malaria Initiative (PMI) is to reduce malaria mortality by 50% in vulnerable groups---pregnant women, children under five years of age, and people living with HIV/AIDS. This will be accomplished by achieving 85% coverage of groups at risk of malaria with four key interventions: artemisinin-based combination therapy (ACT), intermittent preventive treatment (IPT) for malaria in pregnancy, insecticide-treated mosquito nets (ITNs), and indoor spraying with residual insecticides (IRS).

Malaria is a major cause of morbidity and mortality in Ghana, directly contributing to poverty, low productivity, and reduced school attendance. Between 3-3.5 million cases of malaria are reported each year, over 900,000 of which are children under five according to the Ministry of Health (MOH). Malaria accounts for more than 61% of under-five hospital admissions, and 8% of admissions of pregnant women. Malaria is responsible for an estimated 22% of under-five mortality, and 9% of maternal deaths in Ghana.

The most up-to-date information on nationwide coverage of key malaria prevention and control measures in Ghana comes from a Multiple Indicator Cluster Survey, conducted from August to early October 2006. Approximately 30% of households reported owning at least one bednet (of any type) while almost 19% reported owning one or more ITN. Approximately 22% of children under five slept under an ITN the night before the survey. Approximately, 67% of pregnant women received at least one dose of IPTp with sulfadoxine-pyrimethamine (SP) with almost 28% having received two or more doses during their most recent pregnancy. Over 23% of children under five were ill with fever during the two weeks before the survey. Of these, 48% had taken an appropriate anti-malarial drug within 24 hours of symptom onset. Of the children with fever, approximately 3.4% were provided anti-malarials containing artemisinin-based combinations.

Ghana is the recipient of a $9 million Round 2 and a $38 million Round 4 malaria grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). Both grants are performing well. Ghana successfully applied for support through the newly established UNITAID initiative to fill anticipated gaps in ACTs, not covered by existing GFATM support, for 2007 through 2009. UNICEF has been a major supporter of ITN distribution and the World Health Organization is a major source of technical assistance to the National Malaria Control Program (NMCP). Excellent opportunities also exist for partnerships in malaria control efforts with large mining companies, such as AngloGold Ashanti.

The PMI 3-Year Strategy and Year 1 Implementation Plan for Ghana were based on an assessment visit carried out in January-February 2007 by representatives from USAID, the Centers for Disease Control and Prevention, the Rational Pharmaceutical Management Plus Project of Management Sciences for Health, the Ghanaian NMCP, and the World Health Organization. This was followed by a planning visit in May 2007, which brought together all national and international partners involved in malaria control activities in Ghana to finalize a detailed Year 1 implementation plan.

The PMI will support existing NMCP strategies and plans and will coordinate with international and national partners to complement their funding and efforts. To achieve the goal and targets of the NMCP and PMI in Ghana, the following major activities will be supported through the Initiative:

Insecticide-treated nets (ITNs): The NMCP promotes the use of ITNs, especially long-lasting ITNs (LLINs), as a key component of malaria prevention in Ghana. During Year 1, together with partners, PMI will support a comprehensive strategy to increase household ownership and use of ITNs, especially among vulnerable populations. PMI will support expansion of the ITN voucher program to include five regions and children under five in addition to pregnant women, and will support reduction of the co-payment in order to standardize the subsidy across programs and promote high redemption rates. PMI will support the MOH direct subsidized sales of LLINs through antenatal clinics and expansion to child health clinics to include children under five. PMI will also support logistics for the November 2007 national integrated child health/ITN campaign including a post-campaign evaluation. PMI will support small-scale community-based net retreatment programs targeted to geographic areas with documented high conventional net ownership. Because net ownership does not necessarily translate into net usage, the PMI will also invest in information, education, and communication (IEC) and behavior change communication (BCC) activities at the health facility and community level to ensure that residents understand the value of ITNs and their correct care and use. During Year 1, more than 1 million LLINs will be distributed nationwide to vulnerable populations as a result of PMI efforts.

Indoor residual spraying (IRS): Building on the existing entomological capacity at the Noguchi Memorial Institute for Medical Research and the IRS implementation experience of the AngloGold-Ashanti Mining Company during Year 1, PMI will strengthen capabilities in Ghana for vector control by initially supporting spraying of 100,000 households and protecting more than 500,000 residents. In addition, PMI will support development of a detailed IRS monitoring and evaluation plan, including both epidemiological and entomological variables, which will provide the NMCP with data for operational planning of vector control measures.

Case management: Currently, fewer than 14% of all malaria diagnoses in Ghanaian health facilities are based on laboratory examination and the quality of those diagnoses is unknown. PMI efforts will be directed towards improving malaria laboratory diagnostic capabilities through support of a baseline laboratory assessment, procurement of laboratory equipment and supplies, training and quality control of malaria microscopists and introduction of rapid diagnostic tests (RDTs) following development of a strategy and plan for the use of microscopy and RDTs at different levels of the health system. Ensuring prompt, effective, and safe treatment with an artemisinin-based combination therapy (ACT) to $\geq$85% of patients with confirmed or suspected malaria will represent a major challenge in Ghana. Therefore, strengthening of the MOH antimalarial drug management system and promoting safe and effective use of ACTs in government health facilities through pre- and in-service training as well as supporting home based management of malaria with ACTs will be a priority in Year 1. PMI will support the procurement of second-line ACTs and drugs to treat severe malaria, and will also support IEC/BCC activities at the health facility and community level to ensure that Ghanaians take prompt action and receive effective treatment for malaria.

Malaria in pregnancy (MIP): In 2004, the NMCP adopted IPTp with sulfadoxine-pyrimethamine (SP) and with GFATM support has demonstrated significant progress. GFATM Round 4 supported districts in a 2006 facility survey reported 70% of women received at least two doses of SP during pregnancy. During Year 1, PMI will support pre- and in-service training and supportive supervision of health care workers in IPTp and the diagnosis and management of malaria in pregnancy, as well as development and dissemination of IEC/BCC messages to improve mothers' awareness of the risks of malaria during pregnancy, promote the use of IPTp beginning early in the second trimester of pregnancy, and stress the importance of completing the recommended three doses of SP. According to the NMCP, sufficient SP will be procured through the GFATM to meet all needs during the next 12 months. With the efforts of PMI and other partners, IPTp will be fully implemented in all MOH antenatal care services nationwide, which is expected to increase coverage of pregnant women using IPTp to 85%.

Intermittent preventive treatment of infants (IPTi): IPTi with SP is already being used at several sites in Ghana as part of a series of studies funded by a Gates Foundation consortium to evaluate the efficacy of this approach. It is expected that WHO may approve IPTi later this year or early in 2008 for highly endemic areas. To ensure that this first-hand in-country experience is not lost, PMI will support these sites until the final WHO recommendation on IPTi is published, and will then assist the MOH with national policy development and early expansion of IPTi.

Building NMCP capacity: To achieve PMI targets for coverage of ACTs, ITNs, IPT, and IRS, PMI will work directly and with other partners to strengthen the capacity of the NMCP at the regional and district level to plan, conduct, supervise, monitor, and evaluate malaria prevention and control activities. Efforts will also be directed at strengthening coordination and communication among the NMCP and partners.

NGO collaboration: In order to extend the reach of malaria interventions to the community level, PMI will strengthen and improve the capacity of indigenous NGOs and FBOs, and of NGO and FBO networks, to undertake malaria prevention and control activities under the leadership of the NMCP.

The PMI includes a strong monitoring and evaluation component to measure progress against the project goal and targets and to identify and correct problems in program implementation. The PMI monitoring and evaluation plan will be coordinated with the NMCP, the GFATM, and other partners to share resources and standardize data collection and reporting.

The FY 2008 proposed PMI budget for Ghana is $17 million. Of this amount, 33% will support procurement and distribution of ITNs, 29% improved case management, and 14% IRS. The NMCP has sufficient funding from the GFATM to support malaria in pregnancy activities, with just 4% of PMI resources dedicated to strengthen capacity in this area. Forty percent of the PMI budget will be spent on commodities, primarily LLINs, as the NMCP has sufficient funds from GFATM and UNITAID grants for the procurement of ACTs and SP to meet the public sector needs through 2009.

To launch the PMI in Ghana, the following high-visibility, high-impact activities are planned:

1. Implementation of a community-based insecticide re-treatment program targeting at least 275,000 bednets belonging to pregnant women and children under five. The program

will be implemented in collaboration with the NMCP and the GFATM supported Coalition of Malaria NGOs and FBOs, and will take place in the first quarter of calendar year 2008; and

2. Implementation of national integrated child health / free LLIN distribution campaign targeted at children under five that will take place in late November 2007. PMI is actively engaged in campaign planning along with other key partners including the NMCP, UNICEF, WHO, and the World Bank, and will contribute resources to support campaign logistics, including net distribution, secure storage, BCC/IEC, follow-up, and a post campaign evaluation.

ACRONYMS AND ABBREVIATIONS

ACT	Artemisinin-based combination therapy
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
ARV/ART	Anti-retroviral/anti-retroviral therapy
BCC	Behavior change communication
CCM	Country Coordinating Mechanism
CDC	Centers for Disease Control and Prevention
CHIM	Center for Health Information Management
CHPS	Community-based Health Planning Services
CHPS-TA	CHPS –Technical Assistance Project
CRS	Catholic Relief Services
DDT	Dichloro-diphenyl-trichloroethane
DFID	Department for International Development, UK
DHS	Demographic and Health Survey
DMIS	District Management Information System
DSS	Demographic surveillance site
FANC	Focused antenatal care
FBO	Faith-based organization
FDB	Food and Drugs Board
GAC	Ghana AIDS Commission
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHS	Ghana Health Service
GSCP	Ghana Sustainable Change Project
HMIS	Health Management Information System
IEC	Information, education and communication
IMCI	Integrated Management of Childhood Illnesses
IPTi	Intermittent preventive treatment of infants
IPTp	Intermittent preventive treatment of pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated net
JHIEPGO	Johns Hopkins Program for International Education in Gynecology and Obstetrics
LLIN	Long-lasting insecticide-treated bed net
M&E	Monitoring and Evaluation
MICS	Multiple Indicator Cluster Survey
MIP	Malaria in pregnancy
MOH	Ministry of Health
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NMIMR	Noguchi Memorial Institute of Medical Research
PLWHA	People living with HIV/AIDS
PMI	President’s Malaria Initiative
QHP	Quality Health Partners Project
RBM	Roll Back Malaria
RCH	Reproductive and Child Health Unit
RDT	Rapid diagnostic test

RTI	Research Triangle Institute
S/P	Sulfadoxine-pyrimethamine
SPS	Strengthening Pharmaceutical Systems
USG	U.S. Government
USP	United States Pharmacopeia
UNICEF	United Nations Childrens' Fund
USAID	United States Agency for International Development
WHO	World Health Organization

DESCRIPTION OF THE PRESIDENT'S MALARIA INITIATIVE

In late June 2005, the United States Government (USG) announced a new five-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions in high-burden countries in sub-Saharan Africa. The goal of this Initiative is to reduce malaria-related mortality by 50% after three years of full implementation in each country. This will be achieved by reaching 85% coverage of the most vulnerable groups – children under five years of age, pregnant women, and people living with HIV/AIDS – with proven preventive and therapeutic interventions, including artemisinin-based combination therapies (ACTs), insecticide-treated bed nets (ITNs), intermittent preventive treatment of pregnant women (IPTp), and indoor residual spraying (IRS).

The President's Malaria Initiative (PMI) began in three countries in 2006: Angola, Tanzania, and Uganda. In 2007, four countries were added: Malawi, Mozambique, Senegal, and Rwanda. In 2008, eight additional countries will be added to reach a total of 15 countries covered under the PMI. Ghana is one of the eight countries added in 2008. Total PMI funding began with $30 million in Fiscal Year (FY) 06 for the initial three countries, and will increase to $135 million in FY 07, $300 million in FY 08, and reach $500 million in FY 10 in 15 countries by 2010.

In implementing the PMI, the U.S. Government is committed to working closely with host governments and within existing national malaria control plans. Efforts will be coordinated with other national and international partners, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM), Roll Back Malaria (RBM), the World Bank Malaria Booster Program, and the non-governmental and private sectors, to ensure that investments are complementary and that RBM and Millennium Development goals are achieved. Country Assessment and Planning visits for the PMI, as well as subsequent evaluations, will be highly consultative and held in collaboration with the National Malaria Control Program (NMCP) and other partners.

This document presents a three-year strategy and a detailed one-year implementation plan for the first year of the PMI in Ghana. This detailed plan briefly reviews the current status of malaria control and prevention policies and interventions, identifies challenges and unmet needs if the goals of the PMI are to be achieved, and provides a description of planned Year One activities under the PMI. The document was developed in close consultation with the National Malaria Control Program and with participation of many national and international partners involved in malaria prevention and control in the country. The total amount of PMI funding requested for Ghana is $17 million for FY 2008.

COUNTRY BACKGROUND

Ghana has a population of approximately 23 million, 46% of which is below the age of fifteen. In 2005, the total expenditure on health represented 12% of the GDP and has been steadily rising in the last decade (UNDP, 2005). Ghana's key development trends are generally positive: the poverty incidence is 35%, down from 52% in 1992; life expectancy increased to 57 years; HIV/AIDS overall adult prevalence remains under 3%; and the national primary school enrollment level is nearly 80%. Yet, the nation still faces major development challenges. Ghana ranked 138 out of 177 countries on the 2005 United Nation's Human Development Index, which measures life expectancy, adult literacy, and per capita income. It is worrisome that the infant

mortality rate (64/1000) and the under 5 mortality rate (111/1000) appear to have stalled at high levels following decades of improvement (DHS 2003). While the total fertility rate dropped to 4.4 children per woman from 6.9 in 1970-1975, women continue to have more children than they desire, primarily due to lack of access to contraceptive services and commodities. With a population growth rate of 2.7% per annum, Ghana's current population is expected to double in 26 years, placing enormous pressure on the economy and the environment, and swelling urban centers. Furthermore, one in nine children die before the age of five, with malaria being the number one child killer, and the HIV seroprevalence seems to be rising in some of the most-at-risk populations.

Fig. 1 MAP OF GHANA

Ghana is just over 92,000 square miles (238,500 square kilometers) in area and most of the country falls between 5 and 11 degrees north latitude. It is bordered on the northwest and north

by Burkina Faso, on the east by Togo, on the south by the Atlantic Ocean, and on the west by Côte d'Ivoire. The capital city is Accra (greater metropolitan population 3-4 million). Administratively, the country is divided into 10 regions (see map above), and 138 districts.

In the undulating savannas of the north, a prolonged dry season occurs from September - November to March-April, with a rainy season that peaks in August. The mean annual rainfall is 45 to 50 inches. The north is drained by tributaries of the Volta river, which form the world's largest manmade lake behind the Akosombo Dam. The southern part of the country is mostly forested, and is traversed by ranges of low hills (max altitude 2,800 feet), with rainfall ranging 50 to 86 inches. There are two rainy seasons (April-June and September-November) and two relatively dry periods that occur during the harmattan season (December-February) and in August. The Accra Plains are unusually dry for the coast, with a climate resembling that of the north. Temperatures vary relatively little throughout the country, with a mean annual temperature from 78° to 84° F (26° to 29° C). Average relative humidities ranges from nearly 100 percent in the south to 65 percent in the north; during the harmattan season the drier areas can fall as low as 12 percent.

GOVERNMENT HEALTH SYSTEM

At the national level the government health system includes the Ministry of Health (MOH) and the Ghana Health Services. The former is responsible for national health policy formulation and overall public health sector coordination, while the latter, in collaboration with the teaching hospitals and the government-supported mission hospitals, is responsible for service delivery.

The Ghana Health Service is organized into a four-tiered system, with national, regional, district and subdistrict levels. As a result of decentralization and health sector reform, services are integrated as one goes down the hierarchy of health structure from the national to the subdistrict. The distribution of health personnel is skewed towards the cities and larger towns. Despite the increased health expenditure, funding for programs remains insufficient. Faith-based institutions participate greatly in the provision of health services outside the major cities. They provide an estimated 35% of health services in Ghana.

At the regional level, curative services are delivered at the regional hospitals under the leadership of the regional director of health services. Responsibility for implementation of public health activities and programs rests with the deputy regional director for public health. At the regional level the regional hospital serves as the point of referral for district hospitals as well as serving as a primary health care delivery service for the surrounding population.

At the district level, curative services are provided by district hospitals. Public health services are delivered by the district health management team led by the district director of health services. The district hospital also has a public health unit. The district health administration provides supervision and management support to the subdistricts.

At the subdistrict level, both preventive and curative services are provided by health centers, including outreach services to the communities within their catchment areas. Basic preventive and curative services for minor ailments are addressed at the community and household level. The reach of the government services at the community level is variable, though weak overall. The government's innovative Community-based Health Planning and Services (CHPS) strategy,

which uses community-based nurses and community volunteers to deliver basic health care and prevention services at the community level, covers less than 10% of the population, but is expanding slowly.

At the national level the Ghana Health Service is composed of six main divisions, one of which is the Public Health Division. The Public Health Division is composed of five units, one of which is the Disease Control Unit where the National Malaria Control Program (NMCP) and other disease programs are located. The NMCP is responsible for technical leadership for malaria control and implementation.

SWAp in Ghana

Since 1996, Ghana's Health Sector has organized its donor relationships through a Sector-Wide Approach (SWAp) that consists of joint planning and management by all stakeholders as well as common funding arrangements. Five-year and annual planning and assessment exercises involve all major stakeholders, the costs of which are shared among donor partners. Donor partners finance the health sector through three funding mechanisms: budget support through the Ministry of Finance, sector support through a MOH basket funding mechanism, and direct or project support. The USG is involved in the joint management and planning of health sector activities and provides direct project-based support, but does not contribute directly to basket funding.

National Health Insurance

The Government of Ghana is committed to improving equity and access to essential health care and ensuring that the health sector plays a key role in the Ghana Poverty Reduction Strategy (2002). The strategic objectives of the Ghana Health Sector five-year program of work (2007-2011) include increased geographical and financial access to basic health services, better quality of care, and sustainable financial arrangements that protect the deprived and vulnerable. To this end, the Government of Ghana in 2003 passed the National Health Insurance Law (Act 650, 2003) that instituted a National Health Insurance Scheme to secure the provision of basic healthcare services to persons resident in the country through mutual and private health insurance schemes. The National Health Insurance Program design is based on the principles of equity, risk equalization, cross-subsidization, solidarity, quality care, efficiency in premium collection, community/subscriber ownership, partnership, reinsurance and sustainability (MOH, August 2004). Financing is achieved primarily through a national levy that is collected along with the value added tax.

Health financing is of high priority on the socioeconomic agenda in Ghana. The National Health Insurance Act mandates health insurance for every district with the objective of covering every resident of Ghana within the next five years. Statistics available at the National Health Insurance Commission as of December 2006 show approximately 137 District Mutual Health Insurance Schemes have been established in the 138 districts in Ghana. These district schemes are at various stages of implementation. Thirty-four percent of the population (6.8 million people) is presently enrolled, which is considered a tremendous achievement. However, only 26.5% (5.4 million people) hold membership cards and thus are able to access services. Many challenges to scaling up the National Health Insurance Program exist, including the timely issuance of identity cards to those enrolled and the sustainability of financing the extensive package of services covered, with most enrolled individuals being children under 18 and thus exempt from any co-payments.

THE GLOBAL FUND TO FIGHT AIDS, TUBERCULOSIS & MALARIA

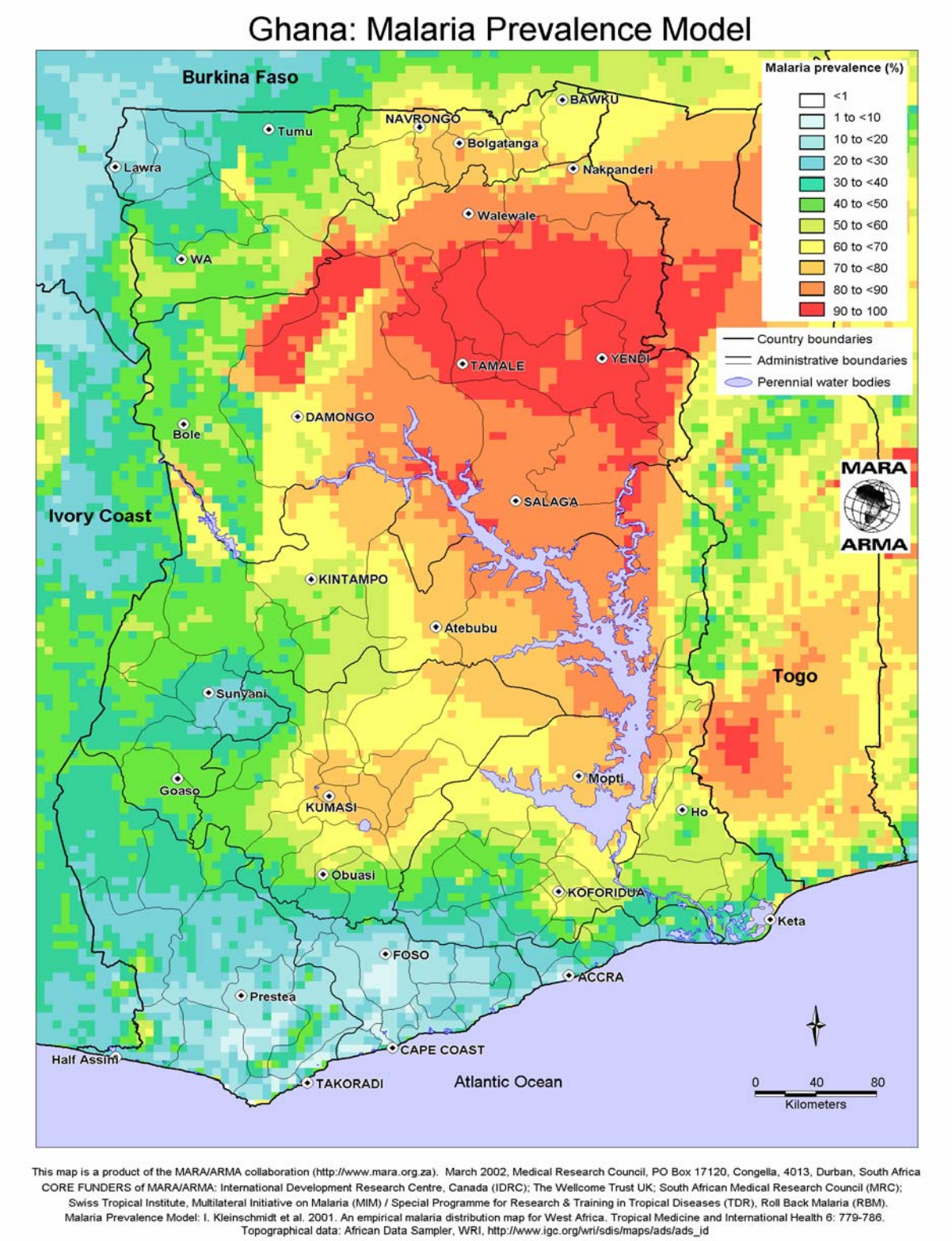
Ghana was a recipient of a $9 million Round 2 and a $38 million Round 4 malaria grant from the GFATM for malaria control activities. Implementation activities for these rounds are still on going. Another malaria proposal with an emphasis on piloting IRS activities was recently submitted to the GFATM for Round 7. The Country Coordinating Mechanisms and the MOH received support from the Roll Back Malaria Partnership for a consultant who provided technical assistance with the Round 7 malaria proposal development.

Ghana has received a Grade "A" evaluation on both grants, achieving or surpassing all targets. The Round 2 grant mainly focused on IPTp, ITNs, monitoring of antimalarial drug efficacy and monitoring and evaluation in 20 pilot districts. The Round 4 grant is focusing on scaling up Round 2 activities to all 138 districts and added implementation of the new malaria treatment policy nationwide. In 2006, Ghana was requested by the GFATM secretariat to apply for support through the newly established UNITAID initiative to fill anticipated remaining gaps in ACTs, not covered by existing GFATM support, for 2007 through 2009. The application has been approved, and will provide a total of 1.835 million treatments, split between adult, child and infant treatment packets covering public sector needs through 2009. UNICEF will be responsible for procurement actions for the UNITAID initiative, and logistics support will be provided by the government with overall implementation monitored through the GFATM itself.

MALARIA SITUATION IN GHANA

Malaria is a major cause of morbidity and mortality in Ghana, directly contributing to poverty, low productivity, and reduced school attendance. According to the MOH, between 3-3.5 million cases of malaria are reported each year, over 900,000 of which are children under five. Malaria is reported to account for 61% of under-five hospital admissions and 8% of admissions of pregnant women. However, the malaria statistics captured by health facility data are well recognized to greatly underreport the extent of malaria morbidity and mortality. Given that the under five mortality rate of 111/1000 is well documented, and assuming that malaria is responsible for an estimated 22% of under-five mortality and 9% of maternal deaths in Ghana (WHO 2005), one can conservatively estimate that 20,000 children under five die from malaria in Ghana each year.

Although malaria is hyperendemic in Ghana with year-round transmission, in the northern part of the country, which has a prolonged dry season from September to April, there is a perceptible seasonal variation. The crude parasite rates range from 10-70%, with *Plasmodium falciparum* accounting for about 90-98% of all infections, *P. malariae* for 2-9%, and *P. ovale* for 1%.



This map is a product of the MARA/ARMA collaboration (http://www.mara.org.za). March 2002, Medical Research Council, PO Box 17120, Congella, 4013, Durban, South Africa
CORE FUNDERS of MARA/ARMA: International Development Research Centre, Canada (IDRC); The Wellcome Trust UK; South African Medical Research Council (MRC);
Swiss Tropical Institute, Multilateral Initiative on Malaria (MIM) / Special Programme for Research & Training in Tropical Diseases (TDR), Roll Back Malaria (RBM).
Malaria Prevalence Model: I. Kleinschmidt et al. 2001. An empirical malaria distribution map for West Africa. Tropical Medicine and International Health 6: 779-786.
Topographical data: African Data Sampler, WRI, http://www.igc.org/wri/sdis/maps/ads/ads_id

The country can be stratified into three malaria epidemiologic zones: the northern savanna; the tropical rainforest; and the coastal savanna and mangrove swamps. The major vectors are *Anopheles gambiae* and *An. funestus*. Characteristically, these species are highly anthropophilic,

bite late in the night, are indoor resting and are commonly found in the rural and peri-urban areas where socio-economic activities lead to the creation of breeding sites. *Anopheles melas* is found in the mangrove swamps of the southwest and *An. arabiensis* in savanna areas of northern Ghana.

NATIONAL MALARIA CONTROL PLAN AND STRATEGY

The goal of the NMCP in Ghana is to reduce morbidity and mortality due to malaria in the general population by 50% by 2010. The Program has placed special emphasis on vulnerable groups especially pregnant women and children under five. Ghana adapted the WHO/Roll Back Malaria (RBM) initiative in 2000, and is implementing a malaria control strategy that involves multi- and inter-sectoral partnerships working under a single national plan. The MOH through the NMCP and its partners are in the process of completing a new RBM Strategic Plan for Ghana (2007 – 2011) which is expected to be finalized by the end of 2007. This plan will build on the first RBM strategic plan launched in 2000 and will set revised targets for coverage with the major malaria control interventions: ITNs, IPTp, and ACTs, and (for the first time) for vector control activities such as indoor residual spraying (IRS), a new area of focus.

CURRENT STATUS OF MALARIA INDICATORS

The Ghana NMCP's Annual Report 2005 compares selected RBM indicators collected through the 2005 Global Fund survey, and estimates generated through the NMCP database, with data from the 2003 DHS. Based on these data, the MOH noted improvements in case management and the use of ITNs and IPTp with sulfadoxine-pyrimethamine (SP). The 2003 Demographic and Health Survey (DHS), carried out from late July to late October 2003 (the end of high transmission season for malaria), showed generally low national coverage rates for most malaria interventions, but it should be noted that considerable scale up of interventions has occurred during the three plus years following the survey, with a significant expansion in the last 18 months and thus current coverage rates are undoubtedly higher. In addition, UNICEF conducted a Multiple Indicator Cluster Survey (MICS) from August to October 2006. According to the 2006 MICS, 67% of pregnant women took an antimalarial drug to prevent malaria during their most recent pregnancy, with 28% having taken SP two or more times. SP was introduced as the standard in 2004. About 30% of households possessed at least one mosquito net (any type of net, treated and untreated), with greater ownership in rural compared to urban areas (37% vs. 21%, respectively) and among the poorer as opposed to the richer quintiles (41% lowest and 24% highest quintile). Overall, 19% of households owned at least one ITN, a significant increase from only 3% in the 2003 DHS. About 33% of children under five slept under a bednet the night before the survey, with 22% under an ITN. Over 23% of children under five were ill with fever during the two weeks before the survey. Of these, 48 % had taken an appropriate antimalarial drug within 24 hours of symptom onset. Of the children with fever, approximately 3.4% were provided antimalarials containing artemisinin-based combinations. ACTs were introduced in Ghana in 2004.

Recent Estimates of Malaria Indicators: 2003 Ghana DHS; 2006 Ghana MICS		
Indicator	**2003 DHS**	**2006 MICS (preliminary)**
Proportion of households with at least one ITN	3%	18.7%
Proportion of children under five years old who slept under an ITN the previous night	3.5%	21.8%
Proportion of pregnant women who slept under an ITN the previous night	2.7%	TBD%
Proportion of targeted houses adequately sprayed with a residual insecticide in the last 12 months	NA	NA
Proportion of women who received two or more doses of IPTp during their last pregnancy in the last two years	0.8%††	27.5%
Proportion of children under five years old with fever in the last two weeks who received treatment with an antimalarial according to national policy within 24 hours of onset of fever	44.2%	48.2%
Proportion of children under five years old with fever in the last two weeks who received treatment with ACTs	N/A††	3.4%

††ACTs were adopted in 2004; SP was adopted for IPT in 2004

GOAL AND TARGETS OF THE PRESIDENT'S MALARIA INITIATIVE

The goal of PMI is to reduce malaria-associated mortality by 50% compared to pre-Initiative levels in PMI countries. By the end of 2010, PMI will assist Ghana to achieve the following targets in populations at risk for malaria:

- More than 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;
- 85% of government health facilities will have ACTs available for treatment of uncomplicated malaria; and
- 85% of children under five with suspected malaria will have received treatment with ACTs within 24 hours of onset of their symptoms.

Final baseline coverage figures for the PMI will come from the 2008 DHS data, with data from the 2006 MICS survey providing a preliminary baseline.

EXPECTED RESULTS – YEAR ONE

Prevention:

- More than 1 million LLINs will have been distributed nationwide to vulnerable populations (by PMI and other partners);
- More than 368,000 pregnant women will receive two or more doses of IPTp with SP;
- Approximately 100,000 households targeted for IRS will have been sprayed, protecting more than 500,000 residents;

Treatment:

- Approximately 1,208,000 ACT doses will be available to treat at least 345,000 children under five for 3 episodes of fever;
- Approximately 14,700,000 ACT doses will be available to treat older children and adults diagnosed with malaria;

Other:

- Rapid assessment of malaria laboratory diagnostic capacity and infrastructure will have been completed;
- National policy on malaria diagnosis including a strategy on the use of malaria microscopy and rapid diagnostic tests in different malaria epidemiologic and health care settings will have been developed;
- Unified, comprehensive national malaria M&E plan developed.

INTERVENTIONS – VECTOR CONTROL

The 2007 Integrated Malaria Vector Management Policy, developed by the NMCP in coordination with the GFATM, places considerable emphasis on vector control and outlines four primary intervention areas (environmental management, adulticiding using IRS and larviciding, biological control, and insecticide-treated materials). These interventions may be used alone or in combination, depending upon the epidemiological setting.

The targets being set by the NMCP for IRS and ITNs over the next three years were evolving during the PMI needs assessment and planning visits, and are not yet final. However, there was a consensus that the following vector control activities are needed and would be complementary to the NMCP's overall malaria control plan.

Insecticide-treated nets (ITNs)

Current Status, Challenges, and Needs

Ghana has seen a significant increase in ITN use over the past five years. ITN use in children under five years increased from 3.5% in 2003 (DHS) to 22% in 2006 (MICS). ITN use in pregnant women increased from 3.3% in 2003 (DHS) to 46.5% in August 2006 (GFATM survey in focus districts). Since those surveys were conducted, coverage has been increased by an additional 1.9 million LLINs distributed in November 2006 through an integrated child vaccination/ITN campaign and will be further increased with a planned distribution of 2.1

million additional LLINs in late 2007 through a similar child health/ITN campaign. LLINs were introduced in Ghana in 2004 under the GFATM Round 2 grant. The 2006 survey indicates that 67% of the mosquito nets were treated, but it was not stated how many of these were conventionally-treated nets or LLINs.

National ITN Policy

The MOH applies different models for ITN distribution including free net distribution, net subsidization, and commercial market access and promotion. Seven different ITN brands in a variety of shapes, colors and styles are registered in Ghana. The NMCP formulated an ITN policy in May 2002, which was updated in April 2007. The updated policy states:

> *Distribution of insecticide-treated materials (ITMs) in Ghana shall take into consideration the need to improve access to vulnerable groups while at the same time creating an incentive for the private sector involvement to ensure sustainability. A dual approach shall therefore be used to distribute ITMs in Ghana:*
>
> - *Sale of ITMs at full commercial cost. The private/commercial sector shall be responsible for the ITMs they import/produce for sale. These shall be distributed through multiple retail outlets ensuring increased availability to these products.*
>
> - *Sale at subsidized prices to persons in the target population (children under five and pregnant women) who cannot afford the full cost of ITMs. These shall be distributed through well coordinated targeted subsidy approaches such as health facility based distribution, voucher schemes, community based distribution, etc.*
>
> *This policy shall make room for "ITM Donations". "ITM donations" are defined as ITMs provided at 100% subsidy or free of charge to the beneficiaries. To ensure the effective and efficient use of ITMs donations, these will be handled according to the guidelines provided…*

Operationally, the policy supports a "mixed model" of at least six different distribution channels targeting specific populations:

a) Subsidized sales through ANCs and other health facilities as well as community health worker schemes;
b) Targeted subsidies using the discount voucher scheme. With support from the NetMark Project, the targeted voucher scheme has been operating in four regions (Brong-Ahafo, Ashanti, Eastern, and Volta), and has recently expanding to a fifth region (Central);
c) Commercial sales at full cost. There are seven brands of ITNs registered for commercial sale in Ghana, each with their local agents, distribution systems and retail outlets;
d) Mass free distributions through child health week/immunization campaigns;
e) Distributions of free or subsidized nets through individual NGO programs; and
f) Workplace distributions, through large employers, such as mines, plantations, etc.

The NMCP, with GFATM support, provides highly subsidized ITN sales through ANCs and other health facilities at a cost of 20,000 cedis (approximately $2) to pregnant women and children under 5 years of age. This program is national and aims to cover all public ANCs and health facilities. To date, the program has distributed approximately 1.5 million ITNs through ANCs and health facilities.

A NetMark project supported by USAID and GFATM funding promotes a voucher scheme in four southern regions, which in 2007 has been expanding into a fifth region. NetMark was launched in Ghana in November 2002 and currently partners with five manufacturers and distributors of ITN products in the country. Through partnership with the NMCP and funding to support the voucher subsidy provided by the GFATM, the NetMark project provides technical assistance and manages implementation of the voucher program in four southern regions providing subsidized sales of ITNs to pregnant women. The scheme represents a scale up of successful projects piloted by NetMark with support from USAID and other donors in 2002-04. In addition, USAID is supporting NetMark to scale up of the voucher program in the Central Region supporting subsidized sales of ITNs to pregnant women, with plans to expand to children under five. The voucher value is currently 40,000 cedis (approximately $4), which is significantly higher than the cost to the consumer of a subsidized ITN purchased through an ANC or health facility. Increasing the face value of the NetMark voucher to 60,000 cedis would bring it more in line with the price of the subsidized direct sales through ANCs and other health facilities.

During the first week of November 2006, a nationwide integrated measles/polio/vitamin A/ITN distribution campaign was implemented. A total of 3,994,052 children were vaccinated against measles, 5,035,165 provided polio vaccinations, 5,367,408 given vitamin A, and 1,935,068 LLINs distributed to children under two years of age. Plans are currently underway for a second national integrated child health/ITN campaign targeting net distribution to children under one year of age (i.e., those born since the last campaign) and pregnant women. Financial pledges of support have been received from UNICEF and the World Bank. The campaign is planned for November 2007, which will be too early for PMI commodity support, but would be an opportunity for logistical and other "systems" support from PMI.

Direct commercial sales of ITNs are available from about 2,000 retail outlets at a full cost of 60,000-95,000 cedis (approximately $6-10) depending on size, type and color. UNICEF is the main partner of the NMCP for ITN promotion and distribution in the three northern regions. UNICEF supports the direct sale of nets at 5,000 cedis (approximately $0.50) through ANCs. Mosquito net re-treatment is provided through approximately 2,000 re-treatment centers throughout the country, supported by NetMark, the Malaria Consortium, and other NGOs. Taxes and tariffs for ITNs have been permanently removed.

Proposed USG Component

Based on the information gathered during the assessment visit – and in keeping with PMI's approach of supporting procurement and distribution only of LLINs, of re-treating nets only until they can be replaced by LLINs, and of supporting segmented ITN distribution channels to promote sustainability -- the following needs were identified for potential support by the PMI in Ghana:

Insecticide-Treated Nets ($5,650,000)

As mentioned, Ghana supports a mixed model for ITN and LLIN distribution by providing an enabling environment for the commercial sector to market their full-priced ITNs and LLINs to those who can afford them. The model incorporates targeted subsidies, including a discount voucher system for some vulnerable populations and subsidized sales at ANC clinics, in addition

to free ITNs and LLINs to certain groups and geographic regions. Potential areas for PMI investment in Year 1 in ITN-related activities include:

- Support for expansion of the ITN targeted subsidies voucher program to include pregnant women and children under five: Broaden existing voucher program in four ways: a) support the recent expansion from 4 to 5 regions; b) expand geographically within those regions; c) expand to children under 5 years of age; and d) increase the face value of the discount from 40,000 to 60,000 cedi so that the cost to the family will only be 20,000 cedis ($2.00 USD) per net. ($2,000,000)

- Expand MOH direct subsidized ITN sales through ANC and child health clinics: Procure LLINs for the public sector subsidized net distribution though ANC and other public health facilities. ($2,200,000)

- Support for bednet retreatment programs: Provide support for the purchase of KO Tab 1-2-3 long-lasting tablets for community-based bednet retreatment efforts. This activity will be carried out through the malaria coalition of NGOs and other partners, with the objective of retreating at least 275,000 bed nets. There have been large numbers of conventional nets sold in the last couple of years that warrant retreatment. This will be the only year of support for this activity, with PMI prioritizing the purchase of new LLINs over retreating conventional nets in the future. ($500,000)

- In collaboration with the NMCP, UNICEF, World Bank, WHO, and other partners provide support for the next integrated child health/free ITN distribution campaign: Support logistics for net distribution and secure storage for the November 2007 national integrated child health/ ITN campaign, including post-campaign evaluation. ($200,000)

- Support for BCC/IEC at the community level: Support year-long BCC/IEC at community level to support MOH to promote correct and consistent use of ITNs by pregnant women and children under five, including house-to-house- and radio-based strategies. In addition, provide support for a post free net distribution campaign evaluation. ($600,000)

- Systems/database support to the National ITN program. Provide systems support for strengthening management of national public/private partnership for ITN distribution. This will include support for creating a database to track numbers of nets distributed through all channels, and strengthening NMCP linkages to institutional sales of LLINs to mines/ agriculture groups and special distributions for PLWHA etc. ($150,000)

Indoor Residual Spraying (IRS)

Current Status, Challenges, and Needs

The April 2007 National Policy for Vector Control includes, for the first time, IRS as part of an integrated vector control program. IRS implementation plans are being built upon the model of the AngloGold Ashanti Mining Company in Obuasi, which has been implementing IRS and other vector control measures in the district since 2004.

Insecticide resistance presents a major challenge for IRS operations in Ghana. Two groups have conducted insecticide resistance monitoring in Ghana. One group from the University of Witwatersrand in South Africa is providing support to the AngloGold Ashanti IRS operations in Obuasi. The other group is the Noguchi Memorial Institute for Medical Research (NMIMR) which supports the NMCP. In a paper published in 2006, the Obuasi group found high levels of resistance to Dichloro-Diphenyl-Trichloroethane (DDT), bendiocarb, propoxur and some pyrethroids in *A. gambiae* ss and resistance to DDT and bendiocarb in *A. funestus*.

INSECTICIDE SUSCEPTIBILITY

Table I

Insecticide susceptibility test of An. Gambiae S form from Obuasi

Insecticide	Number tested	% 24-hr mortality
Deltamethrin	54	75.9
Lambda-cyhalothrin	15	40
Cyfluthrin	27	12.5
Etofenprox	21	57.1
DDT	26	30.8
Bendiocarb	39	56.4
Propoxur	38	34.2
Fenitrothion	89	100
Malathion	40	100

Table II

Insecticide susceptibility tests of An. Funestus from Obuasi, Ghana

Insecticide	Number tested	% 24-hr mortality
Deltamethrin	53	100
Cyfluthrin	13	100
DDT	23	60.9
Bendiocarb	56	71.4
Malathion	45	100

Resistance monitoring by the NMIMR found similar results. In 2004 it was found that the *A. gambiae* sl (possibly including *A. melus* and *A. arabiensis*) was highly resistant to DDT in five sites sampled along the southern and eastern regions. Only samples from Ada Foah were found to be susceptible.

The high levels of insecticide resistance in some parts of Ghana are likely due to the historically heavy use of insecticides, including DDT, on cocoa, cotton, and other crops. There remain gaps in the resistance mapping, particularly in the northern savanna and tropical rainforest zones. Assessment and continued monitoring of insecticide resistance is a high priority need in Ghana. A robust monitoring and mitigation plan needs to be developed.

SUSCEPTIBILITY TO DDT

Locality	DDT Mean % mortality (CL)
Central Region	
Twifo Praso	5.6 (4.6 -9.1)
Eastern Region	
Suhum	7.6 (0-13.1)
Volta Region	
Hohoe	29.8 (0-64)
Western Region	
Axim	26.2
Gt. Accra Region	
Ada Foah	98.5 (87-100)
Weja	19 (8-28)
KND	73.26
Bongo District	<80.0
Laboratory Controls	**100**

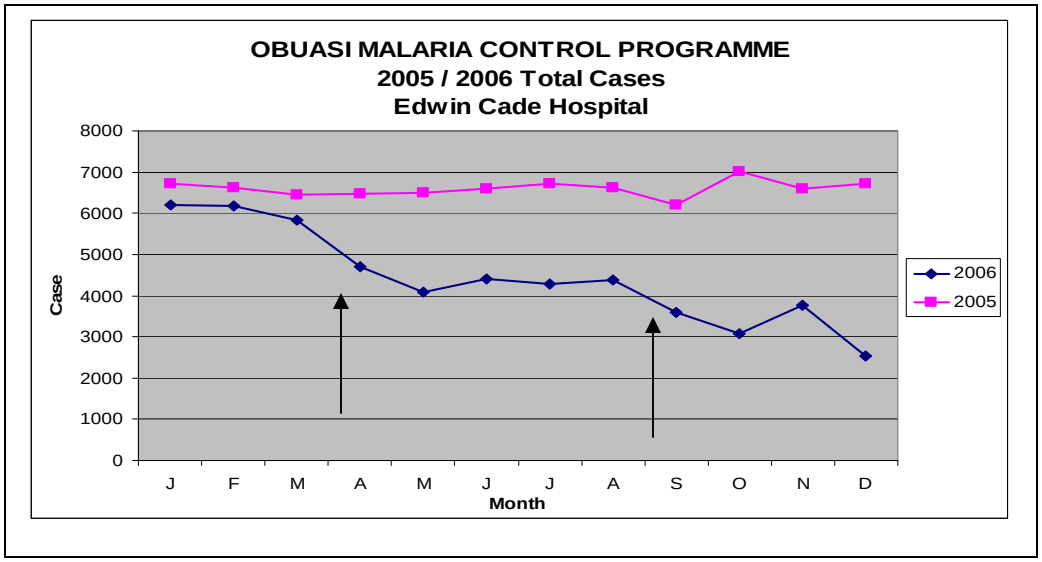
IRS Operations

IRS operations began in 2004 with the AngloGold Ashanti Mining Company initiative. With an initial investment of $1.7 million and a subsequent outlay of $1.3 million, AngloGold Ashanti sprayed two rounds in 2006 (five months apart) in 130,000 structures, using 116 spraymen. This was an extremely well-managed and well-supported operation, with excellent physical infrastructure in terms of spray operators and insecticide storage facilities, training, information management and community outreach facilities, transportation and logistics. The company's health facility reported a 50% decrease in slide-confirmed malaria cases between December 2005 and December 2006 as shown in the figure below. AngloGold Ashanti has a strong community relations component in their malaria control program and reports more than 98% acceptance rate for the IRS operations. There are 120 "Volunteer Community Advocates" who are provided training, shirts and caps and who work to prepare the household residents for the spraying.

Expansion of AngloGold Ashanti IRS Model

In 2006 AngloGold Ashanti assisted in training of 19 spray operators at Newmont Mining, Ghana, who will be initiating IRS operations in the future in their mining community. The AngloGold Ashanti malaria program manager is also making presentations to the Ghana Chambers of Mines and other private sector groups on the positive return for investment they have seen with their malaria control program. The Minister of Health spoke highly of the IRS operations in Obausi and would like to see it expanded to other areas. The NMCP, in collaboration with AngloGold Ashanti, submitted a GFATM Round 7 Proposal in July 2007, with IRS as a major component, as mentioned. While the details are still being developed, the program will likely expand first into other parts of Ashanti, Central and Western Regions, where entomological data is available, then begin laying the groundwork for IRS operations in other regions in future years. The program is cognizant that expanding IRS needs to be done carefully and with appropriate preparations, in terms of the entomological surveys, the mapping and logistics needs, and most importantly, the development of community support and collaboration.

OBUASI MALARIA CONTROL PROGRAM



(The two arrows refer to the two rounds of spraying conducted in 2006).

In addition to the GFATM Round 7, there is a new development, with the potential trial of the WHOPES-approved pyrethroid insecticide, bifenthrin, manufactured by the FMC Company. This insecticide has some interesting properties (e.g., low irritancy to the mosquito), and the trial, being managed outside PMI, will nevertheless provide good data that will benefit the Ghana program as well as others.

Proposed USG Component

Based on the information gathered during the assessment visit, the following needs were identified for potential support by the PMI in Ghana.

Indoor Residual Spraying ($2,335,000)

As was mentioned above, the Ministry of Health is planning on expanding the "AngloGold Ashanti model" for IRS, initially to other parts of Ashanti region and possibly to other regions to follow. While the MOH and the NMCP are preparing a proposal for GFATM Round 7 to support future IRS activities in Ghana, there is an immediate need for early support to lay the ground work for expansion of the model. These areas of potential PMI support include:

- Support for IRS program implementation: Support baseline entomological and environmental assessments and pesticide safer use action plan in districts targeted for IRS spraying. Procure IRS equipment (insecticide, sprayers, etc.) and support program planning and implementation, data collection, protocols/ guidelines, IEC/BCC, and logistics support for spraying 100,000 households. The selection of districts to be sprayed will be made in consultation with the NMCP. ($2,150,000)

- Technical assistance: Support for technical assistance by an entomologist experienced in IRS programs to monitor and provide expert guidance to the IRS program as it unfolds. ($10,000)

- Support for insecticide resistance and entomological monitoring: Building on existing strengths in resistance and entomology monitoring, provide support for implementation of entomological monitoring including resistance monitoring. ($175,000)

INTERVENTIONS – MALARIA IN PREGNANCY

Intermittent Preventative Treatment of Pregnant Women (IPTp)

Current Status, Challenges, and Needs

According to the 2005 annual report from the MOH Reproductive and Child Health Unit (RCH), 13.8% of pregnant women who sought outpatient services and 10.6% of hospital admissions of pregnant women were due to malaria. Malaria accounts for 9.4% of maternal deaths. According to the latest report available, 88.7% of pregnant women attended an antenatal care clinic at least once during their pregnancy, with the number of visits per woman averaging 3.4. In Ghana, about 30.9% of pregnant women register their first ANC visit during their first trimester, and 50.1% register for their first attendance in the second trimester. In 2005, 22.2% of pregnant women who registered at ANC had anemia (Hb <11g/dl) at the time of registration.

Ghana adopted IPTp with SP as a policy in 2004. The policy reserves SP for IPTp only. The program recommends three doses of SP to be administered to HIV-negative pregnant women starting after quickening (16 weeks or thereafter) and with each dose administered at least one month apart. The last dose of SP should be administered at least one month before delivery. All doses are recommended to be administered under direct observation. HIV-positive pregnant women are expected to receive monthly doses of SP after quickening (with a total of 4 of doses) except if they are receiving cotrimoxazole. Quinine is the drug of choice for the treatment of symptomatic malaria in pregnancy.

IPTp is being implemented by the Ghana Heath Service Reproductive Health Division in collaboration with the NMCP in public health facilities in all regions, including those managed by missions and faith-based organizations (FBOs), but not all health facilities are currently capable of delivering IPTp. SP is provided free of charge through ANCs. Even though it is the policy of the Program that IPTp should be given as directly observed therapy, there are challenges to full implementation of this policy. Inadequate human, technical, and financial resources are contributing to less than full coverage of this policy. SP is produced locally and the NMCP reports having adequate supply to cover the anticipated needs over the next two years.

The NMCP conducts pharmacovigilance studies of SP through technical agencies such as the Ghana Food and Drug Board and the University of Ghana Medical School. The NMIMR carries out regular monitoring of SP resistance using molecular markers.

The NMCP sees improving the rates of administration of the second dose (IPT2) and third dose (IPT3) as a priority. Currently the use of the first does of IPT (IPT1) is approximately 60%, but the rate of IPT2 and IPT3 is significantly lower. Anecdotal reports by zonal malaria coordinators suggest that low uptake of IPT2 and IPT3 can be due at least in part to inaccurate reporting by health facilities at the district level and negative attitudes of health workers, especially towards pregnant women who report late for prenatal care. There is a need for in-service training for health workers and behavioral change communication targeting the general population to encourage pregnant women to initiate prenatal attendance in the first trimester.

The NMCP and RCH have collaboratively been involved in training health workers on focused antenatal care (FANC). FANC consists of a comprehensive and integrated package of interventions that is delivered through routine ANC visits. Training materials and job aides were developed as a part of the FANC efforts and antenatal cards have been modified to record IPTp use. Training has been conducted in all public and Christian Health Association private facilities but there are not sufficient quantities of job aides available for use by all facilities.

Also as noted above, the NMCP promotes the use of ITNs for the prevention of malaria during pregnancy. Despite an increase in ITN ownership among pregnant women, usage remains far below the targets set by RBM and PMI.

Proposed USG Response ($600,000)

- Pre-service and in-service training for Malaria in Pregnancy (MIP): Provide support for updating training curricula on MIP at the pre-service training institutions responsible for training health care workers. Also provide support for in-service training on MIP. This activity is part of a comprehensive malaria in-service training activity to improve health worker performance. The budget for these activities are reflected above in malaria case management pre- and in-service training line item. ($0 – *Cost is reflective in the case management section below.*)

- Strengthening of focused antenatal care (FANC): The antenatal period is a critical time to reach women with effective anti-malaria messages, services and products. While most women in Ghana make at least one antenatal visit to a health center, a majority do not access services early or often enough to complete IPTp. The provision of a quality, comprehensive and integrated service is expected to enhance pregnant women's use of an LLIN, to complete IPTp and get adequate education on malaria. FANC also serves to make other interventions available at one platform, the antenatal clinic, for use by pregnant women. PMI will support the development and printing of training materials and will also support the training of health workers in the delivery of FANC with a special focus on IPT, counseling on use of a bednet, and other effective anti-malaria interventions. ($600,000)

INTERVENTIONS – CASE MANAGEMENT

Malaria Diagnosis and Treatment

Current Status, Challenges, and Needs

In Ghana, the NMCP views malaria case management as one of the major strategic areas in the improved control of malaria. The focal issues in case management have been: ensuring access to prompt diagnosis and effective treatment; improving the quality of health care; improving referral systems; and conducting operational research (drug quality monitoring, efficacy monitoring and pharmacovigilance).

Diagnosis

Early diagnosis and prompt treatment of malaria with safe and efficacious medicines is one of the priority strategies for malaria control in Ghana. The current guidelines for malaria treatment recommend whenever possible the confirmation of malaria diagnosis through microscopy. However, with only 13.4% of malaria diagnoses based on microscopy, the majority of malaria diagnoses in health facilities are made based on clinical symptoms and signs. The NMCP has indicated that improving laboratory capacity for malaria diagnosis is a priority, particularly with the change from relatively inexpensive chloroquine as first-line malaria treatment to artesunate-amodiaquine combination therapy, which is significantly more expensive.

Regional hospitals, district hospitals and some health centers at the sub-district level should have the capacity for microscopy. Although a comprehensive assessment of malaria laboratory capacity has not been completed, it is generally recognized that laboratory services in the public sector are weak, with inadequate infrastructure, insufficient numbers and quality of equipment and supplies, and inadequately trained laboratory personnel. Routine supportive supervision and quality control activities do not take place consistently due to inadequate financial and human resources at all levels. Public health laboratories are responsible for conducting supervision visits to the regional laboratories and regional laboratories to the districts and health centers laboratories.

The NMCP has indicated its intent to introduce rapid diagnostic tests (RDTs) as part of their new malaria strategic plan that is in the process of being updated. A committee has been charged with producing an updated malaria diagnosis policy which is expected to be completed by the end of May 2007 and will outline the role and use of both microscopy and RDTs for diagnosis of malaria in Ghana and provide a framework for implementation. To date, the NMCP has received a donated supply of 100,000 ParaCheck® pf brand of RDTs manufactured in India.

Treatment

Ghana adopted a new antimalarial drug policy in 2004 after studies had shown increasing treatment failure to the first-line drug, chloroquine. Artesunate-amodiaquine (AS/AQ) combination therapy was chosen as a new first-line treatment of malaria in 2004. Combination treatments of artesunate in 25mg and 50mg tablets and of amodiaquine in 75mg and 150mg tablets are packaged in blister packs and are available in three presentations - pediatric, adolescent and adult dosages. Despite having different presentations, the tablet strengths are the

same with the exception of the quantity of tablets in each presentation. In the pediatric and adolescent presentations, tablets have to be divided to conform with the weight dosage requirements for specific patients. For this reason, the NMCP has purchased tablet cutters for all public health facilities. There is a standard price of 3,000 cedis (approximately $3 US) for each combination therapy blister pack regardless of presentation. As a result, patients prefer to purchase an adult package as it can serve as treatment for more than one pediatric patient. The MOH is in the process of adjusting the pricing of the blister packages. With GFATM funding, the NMCP purchases these drugs through WHO from a pre-certified supplier for supply only of the public sector.

Following the launch of the new ACT, local pharmaceutical companies began producing amodiaquine in 600mg and artesunate in 150mg tablets and made them available in blister pack formulations on the local market. Due to the very high dosages of these tablets, patients who acquired them from the private sector reported many adverse effects resulting in overall negative publicity associated with the new ACT. The MOH ordered the removal of these locally-produced triple-strength blisters from the market, but has faced a difficult challenge of regaining public confidence in the new malaria treatment.

Supplies of AS/AQ for the public sector are considered to be sufficient through the end of 2009 as a result of planned GFATM and UNITAID support.

The NMCP set up a committee to choose a second-line ACT. The committee has completed its work, but the new medication policy awaits MOH approval. The NMCP is also considering the use of artesunate rectal suppositories at clinics and health centers as a pre-referral medication for severe malaria to reduce the long delays. There is also a need for additional drugs for the treatment of severe malaria in hospitals. Funding has not yet been secured for the purchase of the new second-line ACT nor for the purchase of rectal artesunate.

The MOH pharmaceutical management system operates as a three tier system including the central and regional medical stores and the service delivery points. The medical stores have transportation networks which together constitute the supply chain, but in practice, there are many deficiencies in this system hindering smooth flow and causing stock-outs particularly at service delivery points. Furthermore, other factors also contribute to the inadequacies of the system, including delays in tendering, ordering, and receipt as well as inaccurate quantification at both regional and facility levels.

The NMCP conducted training for health workers and pharmacists within the public sector as the new ACT drug policy was being rolled-out in 2004-2005, but there has not been any follow-up refresher training to date, nor has the teaching curriculum for pre-service training institutions been updated to reflect current malaria case management protocols.

Despite the establishment the Food and Drugs Board (FDB), which has the mandate to ensure that only drugs that meet an established quality are permitted on the market, there is a persistent concern in Ghana related to substandard drugs being available on the market. There is a need to strengthen the capacity of the FDB to appropriately perform its functions to ensure that only good quality, safe, and effective anti-malaria drugs are available.

To help get treatment to children within 24 hours of the onset of their illness, the NMCP intends to introduce community-based treatment in Ghana. A pilot study has just been completed on the feasibility, acceptability and safety of using ACTs in community. A policy is yet to be formulated, and an implementation plan is yet to be put in place.

Proposed USG Component ($4,945,000)

- Comprehensive baseline laboratory assessment: Support a rapid nationwide assessment of laboratory capacity to determine availability of lab equipment, supplies, and trained personnel for malaria microscopy, as well as to assess the status of the laboratory quality control system. The assessment will also assess utilization of testing services, who is sent for testing and how this impacts decision to treat. ($100,000)

- Development and implementation of a malaria laboratory diagnostic policy: Assist the NMCP to finalize a written malaria laboratory diagnosis policy that outlines the role and use of microscopy and RDTs at each level of the health system and the circumstances under which lab diagnosis would be undertaken. Support for implementation will include pre- and in-service training of laboratory personnel. ($200,000)

- Procurement of laboratory equipment and supplies: Support for procurement of lab equipment, reagents and supplies including battery operated lamps and RDTs. Specific quantities will be determined based on the results of the lab assessment. ($400,000)

- Laboratory quality control and supervision: Support to the NMCP to improve the systems for quality control and supervision of malaria laboratory diagnosis, including both microscopy and RDTs. ($210,000)

- Procurement of second-line ACTs, rectal artesunate, and severe malaria drugs: Support procurement of second-line ACTs, rectal artesunate, and severe malaria drugs (quantities to be determined). ($1,200,000)

- Pre- and in-service training of health care workers: Provide support for updating the curriculum used by pre-service training institutions to incorporate current malaria case management protocols. Support training of institution tutors and faculty, and support in-service training of public and private health workers, including private sector chemical sellers. ($700,000)

- Home-based management of malaria: Support the NMCP in updating its policy for home-based management of malaria with ACTs including advocacy for policy makers; also, support the NMCP in implementing a small-scale HMM activity which can inform national roll-out by helping to define best practices. ($400,000)

- IEC/BCC to promote proper management and use of ACTs: Support for BCC/IEC targeting health care workers and the general public to promote correct and consistent use of ACTs. This activity is part of a comprehensive BCC/IEC strategy that is directly linked to activities funded under malaria prevention, above. ($605,000)

- Strengthen drug management capacity: Support to strengthen drug management system capacity including technical assistance for estimation of drug needs and gaps, appropriate use, and development of a comprehensive drug logistics information system, with modest support to strengthen drug warehousing and storage with an emphasis on regional and district levels. ($600,000)

- Support drug quality monitoring capacity: In collaboration with the Food and Drug Board, provide support to strengthen Ghana's malaria drug quality monitoring capacity. Specifically, provide technical support to strengthen the procedure for drug registration, assist the board to review its drug registration regulations, establish quality control standards for anti-malarial drugs, strengthen the laboratory testing of anti-malarial drugs, and conduct training and refresher training for the laboratory staff. ($190,000)

- Technical assistance for strengthening case management: Provide support for technical assistance from the Centers for Disease Control and Prevention technical experts to assist with implementation of the laboratory survey and policy development and provide support for strengthening the pharmacovigilance system. ($40,000)

- Strengthen pharmacovigilance: Provide support for development of a pharmacovigilance system including surveillance for adverse drug reactions and rapid response to reports/rumors of severe reactions in direct collaboration with the Food and Drug Board. ($50,000)

- Support for *in vivo* antimalarial drug efficacy monitoring: Support *in vivo* clinical efficacy monitoring at a minimum of three sites per year (ideally a total of 10 sites: 3 in year one + 4 in year two + 3 in year three). ($50,000)

- Support for a national health facility survey: Support the NMCP and in-country partners to conduct a national health facility survey to assess the implementation of the new drug policy and case management, IPTp use, and health worker performance. ($200,000)

INTERVENTIONS – Intermittent Preventive Treatment of Infants (IPTi)

Current Status, Challenges, and Needs

Intermittent preventive treatment of infants (IPTi) consists of the regular administration of treatment doses of an antimalarial drug given at the time of routine infant immunization visits (usually at 8-10 and 12-14 weeks of age and again at 9-12 months of age) to reduce the severe consequences of malaria during the first year of life. Six field trials of IPTi with SP have been completed in Ghana as part of a serious of studies funded by the Gates Foundation consortium to evaluate the efficacy of this approach. A pooled analysis of those data shows a 30% protective efficacy against clinical episodes of malaria, 15% protective efficacy against anemia, and 36% protective efficacy against malaria-related hospital admissions. No negative interactions with routine vaccinations nor severe allergic reactions were noted in Africa. The IPTi strategy has been endorsed by a WHO Technical Working Group and is expected to be recommended for use in Africa in the near future. To ensure that this first-hand in-country experience is not lost,

continued support is needed for Ghana's IPTi study sites until the final WHO recommendation is published.

Proposed USG Component ($300,000)

- IPTi early implementation support: Provide funding to existing sites in Ghana where IPTi is being used so that the experience with this approach is not lost before final WHO approval of the IPTi strategy is provided. Support will also be provided to the NMCP for national policy development and assistance with early expansion. ($300,000)

NGO and FBO COLLABORATION

Current Status, Challenges, and Needs

The NMCP has established on-going successful partnerships with a number of non-governmental organizations who are using their existing networks and community based activities and volunteers to extend the reach of malaria prevention and control activities. Beginning in 2005, the NMCP began to partner directly with NGOs to extend the reach of malaria prevention and control activities. Currently there are approximately 50 NGOs active in 50 districts in 9 regions. There is a need to strengthen the capacity of NGOs and networks engaged in malaria prevention and control activities, and to expand their number and geographical reach, in order to move closer to reaching all 136 districts in the ten regions with community-based malaria activities.

Proposed USG Component ($800,000)

- Improve the capacity and reach of indigenous NGOs and FBOs and NGO and FBO networks engaged in community-based malaria prevention and control activities in partnership with the NMCP: Provide support to the NMCP to expand partnerships with NGOs/FBOs and NGO/FBO networks, in number and geographic coverage, to extend the reach of malaria prevention and control activities at the community level. Specifically, provide support to NGOs/FBOs to: promote ownership and correct and consistent use of ITNs; implement targeted bednet retreatment campaigns; in IRS target areas, promote community acceptance of and preparedness for spraying activities; promote early and regular ANC attendance by pregnant women to increase proportion of pregnant women receiving at least two doses of IPTp; and increase early and appropriate health seeking behavior for fever and treatment adherence. ($800,000)

HIV/AIDS and MALARIA

Current Status, Challenges, and Needs

Ghana has an HIV prevalence estimated at 2.3% (UNAIDS, 2006). HIV prevalence rates are not uniform across the country. HIV transmission in Ghana is substantially concentrated among persons that engage in high risk behaviors, particularly commercial sex workers, their clients, men who have sex with men, and prisoners. Sexual transmission accounts for over 80% of new

infections. HIV infection peaks in 35-49 year-old women (4.1%) and 40-44 year-old men (4.7%). Women account for 51% of Ghana's population, yet 65% of the country's HIV infections occur in women. The relatively low rate of HIV infection among men (1.5%) is likely to be partly attributed to a 95% rate of male circumcision (DHS 2003). Evidence suggests a downward trend of HIV infection in the general population, yet HIV infection appears to be increasing in at-risk populations. There are an estimated 320,000 people living with HIV/AIDS (PLWHAs) (UNAIDS, 2006) and 1 million orphans and vulnerable children (OVCs), with approximately 17% due to HIV (Children on the Brink, 2004).

Although Ghana is not one of the 15 PEPFAR focus countries, it receives the next level of priority and attention from the U.S. Government's Office of the Global AIDS Coordinator, with an annual HIV/AIDS budget of between 5 and 10 million dollars.

At of the end of 2006, an estimated 6,500 PLWHAs were on anti-retroviral therapy. USG-Ghana's key strategic priorities are the prevention of HIV in persons engaged in high risk behaviors, protecting the general population by reducing HIV transmission from high risk persons to the general population, and providing comprehensive prevention, care and treatment for those infected, their partners and families. A five-year USG HIV/AIDS Strategic Plan for Ghana was approved in 2006 by the U.S. Office of the Global AIDS Coordinator. USG-Ghana's HIV program concentrates its efforts in 27 of Ghana's 138 districts, which were selected through mapping techniques based on seroprevalence, concentration of most-at-risk groups, and the presence of other donor activities.

In 2000, the Ghana AIDS Commission was established to respond to Ghana's HIV/AIDS epidemic. In line with the "Three Ones" principle, the AIDS Commission is a multi-sectoral body that leads the national response in-line with Ghana's five-year strategic framework and national M&E plan. The AIDS Commission supports several hundred NGOs to implement HIV/AIDS activities. All districts and municipalities and all GOG ministries, agencies and departments have HIV action plans and receive funds from pooled resources. Selected ministries and all 138 districts have a part-time person responsible for HIV/AIDS. The GFATM represents the largest donor investment in HIV in Ghana with a $97 million, five-year Round 5 grant focusing on nationwide scale up of HIV/AIDS care and treatment services.

There is presently limited, but growing attention in Ghana for the links between AIDS and malaria. The leadership of the National HIV/AIDS and Malaria Control Programs have publicly highlighted studies which have shown that malaria is common among those living with the virus and hampers their immune response. Initial discussions have shown that national authorities working on malaria and those working on HIV/AIDS are enthusiastic about integrating their activities, especially concerning bednet distribution through PLWHA organizations (e.g. using a voucher scheme) and providing presumptive treatment as part of prophylactic efforts to prevent opportunistic infections.

Proposed USG Component (*no funding during Year 1 of the PMI*)

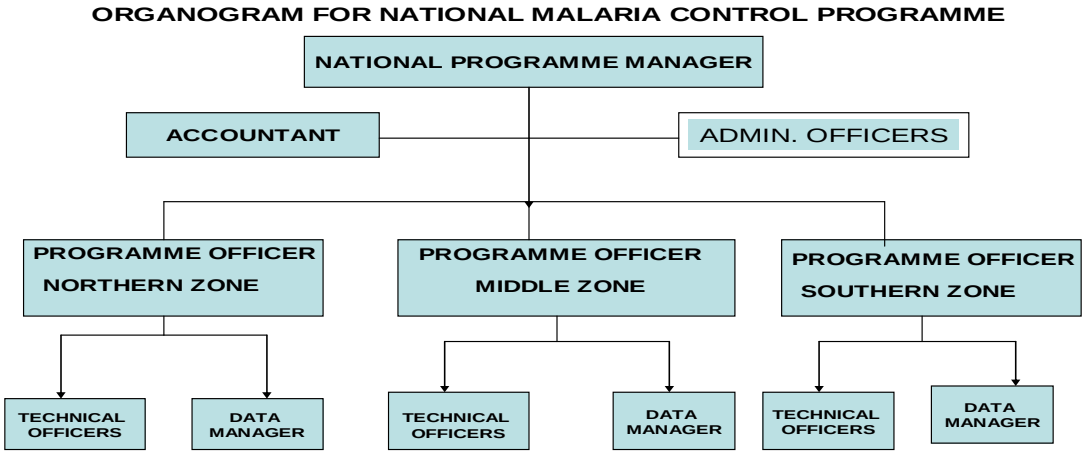
PMI staff will work with the NMCP, the Ghana AIDS Commission, and USG HIV/AIDS program and partners to review current standards for malaria prevention measures in PLWHA in Ghana, including strategies to make LLINs available at a subsidized price to PLHWAs. Based on this assessment, the PMI will develop a plan for support to strengthened prevention and

treatment of malaria in PLWHA.

CAPACITY BUILDING WITHIN THE NATIONAL MALARIA CONTROL PROGRAM

Current Status, Challenges, and Needs

The NMCP is responsible for policy development, establishing norms, and planning, organizing, and oversight of all malaria control activities in Ghana. The NMCP is directed by a public health physician and has a staff including three program officers with pharmacy background, an entomologist, three technical officers, and three data managers. The NMCP staff and leadership consider themselves overstretched, even with the relatively recent decentralization of staff from the central level to three zonal offices. Each of the three Zonal Offices (southern, middle, and northern) has a program officer, technical officer and a data manager. These malaria program staff offer support to the regional, district and facility staff who are the main implementers of planned malaria control activities. In addition, the technical staff are responsible for conducting routine program M&E activities. At the regional level, a malaria focal person has general oversight responsibility for malaria-related activities. The focal person is usually a biologist who also has additional responsibilities across other public health programs. The structure at the district level is similar. The district level malaria focal person is usually a technical officer with training in disease control who has responsibility for several public health programs.



Proposed USG Component ($200,000)

Given the expanding program resources and activities resulting from the two GFATM malaria grants and PMI, strong and effective supervision at all levels of the program will be critical to the success of malaria control efforts in Ghana. In order to strengthen the human capacity, the PMI proposes the following activities:

- Strengthen NMCP capacity for program management: Improve NMCP capacity for program management by facilitating supervision from the regional to district levels and below in

collaboration with in-country partners. Specifically, funds will be provided to support the transport and per diem costs of program staff to facilitate routine supervision visits to the peripheral levels. NMCP central level staff indicated that adequate funds exist in their national level budget to support their supervision of the regions. ($200,000)

- Support IT Network Capability: Provide support to strengthen IT network capability by installing IT infrastructure and assist with establishing and supporting maintenance of the NMCP webpage. *(Funding for this activity is reflected below under M&E data management support)*

SURVEILLANCE, MONITORING AND EVALUATION

Current Status, Challenges, and Needs

Although the NMCP has established a strong foundation for malaria monitoring and evaluation (M&E) at various levels of the public health system, no overall written M&E plan exists. An annual M&E plan is developed every year as part of the annual Malaria Strategic Plan. This plan is currently being revised and should be completed by the end of 2007. The new plan will attempt to harmonize existing M&E activities of the various malaria control initiatives, such as the GFATM, RBM, and PMI.

The most recent DHS was conducted during the July-October rainy season of 2003. This survey included data on ITN use among children and pregnant women, IPTp, and treatment-seeking behavior for malaria and anemia among children under five. The next DHS is planned for 2008. The 2006 UNICEF Multiple Indicator Cluster Survey (MICS) included the malaria module. The results of this survey will be available by July 2007 and will provide baseline information on many malaria indicators. However, the MICS was conducted before the mass measles/ITN campaign in November 2006 and therefore does not reflect ownership and usage of the additional 1.9 million ITNs distributed during that campaign. Other household surveys include the annual GFATM surveys conducted in 2005 and 2006, which compared the 20 GFATM districts with 12 non-GFATM districts and included questions on ITN possession and use by children under five and pregnant women, IPTp, and knowledge of malaria prevention practices. NetMark conducted a survey on ITN use and knowledge in 2004. None of these surveys measured malaria parasitemia or anemia prevalence. UNICEF is planning a sub-national MICS in 2007 that will cover the three northern regions that have been traditionally supported by UNICEF.

Routine information on malaria is collected through a variety of surveillance systems in Ghana:

1. In 2000, the GHS through the National Surveillance Unit with collaboration from WHO/AFRO undertook an effort to improve the national infectious disease surveillance system by implementing WHO/AFRO's Integrated Disease Surveillance and Response (IDSR) strategy. IDSR aims to improve the availability and quality of information related to 23 priority diseases, one of which is malaria. IDSR provides weekly data on clinically-diagnosed and laboratory-confirmed malaria cases and deaths from sentinel health facilities. Initial efforts have focused on the introduction of IDSR in Ghana's three

northernmost regions, Upper East, Upper West, and Northern Region. The strategy has now been implemented nationally; however data quality varies by district;

2. The Center for Health Information Management (CHIM) receives monthly reports on malaria cases and deaths from all public health facilities and some NGO clinics in the 138 districts. These data include both clinical and laboratory-confirmed malaria cases and are managed using Excel spreadsheets at the health facility and national levels. As a result, the system is very inefficient and this limits the timeliness and completeness of data. With support from other partners, CHIM has developed an Access database, called the Disease Health Information Management System that has been piloted in 20 districts. The plan for national roll out has been hampered by a lack of funding. The District Health Information Management System can be expanded on the request of control programs and currently includes all the major data collection tools. Ghana has also received funding from the Health Metrics Network for strengthening the health information system, but this funding may not cover all of the NMCP needs;

3. To ensure the timeliness of data collection and analysis for the purposes of the GFATM grants, malaria-specific data on IPTp coverage, ITN distribution, malaria cases and deaths and other aspects of GFATM implementation are collected through a parallel system established and maintained by the NMCP for the purposes of reporting to the GFATM on surveillance data to monitor performance. The support of GFATM Round 2 and 4 grants helped the NMCP establish three zonal offices to coordinate the implementation and monitoring of the new ACT policy and other GFATM M&E activities. Each zone has a program officer, technical officer and data manager who collect district-level data and compile quarterly GFATM reports. Supervision of district-level malaria activities is conducted by the zonal officers. District Health Information Officers have been trained on malaria M&E and help with compilation of the additional malaria data.

   GFATM data are collected and maintained in Excel spreadsheets at the national level. These data are reported on a quarterly and annual basis to the GFATM and other partners. In addition, the NMCP compiles an annual report encompassing all the data from health facilities and studies conducted in Ghana. Routine analyses to inform programmatic implementation are limited and need to be strengthened.

<u>Proposed USG Component</u> ($950,000)

Ghana has good but rather fragmented systems for malaria surveillance and monitoring and evaluation. The main sources of routine surveillance information are the CHIM, IDSR, and the NMCP surveillance system. Information for evaluation comes from the MICS, DHS, and the DSS sites. With the increased investment in malaria control, there is a need to harmonize all these sources of information to avoid duplication and increase efficiency and availability. In order to strengthen the NMCP's ability to conduct surveillance on malaria morbidity and mortality as well as to monitor the status of implementation of prevention and control activities throughout the country, the PMI proposes the following activities:

- Support for a single national M&E plan: Support the NMCP to develop and implement a unified and costed M&E plan within which all partners can adhere and invest. The plan will outline the key indicators, data collection formats, and encourage the integration of all malaria-related data collection, analysis, and reporting. The process of developing one M&E plan will be linked to the ongoing review and updating of the national Malaria Strategic Plan and will involve a workshop with broad participation of donors and Ghana RBM partners. ($50,000)

- 2008 DHS: The DHS 2003, MICS 2006, GFATM 2005 and 2006 surveys included all major malaria indicators but did not assess parasite prevalence or anemia. The MICS 2006 data will serve as baseline for the PMI coverage targets (e.g., ITN use among children < 5 years). Supporting the DHS planned for 2008 will ensure that malaria indicators including verbal autopsy, anemia and parasitemia are collected to assist in interpreting the impact of malaria control operations on malaria morbidity and mortality. ($500,000)

- Sentinel Site Surveillance: Establish up to five sentinel sites to collect routine facility-based data on malaria cases for children < 5 years of age. These sites will be located in five distinct regions. One of the five sites will be selected in an area where IRS is being implemented and one will be selected within the Dodowa Demographic Surveillance Site area to monitor use of the health facility for malaria. Specific indicators will be developed in collaboration with the NMCP. A cross sectional survey, developed in collaboration with the Dodowa Health Research Center, will be used to collect community level data to track health care use. ($240,000)

- Technical Assistance: Support for technical assistance from the CDC PMI M&E Advisor for implementation of the sentinel site surveillance activity. ($10,000)

- Data management and information technology infrastructure improvement within the NMCP and training of health information officers in data management: In coordination with other partners, assist the NMCP in developing a data management system to manage the large volumes of data received. The system will be compatible with and linked to the CHIM database but also contain malaria-specific information. Improve the current information technology infrastructure at the national, zonal, and regional levels. Assist the NMCP in training of regional and district health officers in data management and analyses and improve their internet connectivity to facilitate timely reporting. ($150,000)

STAFFING AND ADMINISTRATION

Two new health professionals will be hired to oversee the PMI in Ghana, one representing CDC and one representing USAID. In addition, one or more FSNs will be hired to support the PMI team. All PMI staff members will be part of a single inter-agency team led by the USAID Mission Director or his/her designee in country. The PMI team will share responsibility for development and implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for these positions will be evaluated and/or interviewed jointly by USAID and CDC, and both

agencies will be involved in hiring decisions, with the final decision made by the individual agency.

It is envisioned that these two PMI professional staff will work together to oversee all technical and administrative aspects of the PMI in Ghana, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, and reporting of results. Both staff members will report to the USAID Mission Director or his/her designee. The CDC staff person will be supervised by CDC, both technically and administratively. All technical activities will be undertaken in close coordination with the MoH/NMCP and other national and international partners, including the WHO, UNICEF, the GFATM, 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 will need to be approved by the USAID Mission Director and Controller.

Proposed USG Component ($1,220,000)

In-country PMI staff salaries, benefits, travel and other PMI administrative costs: Two expatriate PMI staff members to oversee activities supported by the Initiative in Ghana will be recruited and hired by CDC and USAID. One FSN will be recruited early in FY08. Procurement of office equipment and one vehicle are also included. ($1,220,000)

ANNEX 1

TABLES

Table 1

President's Malaria Initiative – Ghana
Year 1 (FY08) Timeline of Activities

ACTIVITY	2007							2008					
	OCT to DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Hire PMI in-country staff													
Purchase commodities (LLINs, laboratory equipment and supplies, second-line and severe malaria drugs)													
Health facility survey													
National laboratory assessment													
Improve diagnostic capability of laboratory staff													
IRS baseline entomological and environmental assessments													
IRS campaign													
Expand ITN targeted subsidy voucher program													
Expand MOH direct subsidized ITN program													
Bednet re-treatment campaign													
Comprehensive malaria BCC/IEC campaign (community – national levels)													
Strengthen malaria case management including among private chemical sellers													
Strengthen FANC to deliver malaria prevention and care services													
Strengthen MOH antimalarial drug													

management system													
Support IPTi early implementation													
Support for NGOs/FBOs to implement community-based malaria prevention													
Strengthen capacity for NMCP management and supervision													
Sentinel site surveillance													
Support development of unified M&E plan													
DHS fieldwork with malaria module and verbal autopsy													

Table 2

President's Malaria Initiative – Ghana
Planned Obligations for FY08 ($)

Proposed Activity	**Mechanism**	**Budget (*commodities)***	**Geographic Area**	**Description of Activity**	**Page Number Ref.**
PREVENTIVE ACTIVITIES					
1. Expand ITN targeted subsidy voucher program***	NetMark + New Malaria RFA	2,000,000 *(1,600,000)*	5 Regions (Central, Eastern, Volta, Ashanti, Brong-Ahafo,)	Broaden existing voucher program in four ways: a) support recent expansion from 4 to 5 regions; b) expand geographically within those regions; c) expand to children under 5; and d) increase the face value of the discount from 40,000 to 60,000 cedi. (Non- commodity costs support admin. and management of the voucher system as well as social marketing targeted at the general population to increase access and use of ITNs.)	20
2. Expand MOH direct subsidized ITN sale program	DELIVER	2,200,000 *(2,200,000)*	Nationwide	Procure at least 350,000 LLINs for the public sector subsidized net distribution though ANC and other public health facilities.	20
3. Bed net re-treatment	NetMark	500,000 *(500,000)*	Targeted districts with high conventional net ownership	Purchase of KO Tab 1-2-3 tablets for community-based re-treatment of at least 275,000 bed nets.	20
4. Logistics for child health/ITN integrated campaign	DELIVER	200,000	Nationwide	Support logistics for November 2007 national integrated child health/ITN campaign.	20
5. BCC/IEC at the community level to promote ITN use including evaluation	GSCP + New Malaria RFA	600,000	Nationwide	Support BCC/IEC at community level to promote correct and consistent use of ITNs by pregnant women and children under five including radio; support post net distribution campaign evaluation. (CHPS-TA plays a collaborating partner role in this activity.)	20

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
6. Systems support for strengthening management of national ITN program	DELIVER	150,000	Nationwide	Systems support for strengthening management of national public/private partnership for ITNs including database development and information management linking NMCP to institutional sales of LLINs to mines/agriculture groups and special distributions for PLWHA, etc.	20
7. IRS Implementation	RTI	2,150,000 *(1,000,000)*	Targeted districts (TBD in collaboration with MOH)	Entomological assessment; Environmental Assessments and safer use action plan; Procurement of IRS supplies and equipment, implementation, data collection, IEC/BCC, logistics support for 100,000 households.	23
8. Entomological monitoring	USAID	10,000	Targeted districts	TA for entomological /vector control program monitoring and support.	24
9. Capacity building and implementation of entomological monitoring, including resistance monitoring	RTI (in collaboration with Noguchi)	175,000	Nationwide	Building on existing strengths for resistance and entomology monitoring, provide support for implementation of entomological monitoring including resistance monitoring.	24
SUBTOTAL: Preventive		**7,985,000 *(5,300,000)***			
MALARIA IN PREGNANCY					
1. Pre-service and in-service training for MIP	QHP	0 (see Case Management Section)	Nationwide	Update pre-service training curricula for MIP and for pre- and in-service training for MIP. (Part of comprehensive malaria training activities)	25

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
2. Strengthen FANC to build capacity to effectively deliver a package of malaria prevention and care services	QHP / ACCESS	600,000 (complementing FY07 and FY08 Mission RH funds)	Nationwide	Support the provision of quality, comprehensive and integrated FANC services to enhance pregnant women's use of an LLIN, to complete IPTp and receive adequate education on malaria. Support will include the development and printing of training materials and the training of health workers to effectively deliver a package of malaria prevention and care services.	25
SUBTOTAL: MIP		**600,000**			
CASE MANAGEMENT ACTIVITIES					
1. Laboratory baseline assessment	New Diagnostic Procurement	100,000	Nationwide	Assessment of malaria laboratory diagnostic capacity and infrastructure. QHP will collaborate on this activity to help facilitate the work of the Diagnostic partner.	28
2. Development and implementation of microscopy and RDT policy	New Diagnostic Procurement	200,000	Nationwide	Support NMCP to finalize written malaria laboratory diagnosis policy and implementing that policy, including training lab personnel and health care workers in the use of microscopy and RDTs. QHP will collaborate on this activity to help facilitate the work of the Diagnostic partner.	28
3. Procure laboratory equipment and supplies	DELIVER	400,000 (375,000)	Nationwide	Procurement of equipment, reagents and supplies (including at least 50 microscopes, lamps and RDTs) and provide logistics system support for public sector laboratories.	28
4. Laboratory quality control and supervision	New Diagnostic Procurement	210,000	Nationwide	Support to NMCP to improve supervision and quality control of public sector laboratories. QHP will collaborate on this activity to help facilitate the work of the Diagnostic partner.	28
5. Procure second-line ACT; rectal artesunate,	DELIVER	1,200,000 *(1,200,000)*	Nationwide	Procurement of second-line ACTs; rectal artesunate and severe malaria treatment and supplies	28

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
and drugs for severe malaria					
6. Pre-service and in-service training to strengthen malaria case management	QHP	700,000	Nationwide	Update curricula, support pre- and in-service training including private chemical sellers as well as Public Sector	28
7. Home-based management of fever	QHP / CHPS-TA	400,000	Nationwide	Support NMCP in updating policy for HBMF including advocacy for policy makers (QHP). Once policy is in place, define best practices through pilot activity to inform national roll-out (CHPS-TA).	28
8. IEC/ BCC for proper use of ACTs	GSCP + New Malaria RFA	605,000	Nationwide	Support for IEC/BCC targeting health care workers and general public for proper management and use of ACTs (part of comprehensive IEC/BCC strategy – linked with IEC/BCC budget in prevention section above).	28
9. Strengthen drug management system capacity	SPS	600,000	Nationwide	Strengthening of drug management system capacity including development of a comprehensive drug logistics information system supervision, forecasting, warehousing, etc. (at regional and district levels)	29
10. Strengthen drug quality monitoring capacity	USP	190,000	Nationwide	Provide support for strengthening drug quality monitoring capacity in collaboration with Food and Drug Board.	29
11. Technical Assistance	CDC IAA	40,000	Nationwide	TA for a) laboratory survey and policy, and b) pharmacovigilance	29
12. Pharmaco-vigilance	WHO (FDB)	50,000	Nationwide	Provide support for development of a pharmacovigilance system	29
13. *In vivo* clinical efficacy monitoring	WHO (subgrants to sites locally)	50,000	Nationwide	Support for *in vivo* clinical efficacy monitoring at a minimum of three different sites per year (total 10 sites: 3 year one + 4 year two +3 year three).	29
14. Health Facility Survey	QHP	200,000	Nationwide	Assess implementation of the new drug policy and malaria case management, IPTp use and health worker performance in sick child clinics, ANCs and in-patient facilities.	29

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
SUBTOTAL: Case Mgmt.		**4,945,000 *(1,575,000)***			
INTERMITTENT PREVENTIVE TREATMENT OF INFANTS					
1. IPTi early implementation	QHP (with local partners)	300,000	Targeted districts	Sustain and build upon IPTi programs in Tamale, Navrongo, and/or Kumasi and work with MOH/NMCP to develop written IPTi policy.	29
SUBTOTAL: IPTi		**300,000**			
NGO COLLABORATION & CAPACITY BUILDING					
1. Strengthen capacity of indigenous NGOs to implement community-based malaria control activities	GSCP (subcontracts with NGO and NGO networks) / New Malaria RFA	800,000	Nationwide	Provide support to the NMCP to expand in number and geographic coverage of NGOs and NGO networks to extend the reach of malaria prevention and control activities at the community level.	29
2. Strengthen capacity for malaria program management and supervision	QHP (including subgrants to GHS regional and district levels)	200,000	Nationwide	Improve NMCP capacity for program management and supervision at the zonal, regional and district levels in collaboration with in-country partners.	33
3. Support NMCP IT network capability	New Malaria RFA	0 (See M&E, Activity #3 below)	Accra	Strengthen IT network at NMCP including infrastructure support and training. QHP as collaborating partner on this activity.	33
SUBTOTAL: NGO & CAPACITY BUILDING		**1,000,000**			

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
MONITORING AND EVALUATION					
1. Support development of a unified, comprehensive malaria M&E plan	CDC IAA / TBD	50,000	Nationwide	Support NMCP to develop and implement a unified M&E plan, linked to the ongoing review and updating of the National Malaria Strategic Plan	35
2. Support for 2008 DHS	DHS MEASURE	500,000	Nationwide	Support for malaria module component of planned 2008 DHS including verbal autopsy, hemoglobin and parasitemia measurement	35
3. Sentinel Site Surveillance	MEASURE Evaluation / Dodowa Health Research Center (WHO subgrant)	240,000	5 Sites TBD	Establish up to 5 sentinel sites to collect routine facility-based data on malaria case for children < 5 and within one of the sites (DSS) implement a cross sectional survey in collaboration with Dodowa HRC to collect community level data to track health care utilization.	35
4. Technical Assistance	CDC IAA	10,000		Technical Assistance for Sentinel Site Surveillance activity from CDC M&E Advisor.	35
5. NMCP Data Management Support & Training	New Malaria RFA	150,000	Nationwide	Support to strengthen data management at the NMCP, including IT infrastructure, upgrading database/GIS and to support training of health information officers. QHP as collaborating partner.	35
SUBTOTAL: M&E		**950,000**			
IN-COUNTRY STAFFING AND ADMINISTRATION					
1. In-country staff and administrative expenses	USAID / CDC IAA	1,220,000	Nationwide	Salaries, benefits of in-country PMI staff, support staff, office equipment, supplies, and one vehicle.	36
SUBTOTAL: Mgmt. and Admin.		**1,220,000**			

Proposed Activity	Mechanism	Budget (*commodities)*	Geographic Area	Description of Activity	Page Number Ref.
GRAND TOTAL		**17,000,000** ***(6,875,000)***	***Commodities represent 40.4 % of total budget***		

******* The NetMark targeted voucher program, which includes related support for policy, communications and commercial sector strengthening, will initially receive $1,500,000 for Year I, with release of a further $500,000 predicated on success of the expansion of the voucher system in 2007 and early 2008. The NetMark Ghana annual report for FY 2007 for the period Oct. 2006-Sept. 2007 and a semi-annual report for the period Oct. 2007-Mar. 2008 will form the basis of this review. The second period will track the scale up that results once $2 million in 2007 funds is available.

Indicators that will be used to determine the success of the NetMark voucher program in Central Region (the target region for scale up) include: the percent of all health facilities (public and private) that offer the vouchers to pregnant women and children under 5; the total number of vouchers given out, expressed as a percentage of expected pregnancies and of children under five not already sleeping under a net; the total number of vouchers redeemed; the growth and number of commercial vendors in the region selling LLINs from NetMark partner organizations; and the behavior change campaigns carried out to encourage purchase and regular use of the nets by vulnerable groups. To determine the actual percentage of vulnerable groups that receive LLINS in Central Region, the quantity and relative contribution of other distribution systems for LLINs will also be tracked. Based on projected populations of pregnant women and children <5, approximately 35,000 nets per quarter should be distributed to reach vulnerable groups in this region.

The performance of the NMCP voucher program funded by GFATM that is running concurrently in four other southern regions, with NetMark's technical support, will also be tracked. The number of vouchers distributed in these regions and the coverage achieved through this program as well as the free/subsidized net distribution will be the main indicator; if problems occur because of GFATM issues outside of NetMark's control, then the responsiveness of NetMark to step in and fill gaps will be noted.

Table 3

Ghana – Year 1 Targets
Assumptions and Estimated Year 1 Coverage Levels

Year 1 PMI Expected Results:

- More than 1 million LLINs will have been distributed nationwide to vulnerable populations.
- More than 368,000 pregnant women will receive two or more doses of IPTp with SP;
- Approximately 100,000 households targeted for IRS will have been sprayed, protecting more than 500,000 residents;
- Approximately 1,208,000 ACT doses will be available to treat at least 345,000 children under five with 3 episodes of fever;
- Approximately 14,700,000 ACT doses will be available to treat older children and adults diagnosed with malaria.
- Rapid assessment of malaria laboratory diagnostic capacity and infrastructure will have been completed;
- National policy on malaria diagnosis including a strategy on the use of malaria microscopy and rapid diagnostic tests in different malaria epidemiologic and health care settings will have been developed;
- Unified, comprehensive national malaria M&E plan developed.

Assumptions:

Population of country (estimated): 23 million (assume 100% of population at risk for malaria including urban settings)

Pregnant women:	5% of total population =	1,150,000 pregnant women
Infants (children <1):	4% of population =	920,000 infants
Older children (5-19):	36% of population =	8,280,000 older children
Children <5:	15% of population =	3,450,000 children under five
	49% of population =	11,270,000 adults

Average number of malaria-like illnesses per year and cost per treatment with AS/AQ:

Children <5:	3.5	illnesses/year at $0.60 each
Older children (5-19)	2.0	illnesses/year at $1.00 each
Adults	0.5	illnesses/year at $1.75 each (assume that the PMI will cover only one-third of adult episodes)

Cost of IPTp with SP: $0.30 ($0.10 for each of the three treatments a woman will receive during her pregnancy)
Cost of a LLIN = $7.00/net; Average of 2.5 nets/household needed to cover all pregnant women and children under five in family
Average of 4 persons/household (2004 DHS); Cost of spraying a house = $15.00

Inter-vention	Needs for 100% Nationwide Coverage over 3 Years*	Needs for 85% Nationwide Coverage over 3 Years*	Annual Needs to Achieve 100% Coverage	Needs to Achieve Year 1 PMI Targets	Year 1 Contributions
IPTp	1.150 million pregnant women x 3 treatments/woman = 3.45 million treatments/year x 3 years = 10.35 million treatments	8.8 million SP treatments	3.45 million SP treatments	**Target:** 40 *% of pregnant women receive 2 or more doses of IPTp* = 1.38 million treatments	SP part of GOG annual health budget; no remaining gap
LLINs	Mean household size = 4 5.75 million households X 2.5 nets / household = 14.375 million LLINs	12.22 million LLINs	14.375 million LLINs	**Target**: 45% *of households have at least one ITN* *.45 X 5.75 households = 2.59 million nets*	Procure and distribute about 500,000 LLINs; support distribution campaign of 2.0 million LLINs
ACTs – children < 5	3.450 million children under 5 x 3.5 episodes/year = 12.075 million treatments/ year x 3 years = 36.2 million treatments	12.075 million x 85% = 10.264 million treatments x 3 yrs = 30.77 million	12.075 million treatments	**Target**: 60% *of children under 5 receive treatment with ACT*s (within 24 hours of onset of fever) 12.075 X .60 = 7.245 million treatments	Procure and distribute second line ACTs; strengthen supply change management and appropriate and effective use of malaria drugs
ACTs – older children	8.280 million older children x 2.0 episodes/year = 16.56 million treatments/year x 3 years = 49.68 million	16.56 million x 85% = 14.09 million tx x 3 yrs. = 42.23 million	16.56 million treatments		
ACTs - adults	11.270 million adults x .5 episodes/year 5.635 x 33% = 1.86 million treatments/ year x 3 years = 5.58 million treatments	1.86 million x 85% = 1.58 million tx x 3 yrs. = 4.74 million	1.86 million treatments		
TOTAL	91.46 million treatments	77.34 million treatments	30.49 million treatments		

Inter-vention	Needs for 100% Nationwide Coverage over 3 Years*	Needs for 85% Nationwide Coverage over 3 Years*	Annual Needs to Achieve 100% Coverage	Needs to Achieve Year 1 PMI Targets	Year 1 Contributions
Drugs for severe malaria children <5 Drugs for severe malaria older children	12.075 million cases in children under 5 x 10% severe episodes/year = 120,000 treatments/year x 3 years = 360,000 treatments 22.75 million cases in older children x 2% episodes/year = 45,500 treatments/year x 3 years = 136,500 treatments	360,000 X .85 = 306,000 treatments for children under five (136,500 X .85 = 116,025 treatments for older children) [306,000 + 116,025 = 422,025 treatments for children under five and older children combined]	120,000 for children under five 45,500 for older children 120,000 + 45,500 = 165,500 treatments for children under five and older children combined	N/A	Procure rectal artesunate
IRS	X population in districts targeted for spraying (TBD) Assume 85% or greater acceptance rate = X population or greater to be protected	300,000 households targeted over three years	100,000 households targeted for spraying annually	**Target**: *85% of targeted houses to be sprayed* 100,000 households to be sprayed	100,000 households targeted for spraying

Table 4

President's Malaria Initiative – Ghana
Year 1 (FY08) Budget Breakdown by Intervention ($000)

Area	Commodities $ (%)	Other $ (%)	Total $
Insecticide-treated Nets	4,300 (76%)	1,350 (24%)	5,650
Indoor Residual Spraying	1,000 (43%)	1,335 (57%)	2,335
Case Management	1,575 (32%)	3,370 (68%)	4,945
Prevention of Malaria in Pregnancy	0	600 (100%)	600
Intermittent Preventive Treatment Infants	0	300 (100%)	300
NGO / FBO Collaboration	0	800 (100%)	800
Capacity Building	0	200 (100%)	200
Monitoring and Evaluation	0	950 (100%)	950
Staffing and Administration	0	1,220 (100%)	1,220
Total	**6,875 (40.4%)**	**10,125 (59.6%)**	**17,000**

Table 5

President's Malaria Initiative – Ghana
Year 1 (FY08) Budget Breakdown by Partner ($000)

Partner Organization	Geographic Area	Activity	Budget
DELIVER	Nationwide	Procure LLINs, second-line ACTs, rectal artesunate, severe malaria drugs and lab and anemia management equipment and supplies, and support logistics for child health/free net distribution campaign.	$4,150
NetMark	5 Regions	Expand ITN voucher program; implement bednet retreatment	$2,500
Research Triangle Institute (RTI) (*with subgrants to local entities including Noguchi Memorial Institute of Medical Research*)	Target sites TBD	IRS implementation, IRS Baseline entomological and environmental assessments, capacity building and implementation of entomological and resistance monitoring.	$2,325
Quality Health Partners Project (QHP)	Nationwide	Strengthen malaria case management, support FANC, support early implementation of IPTi, and improve program management and supervision capacity.	$1,800
Ghana Sustainable Change Project (GSCP)	Nationwide	Implement comprehensive BCC/IEC malaria strategy at all levels	$1,100
New Malaria Procurement (RFA)	Nationwide	In collaboration with NetMark, expand ITN voucher program; implement bednet re-treatment; in collaboration with GSCP implement comprehensive BCC/IEC strategy including subgrants at district level.	$1,055
Strengthening Pharmaceutical Systems (SPS)	Nationwide	Strengthen drug management system capacity.	$600
New Diagnostics Cooperative Agreement	Nationwide	In collaboration with local partner (QHP), provide TA for laboratory assessment and laboratory policy development and implementation.	$510
DHS MEASURE Follow-on	Nationwide	Support for malaria module including verbal autopsy as part of planned 2008 DHS.	$500
Community-based Health Planning Services Technical Assistance Project (CHPS-TA)	Target districts TBD	Support early implementation of home based management of fever to inform policy development for national roll-out.	$350 (*adding to FY07 funds*)
ACCESS Project - JHIEPGO	Nationwide	Technical assistance for FANC strengthening in collaboration with local partner, QHP.	$250
MEASURE Evaluation	Up to 5 sites	Technical assistance for Sentinel Site	$200

Partner Organization	Geographic Area	Activity	Budget
	in 5 different regions	Surveillance.	
United States Pharmacopeia (USP)	Nationwide	Strengthen drug quality monitoring capacity in collaboration with Food & Drug Board.	$190
WHO (*including subgrants to Food & Drug Board; SSS and Dodowa Health Research Center*)	Nationwide	Provide support for pharmacovigilance system; Support 3 DSS sites to collect malaria specific and all-cause mortality data; support *in vivo* clinical efficacy monitoring.	$140
CDC IAA	Nationwide	Technical assistance for laboratory assessment and policy development; for pharmacovigilance capacity building; for development of M&E plan; and for implementation of health facility survey.	$100 (*not including CDC staffing and admin costs*)
USAID	Targeted districts	TA to support entomologic monitory and vector control.	$10

ANNEX 2

GHANA

PRESIDENT'S MALARIA INITIATIVE

THREE-YEAR STRATEGY

GHANA

President's Malaria Initiative Three-Year Strategy

Malaria is a major cause of morbidity and mortality in Ghana. The disease is endemic nationwide. Transmission is stable and takes place year round, although there is a drop-off in the northern savanna zone during the dry season, November-April. *Plasmodium falciparum* accounts for more than 90% of all malaria infections. *Anopheles gambiae* and *An. funestus* are the major vectors.

Based on a population of 23 million, populations particularly vulnerable to malaria in Ghana comprise an estimated 3.45 million children under five and 1.15 million pregnant women. There are also an estimated 320,000 persons living with HIV/AIDS (PLWHA), some of whom fall within the two previous groups.

TARGETS OF THE PRESIDENT'S MALARIA INITIATIVE

By 30 September, 2010, the PMI will provide accelerated resources to achieve the following targets in populations at risk of malaria in Ghana:

1. more than 90% of households (in areas not covered by IRS) will own at least one ITN;
2. 85% of children under five (in areas not covered by IRS) will have slept under an ITN the previous night;
3. 85% of pregnant women (in areas not covered by IRS) will have slept under an ITN the previous night;
4. 85% of houses in areas targeted by the MoH for IRS will have been sprayed;
5. 85% of pregnant women and children under five will have slept under an ITN or in a house that has been sprayed with residual insecticides;
6. 85% of pregnant women will have received two or more doses of SP for IPTp during their pregnancy; and
7. 85% of children under five with suspected malaria will have received treatment with an ACT within 24 hours of the onset of their symptoms.

PREVENTION ACTIVITIES

Insecticide-treated nets (ITNs): Ghana has seen a remarkable increase in ITN coverage over the past 5 years and further increasing coverage with ITNs remains a high priority for the Ghanaian MOH. A large number of organizations including indigenous and international NGOs are active in ITN distribution and promotion in Ghana. According to current policy, ITN distribution will be targeted to pregnant women and children under five using a mixed or segmented market approach. This includes distribution of free ITNs through large-scale health campaigns, sale of subsidized nets through MOH antenatal clinics (ANCs) and through commercial outlets using a voucher system, and support and promotion of a commercial market for full-cost ITNs for people who can afford them. Seven different ITN brands in a variety of shapes, colors and styles are registered in Ghana. The MOH supports the use of long-lasting

ITNs (LLINs) over conventional ITNs. The Government of Ghana has waived taxes and tariffs on ITNs, but insecticides used for re-treatment are still subject to import taxes.

According to the most recent Multiple Indicator Cluster Survey carried out in 2006, 18.7% of households own one or more ITNs and 22% of children under five slept under an ITN the previous night.

The PMI will support distribution of free LLINs to children under five through large-scale child immunization or health campaigns and distribution of subsidized LLINs to pregnant women during routine ANC visits using both the MOH system and the voucher system. To increase access to subsidized LLINs, the value of the voucher will be increased to equal that of the subsidy provided for nets purchased through ANCs. Efforts will also be made to improve ANC utilization rates, as these clinics offer the most attractive way to reach new pregnant women and sustain high ITN coverage rates of vulnerable groups once all children under five have received a net through large-scale campaigns. With the very low net usage rates reported in the 2006 Multiple Indicator Cluster Survey, PMI will place a major emphasis on behavior change communication efforts directed at increasing net usage.

Given the challenges of trying to ensure regular net re-treatment in widely-scattered and difficult to reach populations, the PMI should only procure LLINs which do not require re-treatment. With increasing worldwide production, sufficient numbers of LLINs are expected to be available over the next 3-4 years to meet all needs in Ghana. Since approximately 15% of the bed nets already distributed in Ghana are not LLINs, PMI will support net re-treatment efforts in the first year of PMI. Evidence suggests that K O Tab 123® (Bayer Environmental Science) is the best product currently available for net re-treatments, although it is not equivalent to a factory-produced LLIN in terms of the duration of the insecticidal effect.

Most of the ITN needs for the November 2007 immunization/ITN campaign are expected to be met by other partners, so the PMI will provide assistance with logistics and IEC/BCC support. With the 1.9 million LLINs distributed during the 2006 campaign and the 2.1 million targeted for the 2007 campaign, household ownership rates of one or more ITNs should increase to 80% or more. At the present time, it is not thought that an additional large-scale ITN distribution campaign will be needed in 2008. Consequently, PMI will support filling in remaining gaps in coverage through procurement and distribution of LLINs through ANCs and the voucher program. After 2008, approximately 1.1 million nets will be needed annually to sustain 100% coverage of newly pregnant women through ANCs. Depending on contributions by other partners, beginning in FY 2009, PMI should plan to procure approximately 400,000 LLINs annually. If other partners maintain their current level of support to ITNs, it should be possible to meet nearly all needs for 2009 and beyond.

Indoor residual spraying (IRS): The MOH and NMCP place a high priority on scaling up IRS in Ghana. Currently, the only large-scale IRS activities in Ghana are supported by private mining companies, such as the Anglogold Ashanti Mining Company, which has been conducting a very high quality malaria control program in Obuasi District since 2004. Insecticide resistance remains a major challenge for vector control operations in Ghana with high levels of resistance to DDT, bendiocarb, and some synthetic pyrethroids. Given the in-country expertise in planning,

conducting, and monitoring and evaluation of spraying activities through the AngloGold Ashanti Mining Company, it should not be difficult to expand IRS to other areas.

During FY08, the PMI will provide support to expand IRS in Ghana to an additional area of approximately 100,000 households. The site(s) for this expansion will be determined in discussions with the NMCP. PMI support to IRS in Ghana will include an environmental assessment and a detailed plan for safe storage, use, and disposal of insecticides, as well as initial planning, training, conduct, supervision, and a thorough evaluation of any IRS activities. In addition, PMI will work with the NMCP to refine its national IRS and ITN strategies and develop a detailed written national vector control plan to provide maximum protection together with the most cost-effective use of resources. PMI support to IRS beyond FY08 will depend on the finalized national strategy and plan.

PMI will also support strengthening of the general entomologic and vector control capabilities of the NMCP and MOH staff at the central, provincial, and district levels, including support for routine entomologic monitoring and baseline entomologic assessments in other areas of the country where IRS may be used in the future. This will include monitoring the insecticide resistance status of malaria vectors at selected sites to ensure continued efficacy of IRS- and ITN-based strategies. Fogging and outdoor ULV (ultra-low volume) spraying are not effective methods for malaria vector control and their use should not be supported with PMI resources.

Intermittent preventive treatment in pregnant women (IPTp): According to the Reproductive and Child Health Unit, 88.7% of pregnant women attend ANCs one or more time, with the number of visits per woman averaging 3.4. About 31% of pregnant women register their first ANC visit during the first trimester, while 50% first attend in the second trimester.

Ghana adopted IPTp with sulfadoxine-pyrimethamine (SP) in 2004. The NMCP recommends three doses of SP to be administered to HIV-negative pregnant women starting after quickening (16 weeks or thereafter) with each dose administered at least one month apart. All doses are recommended to be administered under direct observation. HIV-positive pregnant women are to receive monthly doses of SP. At the time this report was prepared, information was not available from the 2006 Multiple Indicator Cluster Survey on the proportion of pregnant women who received one or more doses of SP for IPTp.

The PMI will fund the distribution of highly subsidized ITNs through ANCs as a means of promoting attendance earlier in pregnancy and increasing the total number of ANC visits each pregnant woman makes. The PMI will support pre- and in-service training and supportive supervision of health care workers in the diagnosis and treatment of malaria and anemia in pregnancy and the use of IPTp as part of overall strengthening of Focused Antenatal Care. Support will also be provided for development and dissemination of information, education and communication messages to ensure that women and their families are aware of the risks of malaria during pregnancy, to promote attendance at ANCs and the use of IPTp beginning early in the second trimester of pregnancy, and completing the recommended three doses of SP.

If each pregnant woman is to receive three treatments with SP during her pregnancy, a total of 3.45 million treatments will be required annually in Ghana. According to the NMCP, there is

sufficient SP in the planned medicine kit procurements to meet all SP needs for 2007-2008. It is also expected that SP needs for IPTp and quinine needs for treatment of malaria during pregnancy will continue to be financed by the MoH over the next 3-4 years from funds provided by other donors into the common basket.

Intermittent preventive treatment of infants (IPTi): It is highly likely that by early 2008 WHO will recommend IPTi with SP as a measure to reduce the impact of malaria during the first year of life and will encourage African countries to adopt this new policy. Ghana already has some experience with this intervention at several study sites supported by the Gates Foundation. The PMI will work with the MOH and NMCP to promote early adoption of IPTi (assuming WHO approval is forthcoming), development of a detailed implementation plan, and the rollout of the new policy. In the short-term, PMI will work with the NMCP and partners to support continuation of IPTi programs in the study areas where it is already ongoing so as not to lose the experiences gained there.

CASE MANAGEMENT ACTIVITIES

Malaria diagnosis: Microscopic diagnosis of malaria is available in all regional and district hospitals and, according to national policy, should also be available at the health center level in Ghana; however, a 2004 survey of 171 health facilities in 30 districts in the five southern regions showed that only 3.3% of health centers could conduct malaria microscopy. The same survey indicated that a lack of equipment, supplies, and trained personnel were common problems in regional and district hospitals and health centers. Little information is available on the quality of malaria laboratory diagnoses.

The NMCP is committed to strengthening microscopic diagnosis where it already exists. There is at present no national policy on the use of rapid diagnostic tests (RDTs) for malaria in Ghana and RDTs are not being used within MOH facilities. The NMCP recently set up a committee to study and provide recommendations on the role and use of RDTs for malaria diagnosis to inform national policy. The current guidelines for malaria treatment in Ghana recommend confirmation of diagnosis through microscopy whenever possible, but when laboratory diagnosis is not possible, treatment should be based on a presumptive diagnosis of malaria. Children under five are to be treated according to Integrated Management of Childhood Illness guidelines.

With the increased cost of ACTs when compared with traditional monotherapies, accurate diagnosis will be critical to target treatment to infected patients and reduce the overuse of antimalarial drugs. In addition, accurate information on the geographic and seasonal distribution of malaria will be needed for planning and evaluation of malaria control activities. The PMI views malaria laboratory diagnosis as a key component of good case management and will support strengthening of malaria diagnosis in MOH facilities. The PMI will work with the NMCP and other partners to develop a written national strategy and detailed implementation plan for microscopy and RDTs at different levels of the health system and in different clinical and epidemiological settings. Support will be provided for a detailed assessment and inventory of the existing malaria laboratory diagnostic network in FY08. The PMI will support strengthening of pre-service and in-service training for MOH laboratory technicians in malaria

diagnosis and upgrading capabilities for quality control of laboratory diagnosis of malaria. The PMI also recognizes the benefits of combining malaria laboratory training with training for other diseases, such as tuberculosis, and will work with the national tuberculosis and HIV/AIDS programs to strengthen laboratory facilities. It will be particularly important to ensure that health workers are trained in the proper interpretation of laboratory tests for malaria, as some clinical officers ignore the results of laboratory tests when their results do not agree with their clinical judgment.

Decisions on PMI procurement of microscopes, microscopy supplies, and RDTs will be based on the initial evaluation of the existing malaria diagnostic network, together with estimated funding for malaria diagnosis from the Global Fund and other partners.

Treatment: In 2004, Ghana adopted AS/AQ as its first-line therapy for uncomplicated malaria; policy on a second-line therapy has not yet been finalized. An AS/AQ treatment costs about $0.30 at government health facilities. Quinine is recommended for the treatment of severe malaria. It is also recommended for the treatment of malaria in pregnant women during the first trimester; AS/AQ is recommended during the second and third trimesters. Although not included in national guidelines, the NMCP is considering the use of artesunate rectal suppositories for the emergency treatment of severe malaria in children in settings in which intramuscular or intravenous quinine cannot be administered. The MOH is currently conducting research on community-based management of fever to gain experience on the best way to deploy ACTs at the community level.

Implementation of AS/AQ began in 2005 and more than 8,000 health workers have already been trained, but little information is available on how well the rollout is proceeding. The proportion of children under five who received an appropriate antimalarial drug in the previous 24 hours for a suspected malarial illness was 48% according to the 2006 Multiple Indicator Cluster Survey.

The forecasting of required quantities of AS/AQ for first-line treatment has been based on the expected number of malaria patients stratified by age group that would attend public health facilities. Using this approach, it is estimated that about 2.4 million treatments would be needed in 2006. With Global Fund Round 4 funds, 5.7 million pre-packaged AS/AQ treatments have been procured from a WHO pre-certified supplier, Ipca Laboratories Limited, in India and dispensed for use by public sector health facilities. It is thought that the Global Fund grants will cover all ACT needs until 2009. If it is assumed, however, that there are 3.45 million children under five in Ghana, that each one has 2-4 episodes of fever annually, and that 50% of those children attend a MOH facility, this age group alone would require 3.5-6.9 million treatments. Consequently, even with improved diagnosis and expanded IRS and ITN coverage (and the subsequent reduction in malaria transmission), the nationwide requirements for ACTs in the future are expected to be considerably higher than these initial estimates. The pharmaceutical management system in Ghana is also quite weak and may not be able to meet all of the needs of the health care system. In the private sector, a variety of antimalarial drugs are available for purchase without prescription including artemisinin monotherapies.

Ensuring prompt, effective, and safe ACT treatment to $\geq$85% of patients with confirmed or suspected malaria will represent one of the greatest challenges for PMI, given the country's weak

pharmaceutical management system, the high cost and short shelf life of AS/AQ and the low usage rates of ACTs at the community level. The PMI will coordinate its activities with those of the NMCP, MOH, Central Medical Stores, and other partners. The PMI will work with partners to provide technical assistance to the NMCP in updating their national malaria treatment policy and developing a detailed, written ACT implementation plan. The PMI will help to fill gaps in procurement needs for second-line ACTs, quinine, and artesunate suppositories. Emphasis on strengthening the pharmaceutical management system in collaboration with the MOH, Central Medical Stores and the NMCP will help ensure constant supplies of antimalarial drugs and avoid stockouts and loss of drugs due to expiration. Efforts also need to be made to strengthen in-country capabilities in monitoring drug quality, given the increasing numbers of fake or substandard antimalarial drugs circulating in West Africa. The PMI will also support pre- and in-service training and supportive supervision of health workers to ensure good ACT prescribing and dispensing practices in coordination with Integrated Management of Childhood Illness program and development and implementation of an information, education, and communication plan for ACT implementation. Support will also be provided for some early implementation of community-based management of malaria with ACTs. Ghana will need an ongoing system to monitor the efficacy of the first- and second-line antimalarial drugs on a regular basis and PMI will work with other partners to provide support for this activity. Decisions on PMI procurement of supplies of AS/AQ in FY2009 and later will be based on improved forecasting of drug needs, the results of the Global Fund Round 7 proposal, and discussions with the MOH and NMCP. Global production of ACTs is expected to be sufficient to meet Ghana's needs over the next two to three years, but the PMI will monitor worldwide demand and supplies closely.

MONITORING AND EVALUATION

The PMI's monitoring and evaluation plan will be coordinated with those of the NMCP, the GFATM, and other partners. A nationwide Demographic and Health Survey (DHS) will be conducted in 2008 (soon after the peak malaria transmission season). This survey, together with information from the 2006 Multiple Indicator Cluster Survey and data on the prevalence of parasitemia and anemia, will be used to provide baseline information on coverage of the four major interventions. Verbal autopsies will be conducted as part of the DHS to estimate malaria-related mortality. The PMI will also support a baseline health facility survey in 2008 to assess health worker performance in facility-based malaria prevention and treatment activities. An end-of-Initiative Malaria Indicator Survey in 2011 will measure progress related to the key coverage and mortality targets described above. Information on other indicators of interest, such as the number of children and pregnant women attending child health and ANC clinics, the number of health facilities delivering IPTp and ACTs, the number of ITNs distributed, stockouts of drugs, and the quality of health services will be collected through routine monitoring by the MoH and other partners and/or smaller, targeted surveys or studies. The PMI will support upgrading of the data management capabilities of the NMCP with hardware, software, and training to improve the malaria surveillance and monitoring and evaluation system.

SUSTAINABILITY

The three-year strategic plan for Ghana is designed to begin addressing the complex issues of long-term sustainability and building national capacity over time. The PMI's framework for sustainability addresses three major components: management capacity; technical knowledge and skills; and financial strengthening.

Strengthening management capacity: The PMI plans to place two full-time malaria advisors in country to support the MOH and NMCP and to oversee implementation of PMI-supported activities with the USAID Mission. It is hoped that these two individuals will be located in or near the NMCP offices and will work closely with NMCP counterparts on day-to-day management and implementation of the PMI and NMCP. Special attention will given to work with the NMCP to build capacity in areas such as planning, budgeting, human resources management, and financial management systems and working in collaboration with other MOH departments and sections as well as with implementing partners. Strengthening these systems will be integral to the NMCP's effective use of resources and ability to attract further resources through the national budget and other donors, such as the GFATM.

Technical knowledge and skills: PMI activities will be implemented in a way that will result in the transfer of technical knowledge and skills to local partners including staff of the NMCP and other MOH departments, non-governmental organizations, community- and faith-based organizations, health workers, and private sector partners. The PMI will also focus on IEC/BCC activities directed at increasing Ghanaians' understanding of the risks of malaria, encouraging the adoption of prevention measures, and seeking appropriate treatment in a timely manner, and promoting demand for quality health services related to malaria.

Financial sustainability: Financial sustainability will be one of the most challenging areas to address within the PMI. There are legitimate concerns that 85% coverage levels for key interventions such as ITN and IRS coverage and access to ACTs are unlikely to be sustained over time without adequate future financing. However, improved local managerial and technical capacity, together with reductions in the cost of and need for key malaria commodities as malaria transmission is brought under control, should make it easier for the MOH to take on increased responsibility to fund key interventions. Other financing sources available to the MOH will include an increased portion of the national budget, resources from other donors including the GFATM, and a greater private sector market share for malaria commodities, such as ITNs. Over time, shifting those beneficiaries that can afford to pay to the private sector will enhance sustainability and enable the government to more effectively target resources. Strategies to prime the local market will include working with private sector pharmacies, shops, and social marketing networks on training, IEC, and distribution.

Table 1
Timeline of Expected Coverage of Interventions – Ghana

Indicator	2006 Ghana MICS (preliminary)*	Year 1**	Year 2**	Year 3
Proportion of households with at least one ITN	19%	*45%*	*80%*	>90%
Proportion of pregnant women sleeping under an ITN the previous night	TBD%	*30%*	*70%*	85%
Proportion of children under five sleeping under an ITN the previous night	22%	*40%*	*70%*	85%
Proportion of targeted houses adequately sprayed with a residual insecticide in the last 12 months	NA	*85%*	*85%*	85%
Proportion of women who have received 2 or more doses of IPTp during their last pregnancy in the last two years	28%	*40%*	*60%*	85%
Proportion of children under five years old with fever in the last 2 weeks who received treatment with an ACT within 24 hours of onset of fever	3.4%	*60%*	*75%*	85%

*These figures represent coverage data as of August 2006, when the Multiple Indicator Cluster Survey was conducted; final baseline coverage figures for the PMI will be obtained from the 2008 DHS.
**Nationwide coverage of interventions will be measured on two occasions: (1) 2008 (baseline); (2) after September 2010. Coverage during the intervening two years will be estimated based on delivery of ACTs and IPTp treatments, distribution of ITNs, and households protected by IRS.

Table 2
Illustrative PMI 3-Year Budget and Expected Coverage Levels - Ghana

PMI Targets:
After three years of full implementation, the PMI will achieve the following targets in populations at risk of malaria in Mozambique:

- More than 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;
- 85% of government health facilities have ACTs available for treatment of uncomplicated malaria; and
- 85% of children under five with suspected malaria will have received treatment with ACTs within 24 hours of onset of their symptoms.

Assumptions:
Population of country (estimated): 23 million (assume 100% of population at risk for malaria including urban settings)

Pregnant women: 5% of total population = 1,150,000 pregnant women
Infants (children <1): 4% of population = 920,000 infants
Older children (5-19): 36% of population = 8,280,000 older children
Children <5: 15% of population = 3,450,000 children under five
49% of population = 11,270,000 adults

Average number of malaria-like illnesses per year and cost per treatment with AS/AQ:
Adults
Children <5: 3.5 illnesses/year at $0.60 each
Older children (5-19) 2.0 illnesses/year at $1.00 each
Adults 0.5 illnesses/year at $1.75 each (assume that PMI will cover only one-third of adult episodes)

Cost of IPTp with SP: $0.30 ($0.10 for each of the three treatments a woman will receive during her pregnancy)
Cost of a LLIN = $7.00/net
Average of 2.5 nets/household needed to cover all pregnant women and children under five in family
Average of 4 persons/household (2004 DHS)
Cost of spraying a house = $15.00

Item/Activity	Annual Cost per Person	Annual Cost	3-Year Total	Assumptions/Comments
Prevention – insecticide-treated nets		$22,020,833	$66,062,499	23 million people at risk of malaria = 5,750,000 households X 2.5 nets/household = 14,375,000 X 90% coverage = 12,937,500 – 3.5 million LLINs already distributed = 9,437,500 X $7.00 / net = $66,062,499
Prevention – indoor residual spraying		$1,275,000	$3,825,000	Assumes IRS (one round per year) will target 100,000 households in Year 1 -3; Total of 300,000 households X 85% coverage = 255,000 X $15 / household = $3,825,000. Possible scale up of IRS in years 2 & 3 will be based on lessons learned and NMCP IRS plan and is not budgeted in this assumption.
Treatment – malarial illnesses		$27,055,000	$81,165,000	Assumes treatment of 85% of all malaria-like illnesses in under-fives, older children, and adults (see assumptions listed above). 3.45 children <5 X 3.5 illnesses / yr = 12.075 X $.60 = $7.245; 8.280 older children X 2.0 = 16.56 X $1 = $16.56; 11.270 adults X .5 = 5.635 X .33 = 1.860 X $1.75 = $3.25 = $27.055 million annually
Treatment – IPT for pregnant women		$293,250	$879,750	1,150,000 pregnant women X 3 years = 3,450,000 X 85% coverage = 2,932,500 X $.30 per year = $879,750
Implementation Support	$0.92	$21,160,000	$63,480,000	Commodity management, human resources, supervision, training, social mobilization, etc. (23 million population at risk of malaria X $0.92 x 3 years)
Monitoring and Evaluation		$2,000,000	$6,000,000	There is currently no costed national M+E plan for Ghana. Assume that the cost to implement the national M&E plan is an estimated $2 million per year.
Cost of Program		$73,804,083	**$221,412,249**	

USG Implementation Support Costs		$1,220,000	$3,660,000	Long-term expatriate advisors' salaries, benefits, travel; local staff; office supplies and equipment for PMI in-country office; TDY from CDC and USAID
Total funding needed (including USG program costs)		$75,024,083	***$225,072,249***	
Government of Ghana malaria budget*		$1,845,000	$5,535,000	Assumes that the GOG's annual malaria budget is constant over the period 2008-2010 and funding is at the same level as it was in 2005 and 2006.
GFATM Round 4 approved funding (not yet expended)			$20,470,000	The funds from Round 2 will have ended by September 2008; Round 4 will be on-going during the 2008-2010 period. Also note: Ghana has submitted a Round 7 proposal.
UNITAID Grant for ACTs		$4,464,000	$4,464,000	
World Bank malaria funding		$10,000,000	$30,000,000	There is no WB Booster Program in Ghana. WB provides direct budget support to the health sector. Confirmation of targeted funds for one-time support for LLINs for the Nov. 2007 integrated child health / ITN campaign, with assumption that similar level of funding will be targeted to malaria in years 2-3**.
UNICEF		$1,200,000	$3,600,000	
Private Sector Contributions (Mining companies)			$2,692,000	AngolGold Ashanti and Newmont; Tarkwa Consortium of Mines**
Available funding from other sources			**$66,761,000**	
PMI funds available (estimated):				Assumes PMI funding is divided between countries based roughly on their populations
Year 1		$17,000,000		Year 1 planned level
Year 2		$19,000,000		Assumes a slight increase in funding from Year 1 in Years 2 and 3
Year 3		$19,000,000		Assumes a slight increase in funding from Year 1 in Years 2 and 3
Years 1 through 3			**$55,000,000**	
Total Available funding			***$121,761,000***	
Remaining Gap			**$103,311,249**	3-year shortfall to meet total need

*GOG support for malaria control programs as specified in Round 7 GFATM malaria proposal

**World Bank/ private sector planned support per Round 7 GFATM proposal