

Additional funding for the President's Malaria Initiative has been allocated under a Continuing Resolution from Congress for the remainder of FY07. USAID Malaria Programs were allotted \$248 million (\$25 million above the President's 2007 request) to allow the Agency to expand its bilateral global malaria initiative activities from the current 3 countries to 7. Country programs will expand access to long-lasting insecticide treated bed nets and indoor residual spraying, promote and support effective malaria treatment through the use of proven combination therapies; and increase prevention efforts targeted to pregnant women. With the additional funding FY 2007 Malaria Operational Plans (MOPs) will be updated. Revised MOPs will be posted soon.

PRESIDENT'S MALARIA INITIATIVE

Malaria Operational Plan – FY07

SENEGAL

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ABBREVIATIONS and ACRONYMS

ACT – artemisinin-based combination therapy
 AIDS – Acquired Immunodeficiency Syndrome
 ANC – antenatal clinic
 AQ – amodiaquine
 AS – artesunate
 BCC – behavior change communication
 CAD – University Cheikh Anta Diop
 CCF – Christian Childrens’ Fund Consortium
 CTO – Cognizant Technical Officer
 DHS – Demographic and Health Survey
 FBO – faith-based organization
 GFATM – Global Fund to Fight AIDS, Tuberculosis, and Malaria
 GoS – Government of Senegal
 HIV – human immunodeficiency virus
 HMIS – health management information system
 IEC – information, education, communication
 IMCI – integrated management of childhood illnesses
 IPT – intermittent preventive treatment
 IRS – indoor residual spraying
 ITN – insecticide-treated net
 LLIN – long-lasting insecticide-treated net
 MICS – Multiple Indicator Cluster Survey
 MIS – malaria indicator survey
 MOH – Ministry of Health
 MOP – Malaria Operational Plan
 MSH – Management Sciences for Health
 NGO – non-governmental organization
 PLWHA – people living with HIV/AIDS
 PMI – President’s Malaria Initiative
 PMTCT – prevention of mother to child transmission
 PNA – Central Medical Stores
 PNLP – Programme National de Lutte contre le Paludisme (National Malaria Control Program)
 PVO – private voluntary organization
 RBM – Roll Back Malaria
 RDT – rapid diagnostic test
 SP – sulfadoxine-pyrimethamine
 UNDP – United Nations Development Programme
 UNICEF – United Nations Childrens’ Fund
 WHO – World Health Organization

EXECUTIVE SUMMARY

Senegal has been selected as one of the four new countries to receive funding during the second year of the President's Malaria Initiative (PMI). The objective of this Initiative is to assist African countries, in collaboration with other partners, to rapidly scale up coverage of vulnerable groups, including children under five years of age, pregnant women, and people living with HIV/AIDS, with four highly effective interventions: artemisinin-based combination therapy (ACTs), intermittent preventive treatment for malaria in pregnancy (IPTp), insecticide-treated mosquito nets (ITNs), and indoor spraying with residual insecticides (IRS).

Senegal has a population of approximately 11 million with over 40% of the population living in urban areas, with a high rural to urban migration rate. Close to 60% of Senegalese living in rural areas are below the poverty line, living on less than \$1 per day. In urban areas, that number is almost 45%. Holding population growth constant at the current 2.6%, the economy must grow by 7.5% for 10 years in order to meet the Millennium Development Goal of halving the rate of poverty by 2015. Average household size is 8 persons. Although substantial improvements have been achieved since the 1960s, Senegal's indicators of human development remain unacceptable high with Senegal ranked 157 out of 177 countries worldwide in terms of the human development index. The infant mortality rate is 61 and the under five mortality rate is 121 per 1,000 live births. Maternal mortality is estimated to be 401 per 100,000 live births and the mean life expectancy is 56 years. The adult HIV prevalence is approximately 0.7%.

Malaria is a major cause of morbidity and mortality in Senegal and a high priority for the government. Three ecological zones of malaria transmission have been defined: the Senegal River valley (arid, near water, perennial transmission), a central zone with seasonal high transmission, and a southern zone with perennial transmission and a peak during the rainy season, from June to November.

Malaria is responsible for about one-third of all outpatient consultations and between 20% and 30% of mortality in health facilities. The 2005 Demographic and Health Survey (DHS) estimated (with data collected during the dry, low-transmission season), that almost 30% of children under five had had a fever during the two weeks before the survey. Twenty-five percent of these had taken either chloroquine, amodiaquine (AQ), or sulfadoxine-pyrimethamine (SP), but only 11.7% had taken the medication within about 24 hours of the onset of their symptoms. About 83% of pregnant women took an antimalarial drug to prevent malaria during their most recent pregnancy, with 21% having taken SP, which was introduced as the standard in 2003. About 38% of households possessed at least one mosquito net, with greater ownership in rural compared to urban areas and among the poorer as opposed to the richer quintiles. Overall, about 27% of households owned at least one ITN (ever-treated), with 20% owning a net that was factory-treated or had been treated with insecticide within the past 12 months. Only 14% of children under five slept under a net the night before the survey, with 10% under an ITN and 7% under a factory-treated or recently retreated net. Similar results were demonstrated for pregnant women.

Senegal is the recipient of a \$33.3 million Round 4 malaria grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria. Recently, the World Bank announced that it will provide \$12-

14 million over the next five years for malaria control in four regions as part of a multi-country Senegal River Basin Initiative. With support from the World Health Organization, UNICEF, and other national and international partners, a scaling up of malaria prevention and control interventions has already started.

This PMI Year 1 Malaria Operational Plan (MOP) for Senegal was developed in close consultation with the National Malaria Control Program and with participation of nearly all national and international partners involved with malaria prevention and control in the country. The activities that the PMI is proposing to support fit in well with the Ministry of Health Strategic Plan for Malaria Control, which was being finalized as this plan was developed.

To achieve the targets of the PMI in Senegal, the following major activities are proposed for the \$16 million of funding during Year 1 of the Initiative:

1. scale up coverage of children under five and pregnant women with ITNs through a variety of strategies (\$6,650,000);
2. support well-organized IRS activities in up to three districts (\$3,200,000);
3. strengthen the Ministry of Health's pharmaceutical management system and support safe and effective implementation of ACTs nationwide (\$2,975,000);
4. support the MoH to increase the proportion of pregnant women who receive two doses of IPTp at ANCs (\$800,000).
5. improve the quality of laboratory diagnosis of malaria (\$510,000); and
6. support a nationwide survey to measure coverage of major malaria interventions to provide baseline information for the President's Malaria Initiative (\$500,000).

As a "jump start" activity for the PMI in Senegal, support will be provided to a large-scale bed net re-treatment campaign scheduled to begin in September 2006, in which an estimated 100,000 bed nets will be retreated (paid for with USG FY06 funds).

A. PRESIDENT'S MALARIA INITIATIVE

On June 30, 2005, the United States Government 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 nets (ITNs), intermittent preventive treatment (IPTp) of pregnant women, and indoor residual spraying (IRS).

The Initiative began in Fiscal Year 2006 in three countries, Angola, Tanzania, and Uganda. Four additional countries were announced on June 8, 2006: Malawi, Mozambique, Rwanda, and Senegal. Proposed funding levels are \$135 million in FY07, \$300 million in FY08 and FY09, and \$500 million in FY10. The aim is to cover a total population of 175 million in up to 15 countries by 2010.

In implementing this Initiative, the United States Government is committed to working closely with host governments and within existing national malaria control strategies and 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 can be achieved.

This PMI Year 1 Malaria Operational Plan for Senegal was developed in close consultation with the *Programme National de Lutte contre le Paludisme* (PNLP; National Malaria Control Program) and with participation of nearly all national and international partners involved with malaria prevention and control in the country. The activities that the PMI is proposing to support fit in well with the Ministry of Health Strategic Plan for Malaria Control, which was being finalized as this plan was developed and build on investments made by USAID to improve and expand malaria-related services over the past several years. This plan briefly reviews the current status of malaria control policies and interventions in Senegal, identifies challenges and unmet needs if the targets of the PMI are to be achieved, and provides a detailed description of proposed Year 1 activities under the PMI. A 3-year Strategy and Plan for Senegal is presented in Annex 2.

B. MALARIA SITUATION IN SENEGAL

With a population of about 11 million, the Republic of Senegal is ranked 157 out of 177 countries in terms of the human development index. The infant mortality rate is 61 and the under five mortality rate is 121 per 1,000 live births. Maternal mortality is estimated to be 401 per 100,000 live births and the mean life expectancy is 56 years. The adult HIV prevalence is approximately 0.7%.

Administratively, the country is divided into 11 regions and 64 districts.



Malaria is endemic throughout Senegal. Three ecological zones have been defined: the Senegal River valley (arid, near water, perennial transmission), a central zone with seasonal high transmission, and a southern zone with perennial transmission and a peak during the rainy season. Malaria is responsible for about one-third of all outpatient consultations and between 20% and 30% of mortality in health facilities. The 2005 Demographic and Health Survey (DHS) estimated (with data collected during the dry, low-transmission season), that 30% of children under five had an episode of fever during the two previous weeks. The incidence of fever during the high transmission season is unknown.

Peak malaria transmission occurs from June to November. In areas close to rivers or other water sources that do not dry up during the dry season, as well as in peri-urban areas, transmission is becoming less seasonal. *Plasmodium falciparum* is the major malaria parasite species, accounting for more than 90% of all infections. The main vector species responsible for malaria transmission are *Anopheles gambiae sensu stricto* (both M and S sub-species), *An. arabiensis*, *An. funestus*, and *An. melas* in the Senegal River delta area.

Based on a total population of 11 million, vulnerable groups in Senegal comprise an estimated 2,200,000 children under five and 440,000 pregnant women. There are an estimated 75,000 people living with HIV/AIDS (PLWHA).

C. NATIONAL MALARIA CONTROL PROGRAM

The National Malaria Control Program (PNLP) resides in the Ministry of Health's Division of Disease Control. A multisectoral Steering Committee oversees the activities of four PNLN commissions: (1) planning, monitoring, and evaluation; (2) clinical and therapeutic; (3) communication and social mobilization; and (4) research. The Steering Committee has not recently been active, and will be reconstituted under the draft 2006-2010 Strategic Plan for Malaria Control.

The PNLN staff includes four public health doctors, two pharmacists, one economist, and two public health nurses (*technicien supérieur*). Three entomologists work for the Anti-Parasite Service in Thiès (SLAP), and several entomologists and parasitologists serve on the faculty of the Université Cheikh Anta Diop (CAD), School of Medicine. In addition, two French institutions (*Institut de Recherche au Développement* and the *Institut Pasteur*) have many experienced researchers who collaborate with the PNLN. While there are no full-time malaria staff at the regional or district levels, health workers at all facilities are engaged in case management with ACTs and prevention of malaria in pregnancy with IPT. Additionally, employees of the Hygiene Service are involved in some spraying and bed net re-treatment campaigns, and they could be assigned other malaria responsibilities. Laboratory services are generally available at the health center level but not below.

D. CURRENT STATUS OF MALARIA INDICATORS

The draft 2006-2010 Strategic Plan for Malaria Control compares selected RBM indicators collected through the 2000 Multiple Indicator Cluster Survey (MICS), and estimates generated through the PNLN database. Based on these data, the MOH noted improvements in case management and the use of ITNs and IPTp with sulfadoxine-pyrimethamine (SP), but the completeness of these data are unclear. The last DHS survey, carried out from January-March 2005 (low 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 last 18 months and current rates are undoubtedly higher. According to this survey, 83% of pregnant women took an antimalarial drug to prevent malaria during their most recent pregnancy, with 21% having taken SP, which was introduced as the standard in 2003. About 38% of households possessed at least one mosquito net, with greater ownership in rural compared to urban areas and among the poorer as opposed to the richer quintiles. Overall, about 27% of households owned at least one ITN (ever-treated), with 20% owning a net that was factory-treated or had been treated with insecticide within the past 12 months. Only 14% of children under five slept under a net the night before the survey, with 10% under an ITN and 7% under a factory-treated or recently retreated net. Similar results were demonstrated for pregnant women. Almost 30% of children under five had had a fever during the two weeks before the survey. Twenty-five percent of these had taken either chloroquine, amodiaquine (AQ), or SP, but only 11.7% had taken the medication within about 24 hours of the onset of their symptoms.

Status of Key Roll Back Malaria (RBM) Indicators for Outcome and Impact, 2000-2005

(Sources: draft MOH Strategic Plan for Malaria Control 2006-2010; 2005 DHS)

Indicator	2000 MICS	2005 (PNLP database)	2005 DHS
% of cases of fever in children under 5 managed within 24 hours at the community level	36%	45%	12%
% children under 5 with suspected malaria correctly managed	--	13%	--
% of households owning one or more bednets	16%	67%	38%
% of households owning one or more ITNs	--	52%	20%
% of children under 5 sleeping under an ITN the previous night	2%	18%	7%
% of pregnant women sleeping under an ITN the previous night	2%	39%	9%
% of pregnant women receiving IPTp with SP	32% [†]	77%	21%
Rate of directly observed IPTp use among pregnant women	--	47%	--
Morbidity rate attributable to malaria	36%*	32%	--
Mortality rate attributable to malaria	30%*	21%	--

[†]SP was adopted for IPT in 2003 *PNLP database

E. GOAL AND TARGETS OF THE PRESIDENT'S MALARIA INITIATIVE

Goal

The goal of the PMI is to reduce malaria-associated mortality by 50% compared to pre-initiative levels in all PMI countries.

Target

By the end of 2010, PMI will assist Senegal to achieve the following targets in populations at risk for malaria:

- >90% of households with a pregnant woman and/or children under five will own at least one ITN;
- 85% of children under five will have slept under an ITN the previous night;
- 85% of pregnant women will have slept under an ITN the previous night;
- 85% of houses in geographic areas targeted for IRS will have been sprayed;
- 85% of pregnant women and children under five will have slept under an ITN the previous night or in a house that has been sprayed with IRS in the last 6 months;
- 85% of women who have completed a pregnancy in the last two years will have received two or more doses of IPTp during that pregnancy;
- 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 an antimalarial drug in accordance with national malaria treatment policies within 24 hours of onset of their symptoms.

F. EXPECTED RESULTS – YEAR ONE

At the end of Year 1 of the PMI in Senegal (31 March, 2008), the following results will have been achieved:

Prevention:

- More than 1 million long-lasting insecticide-treated bednets (LLINs) will have been distributed nationwide to pregnant women and children under five (this, together with the re-treatment campaign, is expected to increase household ownership of an ITN to more than 60% of the targeted population nationwide);
- 100,000 ITNs will have been retreated as part of a large-scale campaign in 5 of the 11 regions in the country;
- Approximately 75,000 households in three districts targeted for IRS will have been sprayed, protecting more than 500,000 residents;
- IPTp will be fully implemented in all Ministry of Health antenatal care services nationwide (expected to increase coverage of pregnant women using IPTp to 60%).

Treatment:

- Malaria treatment with ACTs will have been implemented in government health facilities in 50% of districts nationwide (with estimated coverage of 50% of children under five);
- Community-based treatment of malaria with ACTs will have been implemented in 30% of districts nationwide (with estimated coverage of about 30% of the population).

Other:

- A nationwide malaria indicator survey (MIS) will be completed to provide baseline data on coverage of the major interventions;
- National policy on malaria diagnosis including a strategy on the use of malaria microscopy and rapid diagnostic test kits (RDTs) in different malaria epidemiologic and health care settings will have been developed.

G. INTERVENTIONS – PREVENTION

Insecticide-treated nets (ITNs)

Current Status, Challenges, and Needs:

The PNLP promotes the use of ITNs, especially long-lasting ones, as a key component of malaria prevention in Senegal. In its draft Strategic Plan for Malaria Control 2006-2010, the

MOH remains committed to diversifying commercial suppliers of ITNs and providing subsidized nets in public and private sectors. It proposes increasing accessibility through antenatal clinics (ANCs), routine vaccination, growth monitoring/nutrition sessions, and through vaccination or micronutrient supplementation campaigns. As a result of USAID and other donor dialogue with the government of Senegal in 2004, national taxes and tariffs on ITNs were dramatically reduced from about 40% to the present 2.5%.

The PNLN has three approaches for distribution of ITNs:

1. ***Commercial nets sold at market prices to the general public (FCFA 5000 – 6000; \$10-\$12);***

There are four major ITN distributors in Senegal, all of whom partner with the USAID NetMark program:

Company: Negrita	Brand: Permanet [®] (long-lasting net)
Company: Palunet	Brand: Sentinelle [®]
Company: Senphyto	Brand: Netto [®]
Company: CAD	Brand: KONet [®]

A fifth distributor will be added to the NetMark Program in late 2006.

In 2004, when the NetMark program began its activities in Senegal, these commercial suppliers sold about 180,000 ITNs. In 2005, a total of 466,000 ITNs were sold; sales of 611,000 are projected for 2006. The commercial suppliers reach 10 of the 11 regions in the country and make ITNs available through about 900 retailers.

2. ***Nets sold at subsidized prices through a voucher system (worth FCFA 2500; \$5) targeting primarily pregnant women and children under five***

Under USAID's NetMark targeted subsidy program in six districts, pregnant women attending ANCs and mothers with small children attending well baby clinics receive vouchers worth 2,500 FCFA (approximately \$5.00) for an ITN that can be redeemed at the health center or health post pharmacy. Up to four different brands of commercial nets are available at these pharmacies. The cost to a mother depends on the type of net purchased; when redeemed with a voucher, a smaller ITN will cost about \$1.00 and a large LLIN will cost about \$5.00. The same health center pharmacies also sell nets supplied by the MoH to the general public at the price of 2,000 FCFA (\$4.00).

NetMark negotiates agreements with local health committees to promote the ITN program. The health committees purchase nets from the retailers (for about CFA 500 above cost) and then sell them to the beneficiaries at the above prices. The difference between the cost of a net for the health committee and the final price to the beneficiary is kept by the health committee. Due to budgetary constraints in previous fiscal years, this small but successful system has thus far been limited to 20 facilities in six districts. From December 2005 through August 2006, the six participating districts achieved 86.42% redemption rates among 22,561 vouchers issued.

3. *Subsidized sales of ITNs purchased by other donors (FCFA 1000 or \$2 for pregnant women and children under five and FCFA 2000 or \$4 to the general public).*

This includes donations of ITNs in the last two years by UNICEF, the World Bank, and the Global Fund. These nets are sold at the subsidized prices authorized by the MOH.

Based on the most recent DHS, conducted during the low malaria transmission season in 2005, the status of indicators of mosquito net ownership and use is as follows:

Indicator	Urban	Rural	Total	Any Net	Any ITN	Factory treated/recently retreated net
Households with ≥ 1 net (treated or untreated)	32%	42%	38%	--	--	--
Households with a factory-treated or retreated ITN	18%	22%	20%	--	--	--
Children under five sleeping under a net	--	--	--	14%	10%	7%
Pregnant women sleeping under a net	--	--	--	14%	10%	8%

Proposed USG Component (\$6,650,000):

There is justification for a three-tiered ITN strategy in Senegal comprising the following: (a) untargeted commercial sales for the general public; (b) subsidized distribution at the health center and health post levels targeted to vulnerable groups attending antenatal care and immunization sessions; and (c) free distribution to vulnerable populations through periodic campaigns to increase coverage in underserved populations.

In Year One, the PMI proposes to support a comprehensive approach to increasing household ownership and the use of ITNs among vulnerable populations. This includes the following related lines of work: distribution of free LLINs during the spring 2007 National Micronutrient Days, subsidized distribution of ITNs for pregnant women under an expansion of the existing voucher program, a net re-treatment campaign, and support for private sector sales of ITNs to the general public.

Proposed activities during Year 1 are as follows:

1. *Distribution of free LLINs during the spring 2007 National Micronutrient Days (\$5,050,000, of which of \$4,200,000 is for procurement of nets and \$850,000 for promotion and information, education, and communication)*

To rapidly increase use of ITNs by pregnant women and children under five years of age, the PMI will support the PNLP's plan to link the distribution of LLINs to the micronutrient campaign (Vitamin A and albendazole) scheduled for March-May 2007.

The PMI will provide a free LLIN to every mother attending the campaign from the five regions presently supported by USAID (Louga, Kaolack, Kolda, Ziguinchor, and Thies), the regions of Diourbel and Fatick, and the four periurban communes of Dakar (about one-third of the city's population). The PMI will not provide nets in the Districts of four provinces where the World Bank Senegal River Basin Initiative is planning a large ITN program. A total of 600,000 LLINs will be procured by the PMI from local LLIN distributors. In addition, the PMI's three main implementing partners - Christian Children's Fund (CCF), IntraHealth, and NetMark - will provide support for promotion, logistics, information, and communication for the event. A total of \$950,000 is allocated for logistics and promotion of the campaign.

2. *Post Vitamin A-ITN campaign evaluation: (cost included in M&E Budget total)*

A post-campaign evaluation will be conducted by the CORE group with technical assistance by CDC. Efforts will be made to coordinate this survey with the planned World Bank Senegal River Basin project evaluation.

3. *Subsidized distribution of ITNs to pregnant women: (\$950,000, ITNs purchased with FY-06 funds)*

The PMI will support the expansion of the subsidized ITN distribution program for pregnant women to all 28 districts in the five USAID-focus regions. With support from NetMark, local private distributors will negotiate agreements with the district-level health center committees and health posts, providing subsidized vouchers permitting pregnant women to purchase a LLIN for a 500 FCFA (\$1) co-payment, if she chooses to purchase the least expensive LLIN. It is expected that consumers will have at least two types of LLINs from which to choose. The value of the voucher will be increased from 2500 FCFA to 3000 FCFA (about \$6) (which maintains the minimum co-payment at 500 FCFA), and vouchers will be valid only for LLINs. This is in order to promote use of the more effective but more expensive long-lasting nets, while maintaining consumer choice.

4. *Net retreatment (\$450,000, of which \$300,000 is for the purchase of retreatment kits)*

Senegal has a history of high net ownership (about 40% nationwide of any type of net), but the majority are either untreated or not recently retreated. As a result, the PMI will support annual net re-treatment campaigns focusing on re-treating regular (not long-lasting) ITNs nationwide. With FY 2006 malaria funds, USAID has already begun the first campaign as a Jump Start activity for the PMI in Senegal, with the aim of retreating 100,000 nets in five focus regions with the KO Tab 123 long-lasting tablet. This activity is being carried out by CCF and its consortium of private voluntary organization (PVO) partners, which includes Plan International, World Vision, and Africare.

5. *Private sector sales of ITNs (\$200,000)*

The PMI, working through the NetMark project, will support the efforts of local private ITN distributors to expand their markets and sales, particularly in urban areas of Senegal,

targeting those consumers who can afford to pay full price for the commodity. The focus will be on increasing sales and distribution points for distributors of LLINs. It is expected that sales of ITNs by private sector distributors will increase to over 800,000 in 2007, representing a 33% increase compared to the 2006 projected sales.

Indoor residual spraying (IRS)

Current Status, Challenges, and Needs:

Although the PNLN has little previous experience with IRS, the 2006-2010 draft Strategic Plan for Malaria Control proposes identifying urban areas and areas with unstable transmission appropriate for IRS based on entomologic and epidemiologic investigations. The PNLN proposes to train and equip community-level spraying agents with help from the Hygiene Service, which would monitor spraying activities. Since DDT is not approved for use in Senegal, synthetic pyrethroids would be the insecticides used. In addition, as part of the World Bank Senegal River Basin Project, two pilot studies of IRS are being planned in each country involved.

The country can be divided into three main areas based on annual rainfall: a) the tropical south with 1000-1250 mm of rain and rainy season from May until November; b) the central Sahelian zones with 400-1000 mm of rain and rainy season from July to October, and c) the north Sahelian zone with less than 300 mm of rain and a rainy season from July to September.

The distribution of vector mosquitoes is dependent upon rainfall and the presence of permanent sources of water. Some vectors, such as *An. melas*, that predominate the mangrove swamps of coastal river deltas, prefer to feed outdoors. Consequently, in areas where they are the major vector, IRS would probably have limited impact. *Anopheles gambiae* and *An. arabiensis* are the principal vectors over much of the country and *An. funestus* is found around permanent bodies of water in the south. All three species feed and rest indoors to some extent and thus are susceptible to IRS. In addition, because most malaria transmission is seasonal, a single round of spraying just before the rains begin should suffice each year. In Dakar, where approximately 25% of Senegal's population resides, the malaria burden is low and most cases of malaria are imported from rural areas when students and workers return to the city after working on farms during the growing season. Therefore, IRS would probably not be cost effective in this setting. Nevertheless, data from the Pikine area near Dakar indicates that malaria transmission decreases as the distance from freshwater ponds increases and therefore targeted larviciding might have an impact on transmission and will be considered during Year 2 of the PMI.

Senegal is fortunate to have strong national entomology experts at the Université CAD, SLAP and the Institut Pasteur. Currently, these groups are monitoring mosquito resistance to DDT, permethrin, and deltamethrin at 11 sites throughout the country. Development of a monitoring program including both epidemiological and entomological variables would provide the PNLN with data for operational planning of continuing control measures needed as the interventions take hold.

Proposed USG Component (\$3,200,000):

Proposed activities during Year 1:

1. *Phasing up of IRS; procurement of equipment and supplies for IRS: (\$3,000,000)*
 - As a first step in expanding IRS coverage in Senegal, the PMI will support spraying in three districts covering a total of approximately 75,000 households and protecting more than 500,000 residents, approximately 85% of the total estimated population in the targeted districts. Spraying will be carried out from May through July 2007. Information and experience garnered from these pilot studies will be essential for planning future IRS activities in Senegal. For Year 1, the proposed sites are: Velingara, Nioro and Richard Toll. These were chosen to represent the three primary ecological/entomological zones and to overlap with ongoing drug resistance and quality monitoring sites. The approximate populations listed for each district is 175,000, 270,000, and 140,000 respectively.

This IRS program, together with the ITN distribution described above, would thus address the entomological limitation of indoor and outdoor feeding vectors in areas where many people sleep outside by promoting the use of ITNs for outdoor sleeping.

Funds will be provided to ensure adequate public information and promotion of IRS and to encourage the population's agreement with and adherence to spraying their homes. This work will be done via USAID's PVO partners.

2. *Strengthen entomologic capabilities at Université CAD: (\$200,000)*

It is proposed that the Université CAD (through a grant with WHO), in collaboration with the US Centers for Disease Control and Prevention (CDC) entomologists, develop a detailed PMI monitoring and evaluation plan related to IRS. Indicators for estimating the entomologic impact of the IRS program include indoor mosquito resting densities, indoor and outdoor biting rates, sporozoite infection rates and estimates of infectious biting rates. In addition, sensitivity of vectors to insecticides will be monitored. Quality of spraying (measured immediately after spray campaign) and the effective lifetime of the insecticide on the walls (measured at periodic intervals after spraying) will be measured by chemical analysis of wall scrapings and cone bioassays, which will require upgrading the entomology facilities at the Université CAD.

Intermittent preventive treatment of pregnant women (IPTp)Current Status, Challenges, and Needs:

At the national consensus meeting in 2003, The PNLIP adopted a policy of intermittent preventive treatment for pregnant women (IPTp) with SP. A technical team including the MOH Reproductive Health Division and the Midwives Association of Senegal formulated the policy and training materials for health care workers, based on WHO recommendations. Intermittent

preventive treatment is provided free of charge to pregnant women, and is supposed to be administered under direct observation by a health worker.

Despite the high rates of attendance in antenatal clinics, relatively few women receive a second dose of SP as part of their IPTp. PMI will address this problem by assisting the Ministry technical team on malaria in pregnancy to review their reproductive health training and IEC materials, and update them, if necessary.

Training workshops for health staff will be conducted at all levels of health facilities, including government and non-governmental organization (NGO)-supported facilities. Provision of adequate supplies of SP and drinking water and cups together with supportive supervision should help improve the quality of antenatal care and increase the use of IPTp.

Proposed USG Component: (\$800,000)

1. Support efforts to increase the proportion of pregnant women who receive two doses of IPTp in ANCs. This will include: training of health care workers in IPTp and the diagnosis and management of malaria in pregnancy, including amending and printing new forms for ANC to include IPTp component (fiches and registers); and revision of IEC/BCC messages to make women aware of the risk of malaria during pregnancy, promote early attendance at ANCs and the use of IPTp beginning early in the second trimester of pregnancy, and completing the recommended treatments.

H. INTERVENTIONS – CASE MANAGEMENT

Malaria Diagnosis

Current Status, Challenges, and Needs:

Malaria microscopy is only available at the hospital and health center levels in Senegal, but some of these facilities have shortages of well-functioning microscopes, laboratory supplies, and adequate staff capable of performing microscopic diagnosis. In a 2005 evaluation, 83% of health facilities visited did not have adequate laboratory services for malaria diagnosis. As a result, clinicians lack confidence in laboratories and tend to rely more on their clinical judgment to treat most malaria cases.

According to the draft Strategic Plan for Malaria Control, children under five with fever are to be treated presumptively for malaria. Although it is recommended that malaria infections in older children and adults should be confirmed by a laboratory diagnosis, this does not occur at all health facilities. The PNLP is working with the Université CAD's Department of Parasitology to improve laboratory diagnosis of malaria through training, quality control and formative supervision of the national laboratory network.

At the health post and community health hut level, the Université is conducting a feasibility study to determine whether rapid diagnostic tests (RDTs) or clinical diagnosis is more

appropriate, given the specificity of clinical symptoms and signs of malarial illness. At the conclusion of this pilot test, the MoH will develop a policy for the use of RDTs, microscopy and clinical diagnosis.

In January 2006, the PNLP received 171,000 Paracheck PF[®] rapid diagnostic test (RDT) kits, which is about half of its request of 300,000 tests budgeted under the GFATM grant. The remaining quantity of RDTs will be shipped when supplies are available.

Proposed USG Component: (\$510,000)

With AS-AQ costing considerably more than SP-AQ, and to reduce the chances of drug resistance developing, accurate diagnosis will be critical to target antimalarial drug use to infected patients and reduce the unnecessary use of these drugs as occurs when patients are presumptively treated for malaria. The PMI views malaria laboratory diagnosis as a key component for good case management and will support strengthening of malaria diagnosis capacity in MOH facilities. The PMI will work with the PNLP to ensure the proper and adequate training in diagnosis and treatment for clinic and community level health care providers in all regions. Formative supervision, conducted in collaboration with MoH officials, will be critical to the achievement of PMI goals and will be a major activity for PMI. Further, resources will be used to promote and educate the public about the importance of malaria symptoms and of proper care seeking behavior. The PMI also recognizes the benefits of combining malaria laboratory training with training done by partners working on other diseases. Proposed activities during Year 1 are as follows:

1. Identify all health facilities that are capable of conducting microscopy and strengthen microscopic diagnosis of malaria in those health facilities. Review and update the participant and facilitators' manual for the training of laboratory technicians. Organize training to cover at least two technicians from each of the 56 health centers and the 19 laboratories and provide job aides for each laboratory; (\$80,000)
2. Purchase reagents and laboratory supplies and approximately 60 microscopes, each with an EARL-light to guarantee continuous services in the absence of reliable sources of electricity. Replace non-functional microscopes in health facilities. (\$430,000); and
3. Pending the outcome of the studies by the Université CAD described above, the PMI will work with the PNLP to develop a national strategy and plan for the use of RDTs at different levels of the health system and in different epidemiologic settings in the country. (no cost to PMI in year 1)

Treatment

The results of antimalarial drug efficacy studies in Senegal published in 2002 showed clinical failure rates for chloroquine between 25% and 40%, exceeding the WHO-recommended threshold for changing the national drug policy. In June 2003, the PNLP organized a consensus meeting among malaria program stakeholders. Participants recommended that the MoH discontinue the use of chloroquine as the first-line treatment for uncomplicated malaria. An interim treatment policy consisting of combination therapy with SP + AQ was instituted, and

Senegal officially adopted ACT (Artemisinin-based combination therapy), selecting artesunate-amodiaquine (AS-AQ) as its first-line treatment for uncomplicated malaria. Quinine is the second-line drug for uncomplicated malaria, as well as the treatment of choice for severe malaria and malaria during pregnancy.

In January 2006, the PNLN received its first ACTs - 3 million AS-AQ doses (with expiry dates ranging from October to December 2007) from the GFATM. This combination is presented as age-specific blister packs with 3 different dosages: one for children less than 5 years of age, one for adolescents, and the third for adults. All hospitals, health centers, and health posts have reportedly received AS-AQ supplies and the training to use them. The MOH is also introducing ACTs to the community through the *cases de santé* (village health huts). ACTs have also been incorporated into facility-based IMCI guidelines. Community health workers (CHWs) already provide ACTs in the 12 districts supported by USAID-funded NGOs. In MoH facilities and community health huts, AS-AQ is sold at 600CFA (\$1.20) for an adult treatment and 300CFA (\$0.60) for adolescent and pediatric treatments.

The private sector, although largely limited to the capital city of Dakar and some provincial capitals, is well-developed and organized, and makes ACTs readily available. ACTs can be purchased from private pharmacies in town, but at a higher price of about 4,000CFA (\$8.00) per treatment.

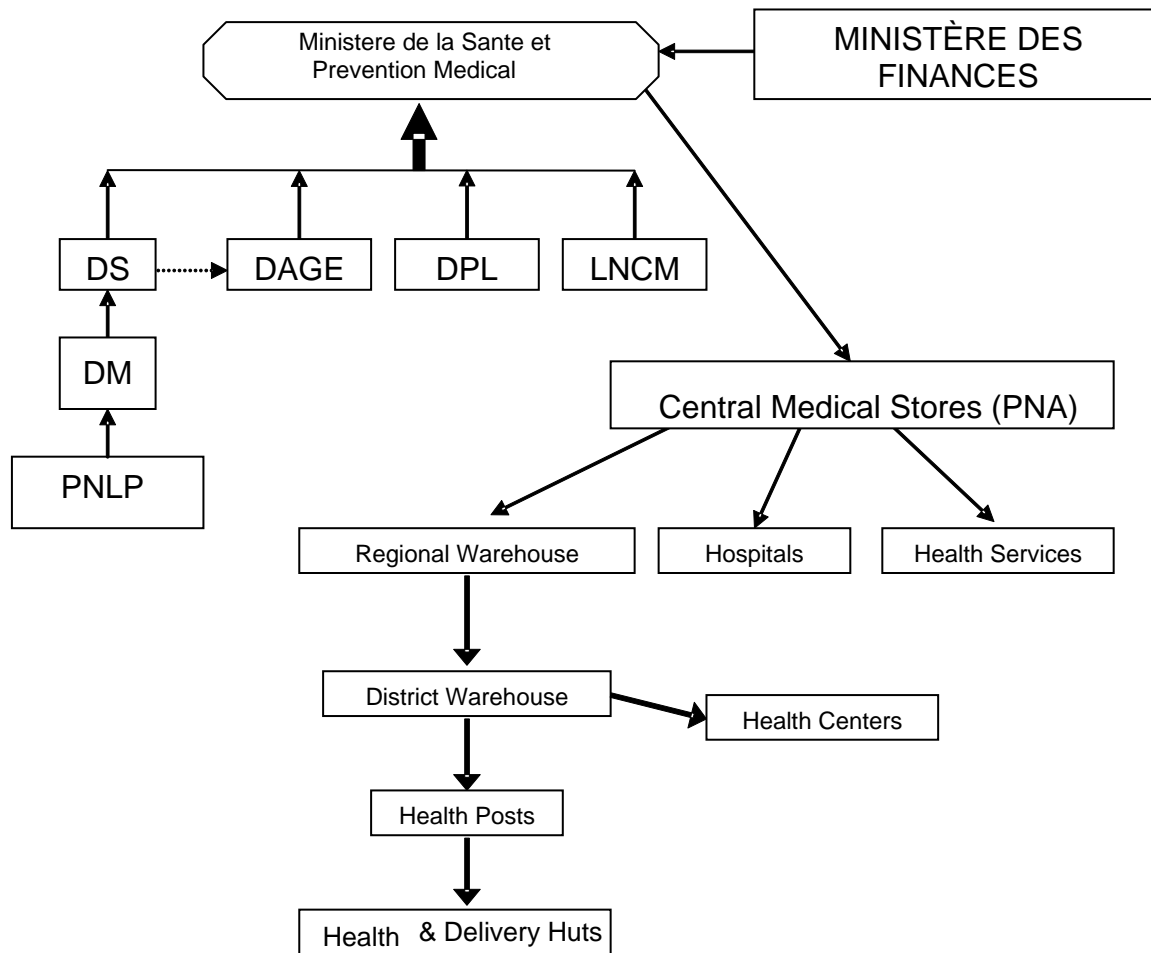
The PMI will continue to work to ensure that effective drug procurement, distribution, storage and use systems are in place and function. Technical assistance will be provided from both CDC and AID/W to complement the work done by Senegal's local partners.

Pharmaceutical Management

Procurement: The Central Medical Stores (PNA) is responsible for procurement of drugs, health commodities and equipment, including antimalarial drugs, ITNs, laboratory products, and treatment kits. Central Medical Stores has sufficient resources for procurement but not to guarantee the quality of products procured. The procedures at Central Medical Stores are set up to be transparent, respect competition, and conform to national and international standards under the supervision of MOH, which is responsible for coordination. Selection of manufacturers and vendors is made through international bidding, as much as possible, based on a list of approved vendors provided by WHO.

The Central Medical Stores manage all resources provided to the health system for procurement of goods, including resources allocated to health facilities. At the health facility level, drugs and other commodities are managed under a cost-recovery scheme, allowing households to participate in the financing of the health system by paying up to 90% of the total expenditures for drugs. Central Medical Stores procure only medicines and other health commodities that are on the National Essential Medicines List.

Flow of medicines and other health commodities through the health system



Note : DS = Directorate of Health ; DAGE = Directorate of Administration and Management; DPL = Directorate of Pharmacies and Laboratories; DM = Directorate of Infectious Diseases; LNCM = National Laboratory for Drug Quality Control; PNLP = National Malaria Control Program

The Directorate of Pharmacies and Laboratories (DPL) provides quality assurance and, in collaboration with Central Medical Stores and the National Laboratory for Drug Quality Control (LNCM) (Laboratoire National de Contrôle des Médicaments), is responsible for establishing regulations and the right to market a drug. The national drug approval and pharmacovigilance committees are based within the Directorate of Pharmacies and Laboratories.

Senegal revised its essential drugs list in 2004 and included ACTs. Standard treatment guidelines were also revised.

Pharmaceutical Regulation and Control: The Directorate of Pharmacies and Laboratories is responsible for drug regulation, in collaboration with Central Medical Stores and the National Laboratory for Drug Quality Control. The Directorate of Pharmacies and Laboratories hosts the national drug approval committee and Commission for Pharmacovigilance. All ACTs recommended by WHO are registered in Senegal.

Quantification and Procurement: The PNLP is responsible for quantification of malaria commodities and coordination of procurement for malaria activities, but procurement and follow-up are done through the Central Medical Stores, Regional Medical Stores, and health facilities. Forecasting of needs and budgeting are usually based on cases registered at health facilities and in the communities. As a result, this method of forecasting can underestimate needs because of the low utilization of health facilities in the country. However, in the case of ACTs purchased the Senegal's Global Fund grant, the quantity was based on all expected cases of fever rather than cases expected to be treated in a facility, and therefore the quantity procured should be sufficient to meet the country's needs at least through December 2007.

Distribution: Central Medical Stores is responsible for the distribution of malaria commodities. They have trucks that deliver the commodities to the nine Regional Medical Stores. Districts come to collect their commodities at the regional stores based on the needs of health facilities in the districts. Health facilities, including community health posts and health huts, collect their orders at the district level. Various means are used at the health facility and community levels to collect the products. Commodities management is computerized at the central and regional levels. Distribution functions under a cost recovery scheme. Each level pays cash to the higher levels for the commodities that were ordered and collected.

Pharmacovigilance: No system is in place for reporting to higher levels on adverse drug reactions. Apparently health workers advise patients either to stop or continue the treatment regimen on a case-by-case basis, but none of this information is formally collected and reported.

Pharmaceutical Management Information System: Central Medical Stores has set up a pharmaceutical management information system with forms and guidelines. This system is separate from the health information system since the health information system does not provide the necessary information needed to manage medicines and other health commodities. A plan is in place for supervision and distribution follow-up activities countrywide, but Central Medical Stores only supervises the distribution system to the regional level. At the district and health facility levels, information is not flowing as it should and the PNLP does not have the capacity to monitor the distribution system. Computerization of the pharmaceutical management system down to the district level is planned.

Proposed USG Component:

Treatment and Pharmaceutical Management (\$3,230,000)

Promoting prompt and effective treatment with ACTs will be a major challenge for the PNLP and the PMI, given the relatively short shelf life of AS-AQ (about 24 months), the limited reach

of health centers and health posts, and co-payments for the drugs at health facilities (300CFA or \$0.60 for children), which may serve as an economic barrier of use by some families. Achieving high coverage rates for ACTs among children will require improvements in the pharmaceutical management system, strong supervision of health providers, and expansion of community-based treatment of fever. The existing blister packs for malaria treatment packets consist of adolescent, adult and pediatric age of up to 5 years. The age range and the corresponding “one size fits all” dosage for the pediatric group does not conform to WHO guidelines for AS-AQ, which recommends three different dosage levels for children under 14 years of age. PMI will need to work with the PNLN to reconsider the current MOH treatment guidelines.

Proposed activities during Year 1 are as follows:

1. Based on the initial 6-12 months of experience with ACT implementation, revise forecasts of AS-AQ needs for both GFATM and PMI procurements. Possible procurement of AS-AQ, if the GFATM does not authorize additional procurements under Senegal’s round 2 grant; (not budgeted under PMI at present but will be closely monitored during next 12 months);
2. PMI will review with the MoH, WHO and the Global Fund the issue of packaging of pediatric AS-AQ treatments and assist with training, should a decision be made to use a fourth age-specific blister pack (no cost to the PMI);
3. Together with the MOH and other partners, provide technical assistance for ACT implementation through PMI/Senegal’s partners CCF and IntraHealth and drug quality partners at the Rational Pharmaceutical Management, Plus (RPM+) project and the US Pharmacopoeia (USP) that addresses: (\$2,975,000)
 - a. importing, quality control, storage, and inventory management;
 - b. coordination with the MOH on quantification and distribution;
 - c. training of health workers in health facilities and at the community level to ensure good ACT prescribing and dispensing practices. Whenever possible, this training will be integrated with training on other interventions). Establish sustainable system for supervision of these workers;
 - d. monitoring and expansion of community case management approach to provide additional evidence of program feasibility and effectiveness for community-based treatment of malaria with ACTs;
 - e. IEC for patients;
 - f. monitoring of implementation/evaluation of coverage;
 - g. promoting correct use of ACTs in the private sector; and
 - h. monitoring antimalarial drug quality in the public and private sectors.
4. Procure quinine and artemether antimalaria drugs for the treatment of severe malaria and provide technical assistance to the PNLN to facilitate appropriate and effective use of these drugs in the treatment of severe malaria in children and adults. (\$255,000)

I. HIV/AIDS

Current Status, Challenges, and Needs

The HIV/AIDS epidemic in Senegal is characterized by a low prevalence in the general population with relatively high levels of infection among some groups. HIV epidemiological surveillance in 2003 showed that HIV prevalence among pregnant women is still low at 1.4% but as high as 20% among commercial sex workers and men who have sex with men. The 2005 DHS produced the first available data for the general adult population. Prevalence is relatively low, at 0.7% among the general adult population. In 2004, the Senegal Epidemiological Bulletin estimated that there are approximately 74,890 people living with HIV/AIDS (PLWHA), of which 3,622 are on anti-retroviral therapy (ART).

USAID supports Senegal's stated strategic objectives to maintain HIV prevalence below 3%; to improve the quality of life of PLWHA; and to reduce the socioeconomic impact of HIV/AIDS. The approach is based on a strengthened partnership with civil society and communities enlisted to participate in key interventions, including a comprehensive behavior-change program encouraging abstinence and fidelity but also providing information about and support for condom use among high risk groups. In addition, USAID promotes voluntary counseling and testing services, prevention of mother to child transmission (PMTCT), and care and support for PLWHA and their families.

In 2000, Senegal began a pilot program to introduce anti-retroviral therapies in the public health system. The National AIDS Plan anticipates that 5,000 Senegalese will be on ART by 2007. In addition, the PMTCT program, introduced in June 2000 on a pilot basis, achieved a testing acceptance rate of 60% among pregnant women.

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

PMI staff will work with the MOH HIV/AIDS program to review current standards for and the status of diagnosis and treatment of malaria and malaria prevention measures in PLWHA in Senegal. Based on this assessment, the PMI will develop a plan for support to strengthened prevention and treatment of malaria in PLWHA.

J. COMMUNICATION/COORDINATION

Current Status, Challenges, and Needs:

Multilateral and bilateral donors in the health sector meet monthly to share information and strategies and discuss current issues in the sector. The MOH is represented by the Secretary General at these meetings. The Country Coordinating Mechanism (CCM) for the Global Fund grants meets quarterly regarding Senegal's Round 4 grants. In the early years of the Global Fund in Senegal, the CCM was too large to be truly functional in terms of decision-making and the role of the CCM was unclear to all. In response to this problem, a group of members proposed a Technical Secretariat that would assist the CCM in administration and decision-making. USAID was at the forefront of establishing the Technical Secretariat, and continues to support it both

financially and technically. The Technical Secretariat has expedited implementation of the grants, and it is expected that this body will continue to do so in the future.

In the past, an active National Malaria Steering Committee, made up of various stakeholders, met on a regular basis. In the past three years, this group has become inactive, although its working groups on drug quality, IPT, ACTs, and ITNs remain active but uncoordinated as a larger group.

Proposed USG Component: (no additional cost to the PMI)

USG/Senegal proposes reviving the National Malaria Steering Committee to coordinate and ensure communication and coordination for all malaria control activities, including those supported by the PMI. The working groups of this Steering Committee, which are still active, will be rejoined as members of the larger Committee, and new working groups created as necessary (e.g., for vector control and monitoring and evaluation).

Proposed activities during Year 1 are as follows:

1. In-country PMI staff will provide support to the PNLN to revive and coordinate regular meetings of the National Malaria Steering Committee, which will be made up of representatives of key stakeholders from public, donor, NGO, and private interests, and support and participate in the working groups within this Committee; and
2. Work with the PNLN and partners to develop an annual work plan and establish clearly defined roles and responsibilities for Steering Committee representatives and their organizations.

K. PUBLIC-PRIVATE PARTNERSHIPS

At this time, there are no public-private partnerships working for malaria control in Senegal.

L. OVERVIEW OF EXISTING PARTNER AND USG ACTIVITIES AND ROLES

Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)

The GFATM Round 1 grant of \$4.2 million was approved in April 2003 and suspended in 2005 due to inadequate progress, inability to document progress, and other irregularities.

The GFATM currently has a \$33.3 million Round 4 grant with Senegal that runs through 2010, with approved funding of \$23.1 million for first phase which lasts from 2006-2007. The Principal Recipient of the GFATM malaria grant is the National Malaria Control Program (PNLP) of the Ministry of Health. This grant has so far been used to procure 3,000,000 treatment courses of AS-AQ and 340,000 doses of SP (through the World Health Organization), and 360,000 ITNs (through UNICEF) for 2006. All of these commodities have already arrived in Senegal and are in all public health facilities throughout the country. In addition, 171,000 RDTs have been received out of a total order of 300,000. A second shipment of AS-AQ has been suspended until it is seen how quickly the existing stocks of ACTs are consumed.

World Bank

Recently, the World Bank adopted a budgetary support mode of financial assistance for Senegal. It is unknown to what extent these funds are used to finance malaria-related activities.

Previously, World Bank funds were used to procure ITNs and to support promotional activities. The World Bank is also planning to provide between \$12 and \$14 million over the next five years, mostly to provide LLINs with a goal of covering 80% of all households in 14 districts in the Senegal River basin (St. Louis, Matam, Tambacounda, and Louga). Finally, the World Bank supports the GOS in a national nutrition project which will soon also include an LLIN component to cover some areas of the country not supported by the river basin project areas. The World Bank has specifically asked that PMI contribute support for behavior change and communications about net usage in the areas where its LLINs will be distributed.

World Health Organization (WHO)

WHO provides technical and some financial support for the implementation of treatment and prevention policies; planning, monitoring and evaluation; research; surveillance and management of the PNLN.

UNICEF

Since 2002, UNICEF has spent \$2.1 million on malaria activities targeted primarily to the Kolda and Tambacounda regions. This has included the purchase and distribution of 342,000 subsidized ITNs and 475,000 KO Tab individual dose insecticide treatment kits and 20,000 bottles of deltamethrin.

USAID

Over the past five years, USAID has provided on average \$2.5 million annually in support of malaria activities. USAID's efforts have been concentrated in four regions (Ziguinchor, Kaolack, Thies and Louga), representing about 37% of Senegal's population and have contributed to the implementation of combination therapy (and now AQ-AS) at both the clinical and community levels, of IPT with SP at all facilities where ANC services are provided, and of the introduction of a voucher system as a mechanism to provide subsidized ITNs to pregnant women and children under five. On a national level, USAID has supported the expansion of the social marketing of ITNs through the commercial sector and the strengthening of drug resistance surveillance and drug quality assurance systems.

In July, 2006, USAID/Senegal competitively awarded a five-year Cooperative Agreement to IntraHealth, International to implement its maternal and child health activities, including facility-based malaria prevention and control in USAID's Health focus regions of Kaolack, Kolda, Louga, Thies, and Ziguinchor. A competitively-awarded, five-year Cooperative Agreement was also granted to a consortium of PVOs led by CCF and including Plan International, Africare, and World Vision to implement community-based malaria prevention and control activities in the same five focus regions.

Other Bilateral Donors

Belgian Cooperation has been involved with both clinical and community-level malaria prevention and treatment activities, primarily in the Diourbel region. The current project has ended and the future of Belgian cooperation is not yet determined. **German** cooperation (GTZ) was formerly active in public health activities, including malaria particularly in the Kolda region and the District of Pikine (Dakar). At present the GTZ is not specifically involved with malaria activities in Senegal. **French** cooperation is involved with malaria activities via the French government's involvement with the Global Fund and via technical assistants working at the MOH. The **Japanese** (JICA) provided several hundred thousand ITNs several years ago but as these were ineffectively distributed through the Ministry of Health, JICA has provided no further support for malaria activities. No other bilateral donor has been involved in the malaria program in Senegal.

PVOs/NGOs

Since 2003, three **PVOs** (CCF, Consortium, Africare, and Plan International) have provided ITNs and support for case management at the community level in twelve Health Districts through USAID/Senegal grants. Additionally, these PVOs have child survival projects in various other areas of the country with non-Mission sources of funding. A fourth, World Vision, has conducted malaria-related activities in some communities, particularly in the Kolda region. As noted in the section above, as of July 2006, these four PVOs now work together in a consortium led by CCF and coherently cover USAID's five focus regions for community-based malaria activities, under a single Cooperative Agreement. Numerous other local NGOs and CBOs are also involved with small-scale malaria prevention projects throughout the country.

M. MONITORING AND EVALUATION PLAN

Current Status, Challenges, and Needs:

In its draft Strategic Plan for Malaria Control 2006-2010, the PNLP acknowledges the generally weak state of the National Health Management Information System (HMIS) and the monitoring and evaluation activities that partially rely on their HMIS data. The GFATM Round 1 grant was cancelled due to a variety of factors, among them the MOH's inability to provide adequate data to measure the required outcome and impact indicators. The PNLP includes a Monitoring and Evaluation Division headed by a public health physician. In an innovative effort, quarterly immunization program meetings held at the district level include presentation of key malaria data such as cases of fever, stocks of drugs and mortality; however, it is unclear whether these data are used effectively, whether their quality is monitored regularly, and if feedback is provided. In its draft Strategic Plan for Malaria Control 2006-2010, the PNLP intends to measure coverage and impact based on RBM indicators and collect routine program data related to supplies, case management, ITN coverage and use, and IRS.

The quality of routine supportive supervision varies for malaria activities. Supervision by national PNLP staff focuses on the regional level and does not go beyond to the district and facility levels. Primary health care and reproductive health supervisors monitor activities in districts. Supervision from the health center to health post levels is irregular. Health post staff conduct monthly visits to health huts through EPI-driven outreach services, at least in the dry

season. In some USAID-supported districts, models and checklists exist for integrated facility-level supervision, and where community case management of malaria is being implemented, NGOs are helping to facilitate more regular supervision, data monitoring, and restocking of drugs and materials for the community health workers. The NetMark ITN program trains community agents to verify voucher redemption and ITN ownership through house-to-house visits and follow-up.

USAID has been supporting sentinel site surveillance to monitor changes in antimalarial drug efficacy. USAID, through a grant to WHO, has provided approximately \$150,000 per year to the *Université CAD* to maintain this system. This monitoring system helped Senegal to quantify the increase in parasite resistance to chloroquine as well as demonstrate the efficacy of alternative combination therapies. Data provided by their sentinel site surveillance made it possible for Senegal to adopt a policy of combination therapy in 2003.

USG Component:

Monitoring and evaluation is a critical component of the PMI. The objective of these activities will be to measure progress against project goals and targets, to identify problems in program implementation and allow modifications to be made, and to confirm that those modifications are having their desired effect. In Senegal, rapid scale up of malaria prevention and control interventions and achieving high coverage rates with ACTs, ITNs, IPT, and IRS are priorities not only of PMI, but of the PNL, the GFATM, and other national and international partners working on malaria. For this reason, all monitoring and evaluation activities funded by the PMI will be integrated with those of the PNL and other partners into a single system to avoid duplication, conserve resources, and ensure as much uniformity as possible in the indicators chosen to measure progress, in approaches to collecting and analyzing data, and in reporting.

The PMI has adopted a general monitoring and evaluating framework that has been adapted to the context of each country. According to this framework, specific activities are monitored on a regular basis to allow in-country program managers to assess progress and redirect resources as needed. Activities within four main intervention areas, ITNs, IRS, IPT, and case management with ACTs, will be tracked through periodic reports from groups providing commodities, health facilities, and international and local partners. Types of activities that will be monitored will include procurement and distribution of commodities, availability of commodities for prevention, diagnosis and treatment of malaria, health worker performance, IEC efforts, supervision and training for health care workers, and monitoring drug and insecticide efficacy and effectiveness.

The evaluation framework is based on the PMI goal to reduce malaria deaths by 50% and to achieve coverage targets with specific interventions over the course of the program. The framework is aligned with the standard methodology for malaria program evaluation that is being adopted and promoted by WHO Roll Back Malaria. Program evaluation will be based on coverage outcomes that will be measured at baseline, midpoint and the end of the Initiative, and impact on malaria mortality, which will be measured at baseline and the end of the Initiative. Information used to evaluate program outcomes and impact in PMI will be collected primarily through household surveys of a representative sample of the national population. All-cause mortality and malaria-specific mortality in children under five (collected through verbal

autopsies) will be interpreted together with data on anemia, parasitemia, available information on malaria cases and deaths reported from health facilities, rainfall and PMI coverage indicators to consider changes in mortality at the population level that can be attributed to reductions in malaria over the course of PMI.

In Year One, PMI will help build national capacity in monitoring and evaluation to enable future implementation of activities to measure coverage rates for ACTs, ITNs, IPT and IRS, through household surveys and health facility and community-level performance through supportive supervision, routine record reviews, and service statistics.

Proposed activities during Year 1 are as follows (\$810,000):

1. *Coverage of interventions and impact on malaria mortality* (\$510,000 total with \$500,000 for a nationwide MIS and \$10,000 to obtain information from Demographic Sentinel Surveillance sites)

To measure baseline coverage for PMI-supported interventions, PMI will support a baseline nationwide malaria indicator survey (MIS) in November 2006. This survey will determine the proportions of children under five and pregnant women who slept under an ITN the previous night, pregnant women who have received two or more doses of SP for IPTp during their most recent pregnancy, and children under five years of age with suspected malaria who have received treatment with an antimalarial drug in accordance with national malaria treatment policies within 24 hours of the onset of their symptoms. Unlike the 2005 DHS, the MIS will be conducted at the end of the rainy (high-transmission) season, and will reflect early implementation of IPTp, ITN and national treatment policies subsequent to the DHS. This survey will be coordinated with other planned malaria evaluation activities, such as those included in the World Bank's Senegal River Basin Project in four regions of Senegal. The PMI in-country staff will provide technical guidance on the ground, supported by epidemiologists and evaluation experts from CDC-Atlanta and USAID/Washington.

The PMI will use the 2005 DHS collected mortality data as the project baseline for all-cause under five mortality. To complement this information and estimate malaria-specific mortality, data will be obtained on malaria-specific mortality from the two Demographic Sentinel Surveillance (DSS) sites, at Bandafassi (run by the National Institute for Demographic Research) and the other at Niakhar (operated by the Institute for Development Research in Dakar). Both DSS sites are members of INDEPTH Network supported by the Gates Foundation. The Bandafassi site focuses on mortality and demographic changes over time. The Niakhar site focuses on malaria and other infectious diseases, and has published data on verbal autopsy and longitudinal trends in mortality. Data is obtained every 6-12 months to validate baseline national estimates obtained through surveys and assess interim progress. This approach was chosen because mortality rates are not expected to change significantly over the year prior to PMI's start.

2. *Post Vitamin A-ITN survey*: (\$100,000) (activity first described in ITN section, page 12)

A post-campaign evaluation of coverage and usage of ITNs will be conducted by the CORE group with technical assistance from CDC.

3. *Antimalarial drug efficacy testing*: (\$150,000)

Although recent studies suggest that the therapeutic efficacy of AS-AQ is >95%, it will be important to confirm these results in various sites around the country and maintain the system for regular monitoring of the efficacy of the first-line drug. These studies will be conducted by the *Université* CAD following standardized WHO procedures.

4. *Drug quality monitoring*: (\$50,000)

Because of concerns about the quality of the antimalarials circulating in Senegal, the U.S. Pharmacopoeia will provide training to MOH staff in antimalarial drug quality testing and together with the MOH develop a plan for routine monitoring of antimalarial drug quality.

N. SUPERVISION

USG component:

Proposed activities during Year 1:

1. Regional level support supervision: (\$50,000 - included under case management p. 21)

To assess on-going performance, PMI will help support supervision activities at the regional levels. More specifically, PMI will support the PNLN to strengthen its capacity while performing frequent supervision activities relating to PMI interventions and other relevant programs at regional health centers.

2. District and community level support supervision: (cost covered under case management p. 21)

In addition to the ongoing monthly support supervision activities performed by PNLN, PMI will support supervision activities for district and local health workers to conduct supportive supervision and monitoring activities. Each malaria activity will include a component for routine supervision to improve health worker performance. PMI will support quarterly visits to health posts by health center staff, and monthly visits to *cases de santé* by health post workers (for outreach and supervision). Supervisors will use or adapt checklists developed by the PNLN and other partners to assess diagnostic capability, case management, communications, logistics, drug stocks, and supplies and equipment. Checklist questions will include those that measure standard process indicators established by the PNLN, PMI, and other partners. Supervisors will provide feedback on their findings during routine meetings (including district-level immunization meetings), and use the information to identify performance problems as well as modify training and supervisory plans and approaches. At the community level, NGOs will

facilitate supervision and monitoring of community health workers to ensure correct diagnosis and treatment of malaria with ACTs.

O. STAFFING AND ADMINISTRATION

Two new health professionals will be hired to oversee the PMI in Senegal, 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, management of collaborating agencies and supervision of 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 Senegal, 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/PNLP 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.

ANNEX 1

Tables

Table 2

**President's Malaria Initiative – Senegal
Planned Obligations for FY07 (\$000)**

Proposed Activity	Mechanism	Budget (<i>commodities</i>)	Geographic Area	Description of Activity	Relation to Interventions
PREVENTIVE ACTIVITIES					
Procurement of LLINs for National Micronutrient Days	NetMark	4,550 (4,200)	Nationwide minus WB districts and 4 peri-urban districts in Dakar	Procurement and logistics for distribution of 600,000 subsidized LLINs to children <5 during National Micronutrient Days	ITNs
Promotion, Logistics, and IEC for LLINs during National Micronutrient Days	CCF Consortium ¹ , IntraHealth	500	Nationwide minus WB districts and 4 peri-urban districts in Dakar	Promotion, distribution and IEC for subsidized LLINs to children <5 during National Micronutrient Days	ITNs
Distribution of subsidized LLINs to pregnant women	NetMark, IntraHealth, CCF Consortium	950 (<i>procurement of ITNs w/ FY-06 funds</i>)	All districts in USAID regions: Thies, Kolda, Koaalack, Louga, Ziguinchor	Distribution of LLINs using voucher system to target pregnant women	ITNs
Bed net re-treatment campaign (07)	CCF Consortium	450 (300)	In selected areas nationwide, TBD	Re-treatment of 100,000 existing bed nets with long-lasting insecticide treatment	ITNs
Support private sector ITN capability	NetMark	200	Nationwide	Commercial sector marketing support	ITNs

¹ CCF Consortium includes subpartners: World Vision, Africare, Plan International, and various local CBOs.

Indoor residual spraying	IRS IQC, CCF Consortium	3,000 (1200)	Velingara, Nioro, Richard Toll Districts	Phasing up of IRS in 3 different ecologic zones	IRS
Pre and post IRS entomologic monitoring and evaluation	WHO (sub grant to UCAD)	200 (20)	3 Districts	Entomological baseline including insecticide resistance testing, pre- /post-campaign entomological assessment and capacity building	IRS
Facilitate implementation of Intermittent preventive treatment (IPTp)	IntraHealth, CCF Consortium	800	Nationwide	Health worker training; supervision and monitoring; IEC materials; purchase of supplies; outreach support	IPTp
SUBTOTAL: Preventive		10,650 (5,720)			
CASE MANAGEMENT ACTIVITIES					
Strengthen laboratory diagnosis of malaria	WHO (sub grant to local university)	80	Nationwide	Training/supervision support to for malaria microscopy and rapid diagnostic testing; quality control	Case management
Procurement of drugs for severe malaria, and diagnostic equipment and supplies	UNICEF	685 (685) (430 for lab equip / 255 for severe malaria drugs)	Nationwide	Procurement of quinine and artemether for treatment of severe malaria and of microscopes, reagents and supplies.	Case management
Support to the PNLP for program supervision	WHO (sub grant to PNLP)	50	Nationwide	Support to PNLP to enable increased supervision and monitoring of national program	Case management
Facilitate implementation of ACTs	IntraHealth, CCF Consortium, RPM+	2,925	Nationwide	Health worker training; supervision & monitoring; IEC materials; purchase of supplies; outreach support	Case management
SUBTOTAL: Case Mgmt.		3740 (685)			

MONITORING AND EVALUATION					
Baseline nationwide Malaria Indicator Survey	ORC Macro (sub contract to local organization)	500	Nationwide	Baseline on intervention coverage	M&E
Post Vit A –ITN campaign evaluation	CORE Group of NGOs	100	Selected regions and districts	Post ITN campaign evaluation	M&E
Demographic Surveillance System	WHO (sub grant to IRD)	10	2 sites	Data on malaria-specific mortality	M&E
Monitoring and supervision for malaria activities	CCF Consortium, IntraHealth, WHO (sub grant to PNLB)	800 included under ACT	Nationwide	Monitoring and support supervision to regions	M&E
Drug efficacy and insecticide testing	WHO (sub grant to local university)	150	Nationwide sentinel sites	Therapeutic efficacy tests of first- and second-line drugs; insecticide resistance monitoring	M&E
Drug quality monitoring	USP DQI	50	Dakar	Develop system of drug quality assurance	M&E
SUBTOTAL: M&E		810			
IN-COUNTRY MANAGEMENT AND ADMINISTRATION					
In-country staff; Admin. Expenses	CDC/USAID ²	800	Nationwide	Coordination of all in-country PMI activities	All interventions
SUBTOTAL: Mgmt. and Admin.		800			
OTHER					
SUBTOTAL: Other		0			
GRAND TOTAL		16,000 (6,405)	Commodities represent 40% of total budget		

². This will cover the salary and benefits for two professional staff, an FSN, vehicle, office equipment and direct and other Mission costs

Table 3
Senegal – Year 1 Targets
Assumptions and Estimated Year 1 Coverage Levels

Year 1 PMI Targets:

- *More than 1 million LLINs will have been distributed nationwide to pregnant women and children under five (this, together with the re-treatment campaign), is expected to increase household ownership of an ITN to more than 60% of the targeted population nationwide);*
- *Approximately 75,000 households in three districts targeted for IRS will have been sprayed, protecting more than 500,000 residents;*
- *IPTp will be fully implemented in all MoH antenatal services nationwide (expected to increase coverage to 60% of pregnant women);*
- *Malaria treatment with ACTs will have been implemented in government health facilities in 50% of districts nationwide (with estimated coverage of 50% of children under five);*
- *Community-based treatment of malaria with ACTs will have been implemented in 30% of districts nationwide (covering approximately 30% of the population).*

Assumptions:

Population of Senegal (estimated for 2006): 11,000,000

Pregnant women: 4% of total population = 440,000 pregnant women

Children <5: 20% of population = 2,200,000 children under five

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 2.0 illnesses/year at \$0.90 each

Adults: 0.5 illness/year at \$1.50 each (assume that the PMI will cover only one-third of adult illness episodes)

Cost of IPTp with SP: \$0.20 (\$0.10 for each of the two treatments a woman will receive during her pregnancy)

Average of 3.0 nets/household needed to cover all pregnant women and children under five in family;

Average of 8 persons/household (2005 DHS survey)

Intervention	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	440,000 pregnant women x 2 treatments/woman = 880,000 treatments/year x 3 years = 2.6 million treatments	2.6M x 85% = 2.21 million SP treatments	880,000 SP treatments	Target: 60% of pregnant women receive 2 doses of IPT = 528,000 treatments	GFATM – \$316,000 planned at <\$0.10/treatment Sufficient SP to achieve 100% coverage, if fully implemented
LLINs	Mean household size = 8 1.2 million households x 3.0 nets/household over 3 years = 3.6 million nets	3.6 million LLINs X 85% = 3.1 million LLINs over 3 years	3.6 million LLINs	Target: 60% of households have at least one ITN = 720,000 ITNs	GFATM – \$4M planned non-LLINs (571,000 nets) UNICEF – \$920,000 non-LLINs (131,000 nets) USG (PMI) – 1 million LLINs (600,000 campaign + 400,000+ voucher and private partners) World Bank- 3 million LLINs TOTAL = 4.0 million LLINs Thus, 100% of Year 1 LLINs needs are met
ACTs – children < 5	2.2 million children under 5 x 3.5 episodes/year = 7.7 million treatments/year x 3 years = 23 million	7.7M x 85% = 6.5 million treatments x 3 yrs = 19.5 million	7.7 million treatments	Target: 50% of children under 5 receive ACTs	GFATM – \$16 million planned, 3M doses received Jan 06 TOTAL available for ACTs = \$16 million.
ACTs – older children	3.3 million older children X 2.0 episodes/year= 6.6 million treatments X 3 years = 19.9 million	6.6 x 85% = 5.6 million treatments x 3 yrs. = 16.8 million	16.8 million treatments	7.7 million x 50% = 3.85 million treatments 16.8 million x 50% = 8.4 million treatments	If all 3.85 million child treatments are covered at \$.60/treatment = \$2.3 million, and all 8.4 older child treatments are covered at \$.90/treatment = \$7.6 million, and all 3.5 million adult treatments are covered at \$1.50/treatment = \$5.3million
ACTs - adults	5.5 million persons x .5 episodes/year = 2.75 million treatments/year x 3 years = 8.25 million	2.75 X 85% = 2.3 million treatments X 3 years = 6.9 million	6.9 million treatments	6.9 million x 50% = 3.5 million treatments	= Total of \$15.2 million needed
TOTAL	51 million treatments	43.2 million treatments		15.8 million Total treatments	Thus, 100% of Year 1 ACT needs are met.

IRS	585,000 population (585,000 population total in 3 districts to be targeted for IRS assume 85% or greater acceptance rate = 500,000 population or greater protected)	225,000 households targeted over three years	75,000 households targeted for IRS annually	Target: 75,000 households targeted for spraying	USG (PMI) – 75,000 households targeted for spraying at a cost of \$3.50/person once a year Thus, 100% of Year 1 needs are met.

*These calculations are based on the assumption that the total population of Senegal is at risk of malaria. Since malaria transmission probably does not occur in large areas of the capital, Dakar, which represents 23% of the country's population, it is likely that only 80-85% of the population is at risk of a malaria infection and needs preventive and curative malaria services.

Table 4

Senegal Year 1 (FY07) Estimated Budget Breakdown by Intervention (\$)

Area	Commodities (%)	Other (%)	Total
Insecticide-treated Nets	4,500,000 (68%)	2,150,000 (32%)	6,650,000 (100%)
Indoor Residual Spraying	1,220,000 (38%)	1,980,000 (62%)	3,200,000 (100%)
Case Management	685,000 (18%)	3,055,000 (82%)	3,740,000 (100%)
Intermittent Preventive Treatment	0	800,000 (100%)	800,000 (100%)
Monitoring and Evaluation	0	810,000 (100%)	810,000 (100%)
Administration	0	800,000 (100%)	800,000 (100%)
Total	6,415,000 (40%)	9,585,000 (60%)	16,000,000 (100%)

Table 5**Year 1 (FY07) Budget Breakdown by Partner (\$000)**

Partner Organization	Geographic Area	Activity	Budget*
NetMark	Nationwide minus WB districts and 4 peri-urban districts in Dakar	Procurement and Distribution of LLINs and support to private sector ITN capability	\$4,950,000
CCF Consortium of PVOs (World Vision, Africare, Plan International, and various local CBOs)	Nationwide	Community promotion of LLIN, ACTs, and IRS, and support to PNLP and MoH for supervision and monitoring	\$3,500,000
IRS IQC	Nioro, Richard Toll, and Velingara districts	Phasing up of IRS in 3 different ecologic zones	\$2,500,000
IntraHealth	Nationwide	Health worker training, promotion of ITNs, ACTs, IEC, and support to PNLP and MoH for supervision and monitoring	\$2,225,000
UNICEF	Nationwide	Procurement of drugs for severe malaria and diagnostic equipment and supplies	\$685,000
ORC Macro	Nationwide	Implementation of baseline nationwide malaria indicator survey	\$500,000
University CAD	Dakar	Strengthen lab diagnosis for malaria; Drug efficacy and insecticide testing; and Pre and post entomologic monitoring and evaluation	\$430,000
RPM plus	Nationwide	Antimalaria drug management capacity building	\$200,000
CORE Group	Selected regions and districts	Post ITN campaign evaluation	\$100,000
GOS (PNLP)	Nationwide	Support National Level Program Management and Supervision to Regions	\$50,000
USP DQI	Dakar	Develop system of drug quality assurance	\$50,000
IRD	2 Sites	Support for demographic surveillance system to obtain data on malaria specific mortality	\$10,000

* Staffing and administration not included

ANNEX 2

SENEGAL

President's Malaria Initiative Three-Year Strategy

Malaria is a major cause of morbidity and mortality in Senegal and is endemic throughout the country. Malaria is responsible for about one-third of all outpatient consultations and between 20% and 30% of mortality in health facilities. Peak malaria transmission occurs from June to November during the rainy season and into the early part of the dry season. In areas close to rivers or other water sources that do not dry up during the dry season, as well as in peri-urban areas, transmission is becoming less seasonal. *Plasmodium falciparum* accounts for more than 90% of all malaria infections.

Based on a total population of 11 million, vulnerable populations in Senegal comprise an estimated 2,200,000 children under five and 440,000 pregnant women. There are also an estimated 75,000 persons living with HIV/AIDS (PLWHA), some of whom fall within the two previous groups.

Goal

The goal of the PMI is to reduce malaria-associated mortality by 50% compared to pre-initiative levels in all PMI countries.

Target

By the end of 2010, PMI will assist Senegal to achieve the following targets in populations at risk for malaria:

- >90% of households with a pregnant woman and/or children under five will own at least one ITN;
- 85% of children under five will have slept under an ITN the previous night;
- 85% of pregnant women will have slept under an ITN the previous night;
- 85% of houses in geographic areas targeted for IRS will have been sprayed;
- 85% of pregnant women and children under five will have slept under an ITN the previous night or in a house that has been sprayed with IRS in the last 6 months;
- 85% of women who have completed a pregnancy in the last two years will have received two or more doses of IPTp during that pregnancy;
- 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 an antimalarial drug in accordance with national malaria treatment policies within 24 hours of onset of their symptoms.

PREVENTION ACTIVITIES

Intermittent preventive treatment in pregnant women (IPTp): In 2003, the National Malaria Control Program (PNLP) adopted intermittent preventive treatment for pregnant women (IPTp) with two doses of SP. The 2005 DHS survey showed that 83% of pregnant women took an

antimalarial drug to prevent malaria during their most recent pregnancy, but only 21% had taken at least one dose of IPTp with SP. The PMI will support efforts to increase the proportion of pregnant women who receive at least two dose(s) of IPTp in ANCs. In addition, PMI will support training and supportive supervision of health care workers in IPT and the diagnosis and management of malaria in pregnancy, as well as support development and dissemination of IEC/BCC messages to improve mothers' awareness of the risk of malaria during pregnancy, promote ANC attendance and the use of IPTp beginning early in the second trimester of pregnancy, and stress the importance of completing the recommended two doses of SP.

According to the PNLP, sufficient SP will be procured through the GFATM to meet all needs during the next 12 months. The PMI will closely monitor SP usage and needs to inform decisions on SP procurements during Years 2 and 3 of the PMI.

Insecticide-treated nets (ITNs): The PNLP promotes the use of ITNs, especially long-lasting ITNs (LLINs), as a key component of malaria prevention in Senegal with a commitment to increase accessibility of subsidized nets through ANCs and child health clinics, and free nets as a part of large-scale vaccination or micronutrient supplementation campaigns. The 2005 DHS found that 38% of households owned at least one ITN but only 10% of children <5 years of age and pregnant women had slept under the net the previous night.

The GFATM has \$4 million for purchase of ITNs. In addition the World Bank has just approved the Senegal River Basin Initiative, a three-country project that includes three regions in Senegal. This project included a large ITN component

In line with the PNLP strategy, the PMI will support a comprehensive, three-pronged strategy to increase household ownership and use of ITNs, especially among vulnerable populations:

1. free distribution to vulnerable populations through large-scale health campaigns (e.g., micronutrient supplementation, immunization, etc.) to rapidly increase coverage in underserved and/or economically disadvantaged populations;
2. subsidized distribution to pregnant women and children under five at health centers and health posts through progressive expansion of the existing ITN voucher program and reduction of the co-payment in order to promote redemption of the more effective but more expensive LLINs. Antenatal 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; and
3. commercial sales targeted at the general public. The PMI will support the efforts of local private ITN distributors to expand their markets and sales, particularly in larger urban areas of Senegal, targeting those consumers who can afford to pay full price for a net.

Because net ownership does not necessarily translate into net usage, the PMI will invest in IEC/BCC efforts to ensure that residents understand the value of ITNs for protecting against malaria and the correct care and use of ITNs.

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 Senegal. Since many of the nets already distributed in Senegal are not LLINs or have not been recently retreated, PMI will support net re-treatment efforts over the next two to three years, until those nets reach the end of their useful lifetimes. Evidence suggests that KO Tab 1-2-3 (Bayer Environmental Science) is the best available product for their net re-treatments, although it is not equivalent to a factory-produced LLIN in terms of the duration of the insecticidal effect.

Indoor residual spraying (IRS): Although the PNLP has little previous experience with IRS, the 2006-2010 draft Strategic Plan for Malaria Control proposes identifying urban areas and areas with unstable transmission that would be appropriate for IRS based on entomologic and epidemiologic investigations. *Anopheles gambiae* and *An. arabiensis* are the principal vectors throughout much of the country, while *An. funestus* is found around permanent bodies of water in the south. All three species feed and rest indoors to some extent and should be susceptible to IRS. In addition, because most malaria transmission is seasonal, a single round of spraying just before the rains begin should suffice each year. Since DDT is not approved for IRS in Senegal, synthetic pyrethroid insecticides will be used. Senegal is fortunate to have strong national capabilities in entomology at the Université CAD, SLAP and the Institut Pasteur.

The PMI proposes to build on this strong foundation to strengthen capabilities in vector control. During FY07, as a first step towards expanding IRS coverage in Senegal, the PMI will support spraying in three districts covering a total of approximately 75,000 households and over 500,000 inhabitants. Indoor residual spraying plans during Years 2 and 3 of the PMI in Senegal will be based on information and experience gained these initial efforts. PMI will also support an epidemiological and entomological monitoring program to provide the PNLP with data for operational planning of vector control measures. PMI will consider a program of larviciding in Year Two of PMI, particularly in the peri-urban areas of Dakar.

CASE MANAGEMENT

Diagnosis: According to the draft National Strategic Plan for Malaria Control, children under five with fever are to be treated presumptively for malaria, while malaria infections in older children and adults are to be confirmed by a laboratory test. In spite of this, malaria microscopy is only available at the hospital and health center levels and shortages of well-functioning microscopes, microscopy supplies, and staff capable of performing microscopic diagnosis are a common problem. The PNLP is working with the Université CAD's Department of Parasitology to improve laboratory diagnosis of malaria through training, quality control, and supervision of the national laboratory network. The Université is also carrying out a study of the role of RDTs in malaria diagnosis. A total of 300,000 Paracheck PF[®] RDT kits have been ordered through the GFATM grant, but as yet there is no clear plan for their use.

With ACTs costing considerably more than monotherapy, accurate diagnosis will be critical to target their use to infected patients and reduce the unnecessary use of antimalarial drugs that occurs when patients are presumptively treated for malaria. The PMI views malaria laboratory diagnosis as a key component of good case management and will support strengthening of malaria diagnosis in MOH facilities with diagnostic laboratories. 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 will work with the PNLP and other partners to develop a strategy and plan for the use of microscopy and RDTs at different levels of the health system and in different clinical and epidemiological settings. Over the next three years, the PMI will attempt to strengthen laboratory diagnosis of malaria through support to training of MoH laboratory technicians and strengthening of a central malaria reference laboratory. The PMI also recognizes the benefits of combining malaria laboratory training with training for other diseases, such as tuberculosis, and will work with other groups to strengthen laboratory facilities. Since physicians as some clinical officers tend to ignore the results of laboratory tests when their results do not agree with their clinical judgment, it will be particularly important to ensure that health workers are trained in the proper interpretation of laboratory tests for malaria.

Decisions on PMI procurement of microscopes, microscopy supplies, and RDTs will be based on an FY07 evaluation of the existing malaria diagnostic network and estimated funding for malaria diagnosis from the MoH, the Global Fund, and other donors.

Treatment: In 2003, Senegal officially adopted artesunate-amodiaquine (AS-AQ) as the first-line treatment for uncomplicated malaria. Quinine is the second-line drug for uncomplicated malaria, as well as the treatment of choice for severe malaria and malaria during pregnancy. In January 2006, the PNLP received 3 million AS-AQ treatments from the GFATM. All hospitals, health centers, and health posts have received AS-AQ supplies and the training to use them. Artemisinin-based combination therapies have also been incorporated into facility-based IMCI guidelines. Community health workers (CHWs) affiliated with the village health huts (cas des santés) already provide ACTs in the 12 districts supported by USAID-funded NGOs. The private sector, although largely limited to the capital city of Dakar, is well developed and organized and ACTs are available in the private sector.

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 the PNLP and the PMI in Senegal, given the relatively weak pharmaceutical management system, the high cost and short shelf life of AS-AQ, and co-payments for the drugs at health facilities (\$0.60 for children), which may serve as an economic barrier of use by some families. The PMI will coordinate its activities with those of the PNLP and other partners. The PMI will provide technical assistance in developing a detailed, written ACT implementation plan. The PMI will also support training and supportive supervision of health workers to ensure good ACT prescribing and dispensing practices in coordination with the IMCI guidelines, expansion of the pilot program on community-based treatment of fever, and development and implementation of an IEC/BCC plan for ACT implementation.

Decisions on procurement of supplies of AS-AQ and quinine by PMI will be based on improved forecasting of drug needs and GFATM purchases. Global production of ACTs is expected to be sufficient to meet the country'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 Malaria Indicator Survey (MIS) will be conducted soon after the rainy season in 2006 to provide baseline information on coverage of ACTs, ITNs and IPTp and all cause and malaria-related mortality in children under five. Malaria-related mortality will be estimated using data from DSS sites. Information of IRS coverage will be obtained from routine spraying records. A mid-project DHS or MIS in 2009 and an end-of-project MIS survey in 2011 will measure progress related to the coverage and mortality targets. Information on other indicators of interest, including 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.

In Year Two, PMI will conduct an evaluation of the effectiveness of ACT distribution by community health workers; and, perhaps a more formal quality of care evaluation of health care providers.

SUSTAINABILITY PLAN

The three-year strategic plan for Senegal 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 PNLP is currently understaffed, especially at provincial and district levels, and training and regular supervision is needed. In addition, basic management systems, such as financial management, planning, budgeting, human resources and operations need strengthening. The PMI plans to place two malaria advisors in country to manage PMI implementation. It is hoped that at least one of these two individuals will be located in the PNLP offices and will work closely with PNLP counterparts on day-to-day management and implementation of the PMI and PNLP operations. Special attention will given to identifying weaknesses in managerial systems and capacity building in areas such as planning, budgeting, human resources management, and financial management systems. Strengthening these systems will be integral to the PNLP'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: The implementation of the PMI will result in the transfer of technical knowledge and skills to local partners including the PNLP, NGOs, community- and faith-based organizations, health workers, and private sector partners. The PMI will also focus on IEC activities directed at increasing understanding at the community level about the risks of malaria, prevention measures, and appropriate avenues for treatment.

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, in addition to reductions in the cost of key malaria commodities will make it easier for the MoH/PNLP to take on increased responsibility to fund key interventions. Other financing sources available to the MoH/PNLP will include an increased portion of the national budget, other donor resources (GFATM), and 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. Finally, PMI is building on the existing cost-recovery structures already operating in the health system (i.e. user fees), which allows a more sustainable source of financing than ongoing free distribution of commodities and services. It has been shown in Senegal that people value quality products and services and are prepared to contribute a reasonable cost for them.

Table 1

Timeline of Expected Coverage of Interventions – Senegal

Coverage Target	Baseline 2005*	End Year 1**	End Year 2	End Year 3**	Final Evaluation
Proportion of households with a pregnant woman and/or children under five who own at least one ITN ⁺⁺	20%	60%	70%	85%	>90%
Proportion of children under five sleeping under an ITN the previous night	7%	20%	40%	60%	85%
Proportion of pregnant women sleeping under an ITN the previous night	9%	20%	40%	60%	85%
Proportion of households in areas targeted for IRS that have been sprayed	N/A	85%	85%	85%	85%
Proportion of pregnant women and children under five who have slept under an ITN the previous night or in a house that has been sprayed with IRS in the last 6 months;	N/A	25%	45%	65%	85%
Proportion of women who have completed a pregnancy in the last two years will have received two or more doses of IPTp during that pregnancy	8%	60%	70%	85%	85%
Proportion of health facilities that have ACTs available for treatment of uncomplicated malaria ⁺⁺⁺	N/A	50%	60%	80%	85%
Proportion of children under five with fever in previous 2 weeks treated with appropriate antimalarial drug within 24 hours of onset of symptoms	12%	25%	50%	70%	85%

*These figures come from the 2005 DHS, which was conducted in the low malaria transmission season and before IPTp with SP was implemented. These figures will be updated when the 2007 MIS survey is completed.

**Nationwide coverage of interventions will be measured on three occasions: (1) 2006 (baseline) (2) at the mid-point of the Initiative in Senegal; and (3) after the end of 2010. Year 1 and Year 3 coverage will be estimated based on delivery of ACTs and IPTp treatments, distribution of ITNs, and households protected by IRS.

⁺⁺Data from the 2005 DHS provides an estimate of the proportion of overall households who own at least one ITN (20%) and not just households with a pregnant woman and/or children under five. Hence, the baseline data for this indicator is a subset of the 20%.

⁺⁺⁺**Data on ACT availability at the health facility level could not be measured in 2005 because ACTs were not available at that time. The first ACTs arrived in Senegal in January 2006.**

Table 2

Illustrative 3-Year Budget and Expected Coverage Levels - Senegal

PMI Targets: By the end of 2010, PMI will assist Senegal to achieve the following targets in populations at risk for malaria:

- >90% of households with a pregnant woman and/or children under five will own at least one ITN;
- 85% of children under five will have slept under an ITN the previous night;
- 85% of pregnant women will have slept under an ITN the previous night;
- 85% of houses in geographic areas targeted for IRS will have been sprayed;
- 85% of pregnant women and children under five will have slept under an ITN the previous night or in a house that has been sprayed with IRS in the last 6 months;
- 85% of women who have completed a pregnancy in the last two years will have received two or more doses of IPTp during that pregnancy;
- 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 an antimalarial drug in accordance with national malaria treatment policies within 24 hours of onset of their symptoms.

Assumptions:

Population of Senegal (estimated for 2006): 11,000,000

Pregnant women: 4% of total population = 440,000 pregnant women

Children <5: 20% of population = 2,200,000 children under five

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 2.0 illnesses/year at \$0.90 each

Adults: 0.5 illness/year at \$1.50 each (assume PMI will cover only 1/3 of adult illness episodes)

Cost of IPT with SP: \$0.20 (\$0.10 for each of the two treatments a woman will receive during her pregnancy)

Average of 3.0 nets/household needed to cover all pregnant women and children under five in family;

Average of 8 persons/household (2005 DHS survey)

Item/Activity	Annual Cost per Person	Annual Cost	3-Year Total	Assumptions/Comments
Prevention – insecticide-treated nets	-	\$8,300,000	\$25,000,000	11 million population at risk of malaria = 1.4 million households x 3 nets/household x 85% coverage x \$7.00/net
Prevention – indoor residual spraying	-	\$1,750,000	\$5,250,000	IRS will target 500,000 population = 75,000 households at a cost of \$3.50/person once a year
Treatment – malarial illnesses	-	\$12,400,000	\$37,200,000	Children under 5 = 2.2 million x 3.5 episodes/year x 85% x \$0.60; Older children = 3.3 million x 2 episodes/year x 85% x \$0.90; Adults = 5.5 million x 0.5 episodes/year x 85% x \$1.50
Treatment – IPT for pregnant women	-	\$74,800	\$224,400	440,000 pregnant women x \$0.20 per year x 85% coverage
Epidemic preparedness	-	-	-	Not included in Senegal plan
Implementation Support	\$0.92	\$10,100,000	\$30,300,000	Estimated cost for commodity management, human resources, supervision, training, social mobilization, etc (based on Uganda plan)
Monitoring and Evaluation	-	800,000	2,400,000	Directly from PMI Senegal Year 1 budget
Cost of Program			\$100,374,400	
USG Implementation Support Costs	-	\$800,000	\$2,400,000	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)			\$102,774,400	
Government of Senegal malaria budget	-	\$1,745,340.0	\$5,236,000	Based on GFATM Round 4 information; GoS is expected to provide staff and some funding for commodities but amount unknown
GFATM 2-year approved funding	-	\$11,000,000	33,000,000	Round 4 three-year approved funding; will assume that GFATM funding becomes available in Years 2-3 at \$11 million/year
World Bank malaria funding	-	\$2,600,000	\$7,800,000	
Available funding from other sources			\$46,036,000	
PMI funds available (estimated):				Assumes PMI funding is divided between countries based roughly on their populations
Year 1	-	\$16,000,000		
Years 2 and 3	-	\$20,000,000		Assumes 15 PMI countries for both years
Years 1 through 3			\$56,000,000	
Total Available funding			\$102,036,000	
Remaining Gap			\$738,400	3-year shortfall to meet total need