

This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2018 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



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PRESIDENT'S MALARIA INITIATIVE

SENEGAL

Malaria Operational Plan FY 2018

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ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
CBO	Community based organization
CDC	Centers for Disease Control and Prevention
cDHS	Continuous Demographic and Health Survey
CFA	West African Financial Community Franc (USD \$1 = F CFA 500)
CHW	Community health worker
CMS	Central Medical Stores
DHS	Demographic and Health Survey
DSDOM	<i>Dispensateur de soins à domicile</i> (village malaria worker)
DSISS	<i>Division du Système d'Information Sanitaire et Sociale</i>
FY	Fiscal year
GHSA	Global Health Security Agenda
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoS	Government of Senegal
G2G	Government to government
HIV/AIDS	Human immunodeficiency virus /acquired immunodeficiency syndrome
IPTp	Intermittent preventive treatment for pregnant women
IRD	<i>Institut de Recherche pour le Développement</i>
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
JICA	Japan International Cooperation Agency
LNCM	<i>Laboratoire national de contrôle des médicaments</i> (National Drug Control Laboratory)
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
PBF	Performance-Based Financing
PECADOM	<i>Prise en charge à domicile</i> (home-based management of malaria)
PMI	President's Malaria Initiative
RDT	Rapid diagnostic test
SBCC	Social and behavior change communication
SLAP	<i>Service de Lutte Antiparasitaire</i>
SM&E	Surveillance, monitoring, and evaluation
SMC	Seasonal malaria chemoprevention
SNEIPS	National Health Education and Information Service
SP	Sulfadoxine-pyrimethamine
SP-AQ	Sulfadoxine-pyrimethamine/amodiaquine
TES	Therapeutic efficacy studies
UCAD	<i>Université Cheikh Anta Diop</i>

UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization

I. EXECUTIVE SUMMARY

When it was launched in 2005, the goal of the President's Malaria Initiative (PMI) was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

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

Senegal began implementation as a PMI focus country in fiscal year (FY) 2007.

This FY 2018 Malaria Operational Plan (MOP) presents a detailed implementation plan for Senegal, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Senegal, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2018 funding.

The proposed FY 2018 PMI budget for Senegal is \$20 million. PMI will support the following intervention areas with these funds:

Entomologic monitoring and insecticide resistance management: Monitoring entomological parameters (species composition, feeding preferences, densities, etc.) as well as insecticide resistance are important priorities in the NMCP's Strategic Plan for 2016-2020. To support the rollout of vector control interventions, PMI has funded entomological monitoring and resistance testing, which has been carried out in partnership with in-country institutions such as the *Université Cheikh Anta Diop* (UCAD), the *Service de Lutte Antiparasitaire*, and the *Institut Pasteur Sénégal*. Molecular analyses have confirmed that four members of the *An. gambiae* complex are present in Senegal (*An. arabiensis*, *An. coluzzii*, *An. gambiae* s.s. and *An. melas*). While anophelines in Senegal feed on a variety of vertebrates, humans are among the primary sources of blood meals. Resistance testing at 20 sites has revealed widespread resistance to pyrethroids and DDT, while resistance to bendiocarb remains limited to Dakar Region. Key activities conducted during FY 2017 included ongoing entomological monitoring and resistance testing, support for a workshop which resulted in a draft national strategy for insecticide resistance management and the creation of a more user-friendly database to centralize and store all entomological data.

PMI FY 2018 funding will be used to continue to conduct entomological monitoring, including insecticide resistance testing. Entomological monitoring remains critical given PMI's continued support for long-lasting ITNs and the NMCP's plans to implement IRS with other donor support.

Insecticide-treated nets (ITNs): During FY 2017, PMI continued to support the NMCP's multiple continuous distribution channels, which distribute free and subsidized long-lasting insecticide-treated mosquito nets (LLINs) nationwide. These include free LLINs to pregnant women attending antenatal care (ANC) clinics and to primary school children, subsidized nets to other health facility clients through community-based organizations, and through social marketing. In June 2016, the NMCP concluded its first nationwide universal coverage campaign, which resulted in the distribution of more than 8 million nets and was supported by numerous partners including the Global Fund, the Islamic Development Bank, and PMI. As measured in the latest continuous DHS (2016), household ownership of at least one ITN is now 82% and utilization of ITNs by children under five is 67%, with similar coverage levels observed among pregnant women and the general population. To promote demand for and correct use of LLINs, PMI continued to invest in social and behavior change communication (SBCC) activities using primarily community-based networks. PMI funding also continued to support durability monitoring and an assessment of the social marketing channel for ITNs.

With FY 2018 funding, PMI plans to continue its support for the operational costs associated with the routine distribution system. This will ensure that high coverage is maintained after the 2016 mass campaign and will provide the population with several options to replace nets as they age and become worn out. PMI FY 2018 funds will be used to purchase approximately 2 million of the needed long-lasting ITNs for the 2019 mass campaign; any residual nets will be used for the routine system.

Indoor residual spraying (IRS): PMI has supported the NMCP's spray program since 2007 and the population protected with this intervention has ranged from around 650,000 in 2007 to more than 1 million in 2012, with high coverage rates (above 95%) being achieved in all years. Due to

pyrethroid resistance among anopheline mosquito populations, the IRS program gradually transitioned to spraying using non-pyrethroids only and currently only long-lasting organophosphates (pirimiphos-methyl) are used. The NMCP's strategy for IRS has evolved to a more targeted approach and, starting in 2015, spraying has been prioritized to hotspots, defined as areas with malaria incidence above 15-30 per 1,000. During 2017, the third and final year of PMI-supported hot-spot spraying, spraying occurred in the same four districts that were sprayed the previous year; this resulted in 156,362 structures sprayed (96% of those targeted) and 619,578 people protected. After three years of implementation, focal spraying of hotspots was only suggestive of a benefit from IRS based on malaria incidence.

Given the reduced funding for the FY 2018 PMI MOP, the need to fill gaps in long-lasting ITNs for the mass campaign in 2019, and continued support of community case management activities with PMI funds, the NMCP and MOP team agreed that no FY 2018 PMI funds would be provided for IRS support. This decision was supported by the IRS Steering Committee during their May 2017 meeting. IRS will be supported in 13 districts within the pre-elimination areas of Senegal with funding through the Islamic Development Bank. As part of PMI's post-IRS withdrawal plan, PMI FY 2017 funds have been programmed to support SBCC messaging related to the IRS withdrawal and emphasizing the use of ITNs as well as prompt care seeking by residents in the four former IRS districts. In addition, activities such as entomological monitoring, implementation of PECADOM Plus, and weekly case notification will continue in these areas.

Malaria in pregnancy (MIP): The NMCP adopted intermittent preventive therapy for pregnant women in 2003 and SP is given free of charge in all ANC sites nationwide. National policy has been revised to include World Health Organization (WHO) recommendations on frequency (one dose at each scheduled ANC visit starting in the second trimester, with at least one month between doses). The NMCP recommends using quinine to treat pregnant women with confirmed malaria in the first trimester and ACTs in the second and third trimesters. During FY 2017, the Government of Senegal continued to procure SP for IPTp while PMI focused its support on training and supervision of health workers in malaria in pregnancy activities. With PMI's assistance, updated registers have been updated and these are now being used in health facilities nationwide. Intervention coverage among pregnant women has shown steady improvement in Senegal. While only 12% of pregnant women received two doses of SP in 2005, this percentage increased to 60% in the most recent cDHS (2016). Coverage with IPTp3 has improved to 37% (cDHS 2016) and the NMCP credits the introduction of this indicator as one of the driving factors behind the recent uptick in national coverage with IPTp2. ITN use among pregnant women has increased from 9% in 2005 to 69% currently (cDHS 2016).

PMI's FY 2018 funding will continue to support activities aimed at reinforcing the provision of effective MIP services in health facilities and outreach activities to encourage IPTp uptake. Support will continue for monitoring and supportive supervision of MIP service delivery, improvement of data collection including IPTp data, and training of new staff on IPTp, including topics such as the importance of LLIN use in pregnancy, diagnosis and management of MIP, and counseling and interpersonal communication skills. PMI-supported activities will be closely coordinated with those implemented via other funding streams (e.g. Islamic Development Bank and Global Fund).

Case management: The NMCP adopted ACTs as first-line treatment in 2006 and introduced RDTs in 2007. In addition, pre-referral treatment with rectal artesunate for severe malaria and seasonal malaria chemoprevention (SMC) are WHO recommendations already adopted by Senegal's NMCP. At the community level, PMI supports both health huts and home-based management of malaria (PECADOM), as a means to reach as many people as possible with proper malaria case management.

With FY 2018 resources, PMI plans to support training and supervision for microscopic diagnosis of malaria, quality control for microscopy and RDTs, and procurement of microscopy consumables and RDTs. The number of RDTs required is expected to remain high as the revised malaria testing algorithm (universal testing of fever cases in all age groups throughout the year) is put into practice during 2017 and more active case detection activities are carried out in the context of pre-elimination. PMI also plans to procure ACTs, injectable artesunate, and antimalarials needed for SMC in the high-transmission regions of Senegal. In addition, PMI plans to support malaria training and supervision both in the formal health sector and at the community level. Finally, PMI plans to support the implementation of single low-dose primaquine for transmission reduction in elimination districts as well as monitor the efficacy of all three first-line antimalarials (artemether-lumefantrine, artesunate-amodiaquine, and dihydroartemisinin-piperazine).

Health systems strengthening and capacity building: During the past year, PMI's health systems strengthening activities included continued support to the Central Medical Stores, support for institutional capacity building at the NMCP, and support for ongoing results-based financing activities. Integrated logistics supervision visits were conducted at all regional medical stores and health districts, and PMI also supported the NMCP to supervise case management at hospitals, health centers, and health posts.

With FY 2018 funding, PMI plans to support activities to develop capacity at sub-national and central levels to continue working towards the attainment of the NMCP's pre-elimination objective. This will include support for biannual meetings to foster better coordination between the NMCP and partners, which is critical given the substantial donor resources devoted to malaria control in Senegal (PMI, Global Fund, Islamic Development Bank). As in previous years, PMI resources will support a malariology course to provide in-country training to health staff at various levels. Given the large Peace Corps program in Senegal and the opportunities to leverage their community presence to further the NMCP's objectives, PMI funds will continue to support malaria-specific Peace Corps projects. Through a direct funding agreement, PMI will continue to provide funding to the NMCP to support staff to conduct formative supervision visits at regional and district levels. PMI FY 2018 funding will also continue to support decentralization efforts in Senegal by strengthening the capacity of local elected officials to address malaria as a priority in local development plans and increase participation of communities in decision-making and financing. Also, PMI will encourage the NMCP to empower their staff at the decentralized level to plan, manage, and coordinate activities and allocate resources as appropriate to achieve expected results. These activities will build upon the findings of the Sédhiou Region pilot conducted in 2017 and will support the planned rollout in five additional regions. In selected districts, PMI FY 2018 funding will be used to support performance-based financing efforts to improve malaria indicators.

Social and behavior change communication (SBCC): The NMCP is taking a more strategic and evidence-based approach to developing and implementing communications campaigns, as detailed in the NMCP's 2016-2020 Strategic Plan and the new malaria communication strategy. PMI has supported various community mobilization and SBCC activities in Senegal. These include both ongoing malaria communications (mass and interpersonal) and activities promoting specific events, such as IRS or long-lasting ITN distribution campaigns. Typical communications activities in Senegal have included community meetings on a specific topic, home visits, theater, community radio, and social mobilization.

With FY 2018 funds, PMI will continue to support a range of communications activities to influence the social and behavior changes needed to improve the adoption of key malaria prevention and care seeking behaviors (e.g., net ownership, proper net use, net care and maintenance, IPTp, when and where to seek care). PMI will also continue to support communication activities to ensure the continued high acceptance rate of the SMC campaign in four regions. PMI resources will also continue to support operational expenses associated with the social marketing of long-lasting ITNs in the private sector.

Surveillance, monitoring and evaluation (SM&E): In 2017, with PMI's support, the fourth phase of the continuous DHS (cDHS) was completed and the preliminary report disseminated. The survey results show continued improvements in intervention coverage as compared with the 2015 cDHS. For example, IPTp2 improved from 49% to 60% and ITN use among children increased from 55% to 67% as well as among pregnant women (from 52% to 69%). Senegal is known for its robust routine malaria information system, providing prompt and complete data to guide and measure scale-up of malaria control activities. The NMCP is working closely with the Division of Social and Health Information Systems (DSISS) to integrate data from the NMCP routine malaria information system into the national HMIS that now uses the District Health Information System (DHIS2) platform. During FY 2017, PMI continued to support 24 epidemic surveillance sites. With the expansion of reactive case detection activities, PMI supported the malaria epidemic surveillance system to expand data collection to all health posts in the districts of Saint-Louis Region. PMI funding also supported a malaria-specific M&E course which was held in 2017 with participation from the central, regional, and district levels.

Using FY 2018 funds, PMI plans to continue to support the planning and design for a Malaria Indicator Survey (MIS) in 2020; support a health facility survey (using FY 2017 in addition to FY 2018 funding); and support the 4th year of a malaria-specific monitoring and evaluation course for medical officers and nurses at the health facility level.

Operational research (OR): The goal of operational research in Senegal, which is grouped with M&E in the NMCP's Strategic Plan for 2016-2020, is to provide data for decision making and in particular to evaluate issues related to achieving pre-elimination, both in the low transmission North and the high transmission South. In support of the NMCP's objectives, PMI has funded seven operational research studies to date on a variety of topics, namely: a study on the burden of malaria among nomadic pastoralists; an evaluation of the malaria diagnostic algorithm; a qualitative study to assess the acceptability of SMC; a study to determine which factors could explain continued high transmission in Vélingara, where all interventions had been scaled up; a study of Senegal's home-based malaria care program known as PECADOM Plus; and a Phase III

evaluation of long-lasting insecticide-treated nets. No operational research is planned with FY 2018 PMI funding.

Pre-elimination: Senegal’s 2016-2020 National Strategic Plan has set out a goal to reach “pre-elimination status” (incidence < 5/1,000) by 2020. Under this plan, districts with an annual reported incidence of less than 5 cases per 1,000 population are targeted for case investigation and active case detection around passively detected cases together with treatment of all detected malaria cases with single low-dose primaquine. The geographic areas that meet this pre-elimination threshold have rapidly expanded. In 2016, 33 out of 76 health districts, representing nearly half of the population (47%), had an incidence below 5/1,000 (as compared with only 15 districts in 2015). The Islamic Development Bank is covering the majority of activities in 25 pre-elimination districts in the North and PMI will continue to support the four districts that it currently supports. With FY 2018 funding, PMI will strengthen and expand epidemiologic malaria surveillance, including weekly case notifications, in addition to supporting active case investigations in districts with less than five cases per 1,000 population. With FY 2018 funding, PMI will continue to support all of Senegal’s needs in terms of primaquine procurement, as well as training for health care providers on administration of the drug.

II. STRATEGY

1. Introduction

When it was launched in 2005, the goal of PMI was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

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

Senegal was selected as a PMI focus country in fiscal year (FY) 2007. Large-scale implementation of ACTs and rapid diagnostic tests (RDTs) began in 2007 and progressed rapidly with support from PMI and other partners. ACTs and IPTp are now available in all public health facilities nationwide, RDTs are used to confirm malaria cases at all levels of the health system (including the community level) and 27.5 million long-lasting insecticide-treated bed nets (ITNs) have been distributed using a universal coverage approach since 2010. Additionally, routine distribution using different channels (school-based, community-based, and health facility-based) has been pursued.

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plan (2016-2020) and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Senegal, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2018 funding.

2. Malaria situation in Senegal

Senegal's estimated population in 2018 will be approximately 15.4 million, based on the most recent census conducted in 2013. Although substantial improvements have been achieved since the 1960s, Senegal's indicators of human development remain low, with the country ranked 162 out of 187 countries worldwide on the Human Development Index¹. The infant mortality rate is 36 deaths per 1,000 live births and the under-five mortality rate is 51 deaths per 1,000 live births². Maternal mortality ratio is estimated to be 315 deaths per 100,000 live births and the life expectancy at birth is 66.9 years¹. The adult HIV prevalence rate is estimated at 0.5% for adults 15-49 years of age, with 15,000 adults and 5,400 children (aged 0 to 14) estimated to be living with HIV/AIDS¹.

Malaria is endemic throughout Senegal and 100% of the population is at risk of the disease. The three ecological zones, based on annual rainfall, are the northern Sahelian zone with < 400 mm of rainfall occurring between July and September, the central Sahelian zone with 400 – 1,000 mm of rainfall occurring between July and October, and the southern tropical zone with 1,000 – 1,250 mm of rainfall occurring between June and October. The country can also be divided into two epidemiological zones: the tropical zone, with year-round transmission peaking during the rainy season and lower transmission during the rest of the year; and the Sahelian zone, with high transmission toward the end of and immediately after the rainy season and very low transmission during the rest of the year. Transmission in the Sahelian zone may occur throughout the year, often as small outbreaks, in areas close to rivers or other water sources that persist through the dry season. In peri-urban areas, persistent flooding during and after the rainy season has led to higher peaks in transmission during the rainy season and a longer transmission season.

Plasmodium falciparum is the major malaria parasite species, accounting for more than 90% of all infections. The main vector species are *Anopheles gambiae sensu strictu*, *An. coluzzii*, *An. arabiensis*, *An. melas*, *An. funestus*, *An. nili*, and *An. pharoensis*. The species distribution depends on rainfall and the presence of permanent sources of water.

In 2017, the vulnerable groups in Senegal comprise an estimated 3.0 million children less than five years of age and 603,000 pregnant women. According to routine data collected by the NMCP between 2001 and 2006, malaria was responsible for just over one-third of all outpatient consultations. In October 2007, the case definition of malaria changed from a purely clinical definition to one that relies on parasitological confirmation. From that point on, health workers

¹ 2016 Human Development Index, United Nations Development Programme:
<http://hdr.undp.org/en/countries/profiles/SEN>

² 2016 Continuous DHS Senegal: preliminary data tables. The finalized report is not yet available (as of June 2017)

were directed to test all suspected cases of malaria and to treat and report only those cases with positive results. Suspected cases of malaria were defined as those with fever who do not have signs or symptoms indicative of other illnesses. In 2013, 87% of suspected cases were tested, in 2014, 96% were tested, and in 2015 and 2016, nearly all suspected cases were tested (99 and 100%, respectively)³.

As a result of these changes, the proportion of all outpatient visits due to malaria fell from 36% (clinically diagnosed) in 2001 to 6% (parasitologically confirmed) in 2008. The proportion of all deaths among children under five years of age in health facilities that were attributed to malaria also fell from 30% to 7% over the same timeframe. Although the change in the case definition of malaria obscured assessment of the impact of program activities, this reduction continued between 2008 and 2009, with malaria representing only 3% of all outpatient visits and 4% of all deaths in 2009. Morbidity and mortality data were not available between 2010 and 2012 because health worker unions were staging a nationwide data retention strike. This data strike ended in March 2013, and data have been backfilled, though data quality for 2010-2012 is not optimal. In 2013, the routine data system was functional once again. Incidence of confirmed malaria per thousand increased from 14 in 2009 to 27 in 2013, fell to 19 in 2014, and rose to 34 in 2015, a year of record rains and in which the definition of a suspect case was broadened (see below). Incidence ranged from 1 per 1,000 in five northern districts to over 200 per 1,000 in two southeastern districts. In 2016, incidence fell more than 30%, to 24 per thousand (see Figure 1).

In 2015, the NMCP adopted an updated policy of testing all patients under the age of five with fever, regardless of any other signs or symptoms, with the ultimate goal to gradually expand to testing all febrile patients, regardless of age. Given the uncertainty in the true number of patients with fever, the transition to this new algorithm has been gradual to avoid large scale stockouts of commodities, starting with children under five years of age during the rainy season, and expanding to include children under five years of age during the dry season, and then to patients five years and older during the rainy season, with the previous algorithm (those with fever who do not have signs or symptoms indicative of other illnesses) in use for those not included in the above. This broadening of the definition of a suspect case of malaria resulted in a 97% increase in the number of suspect cases and an 85% increase in the number of confirmed cases from 2014 to 2015. From June 2017 onward, all febrile patients, regardless of age, season, or other symptoms will be tested with an RDT.

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

Administratively, the country is divided into 14 regions and 46 departments. The health system functions at the level of the regions (each with a Regional Chief Medical Officer) and is further decentralized into 76 health districts that may be all or part of an administrative department. Health districts are led by the District Chief Medical Officer who, together with the District Health Management Team, oversees care and treatment activities at the District Health Center and at peripheral facilities, as well as prevention activities. Health districts have at least one

³ Source: NMCP Annual Activity Reports and Epidemiological Bulletin for 2013-2016, available at: www.pnlp.sn

health center and a number of health posts (total of 1,486 health facilities in 2017) that are staffed by chief nurses and sometimes midwives.

Although not a formal part of the health system, Senegal's health care pyramid rests on a foundation of approximately 2,108 functional health huts (in 2016) that are established and managed by local communities and cover approximately 50% of the country's population. A functional health hut is defined as one that has a trained community health worker (literacy is preferred but not required), regular supervision by the chief nurse of the health post, and the basic structure and equipment needed to provide services. Malaria case management with free RDTs and ACTs was rolled out in health huts in 2008. The community health workers (CHWs) offer an integrated package of preventive and curative services or referral for more advanced medical care. Additional community health staff includes *matrones*, who are trained birth attendants, and *relais*, who are health educators and communicators.

Since 2008, a new type of health worker, the village malaria worker (*dispensateur de soins à domicile - DSDOM*), provides testing with RDTs and treatment with ACTs through the home-based management of malaria program (*prise en charge à domicile - PECADOM*), now active in 2,111 villages in 13 regions where health services are difficult to access. In 2012, 88 DSDOMs were trained in management of pneumonia and diarrhea in addition to malaria, an approach called integrated PECADOM that was scaled up to 492 DSDOMs in the Kédougou and Tambacounda regions in 2013 and to 1,926 villages in 13 regions in 2015. Since 2012, an active model of the home-based management of malaria was implemented, called PECADOM Plus. During the high malaria transmission period, the community health worker performs weekly sweeps and visits every household in his/her village, actively looking for suspected cases and providing RDT diagnosis and subsequent treatment or referral, as needed. In 2016, PECADOM Plus was implemented in the 16 districts in the South/South-East of the country and the NMCP plans to extend in 2017 to central districts, for a total coverage of 40 districts. In the central regions with intermediate incidence levels, the catchment areas of health facilities bearing an incidence of more than 10 cases/1,000 population will be identified as 'hotspots' and will be targeted for PECADOM Plus implementation. Epidemiological data from 2015 indicated that in the central districts of Diourbel, Kaolack, and Touba, malaria morbidity and mortality remained high. Most of the malaria cases were students from informal residential Koranic schools called *Daaras*, where living conditions are favorable to malaria transmission and limited resources for the students' maintenance often lead to delayed health care seeking. Based on these findings, the NMCP developed a customized PECADOM model for these informal schools, called PECADOM *Daara* and focused on enrollment and training of DSDOMs within these structures and stocking them with RDTs and ACTs. In the first year of implementation (2016), 73 PECADOM *Daara* sites were established.

Both health huts and DSDOMs are linked to their supervising health post by the commodity supply chain and the health information system (i.e., they receive supplies from and submit data to the health post). In 2014, the MoH adopted a National Strategic Plan for Community Health to improve linkages between the community level and the formal health system, to increase ownership by communities, and to improve coordination of activities to make Senegal a model for community health.

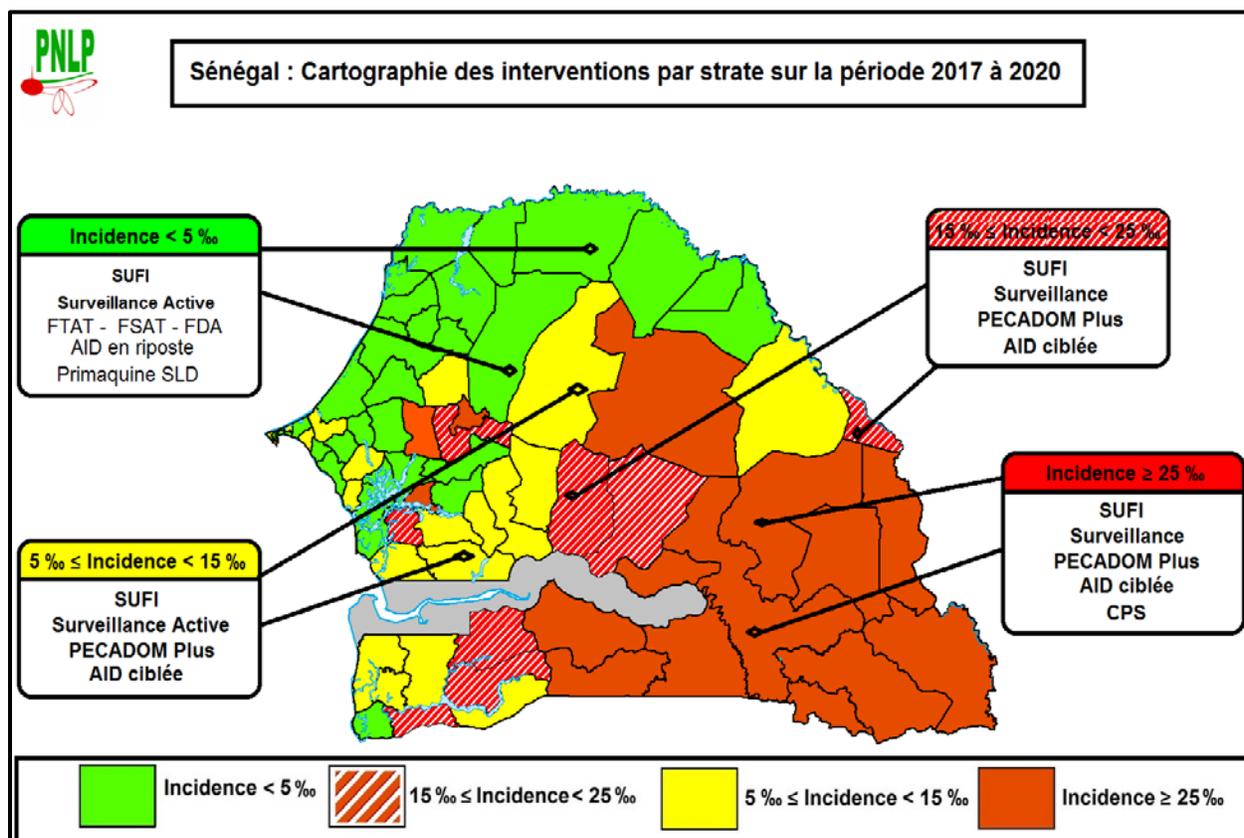
4. National malaria control strategy: Achieve pre-elimination by 2020

In developing the 2016-2020 National Strategic Plan (NSP), the NMCP adopted a goal of reaching the threshold for pre-elimination (defined by the NMCP as annual incidence <5 cases per 1,000) by 2020, continuing the use of proven interventions already scaled up nationally, adopting new proven interventions in a targeted manner, and piloting new interventions. In 2013, the NMCP conducted a midterm program review of its 2011-2015 NSP. Key findings included the need for closer collaboration with private health care providers (case management and reporting) and private enterprises (coordination and resource mobilization); weaknesses in stock management at all levels, including providing malaria commodities free of charge; and the need to extend weekly surveillance to all low-transmission districts. The National Strategic Plan was subsequently updated. In early 2014, a new Strategic Framework was developed to guide the development of a concept note for the Global Fund, covering activities expected to be implemented from 2015 through 2017 (the Framework goes through 2018 in alignment with the National Health Development Plan). In 2015, the NMCP and its partners undertook a Malaria Program Review.

The major recommendations of the 2015 Malaria Program Review included: a) implement the recommendations of the NMCP organizational audit conducted in 2014, b) develop plans for malaria control activities at the regional level in order to mobilize resources from partners at the regional and operational levels, c) ensure availability of commodities (ACTs, RDTs, long-lasting ITNs, SP) at all levels of the health system, d) increase long-lasting ITN storage capacity at the central as well as at the regional level, e) monitor use of injectable artesunate for severe malaria case management, f) implement social behavior change communication campaigns based on evidence and within an appropriate timeframe, and g) conduct data analysis and use at the operational level.

Based on the Malaria Program Review, the timeline of meeting WHO criteria for national pre-elimination was extended from 2015 (as previously described in the 2011-2015 NSP) to 2020 in the 2016-2020 NSP, with interventions targeted to the different transmission zones. In addition to the standard interventions, pre-elimination zones are eligible for case investigation and reactive case detection, while the highest transmission regions (control zones) receive seasonal malaria chemoprevention (SMC) and are prioritized for active home-based management (PECADOM Plus) (see map, below).

Figure 1. Interventions targeted to incidence, by district (2017-2020)



FTAT: focal test and treat; FSAT: focal screen and treat; FDA: focal drug administration; SUFI: scale up for impact (ITNs, IPTp, RDTs, ACTs, PECADOM Plus); *AID ciblée*: focal IRS; *AID en riposte*: epidemic response IRS; CPS: seasonal malaria chemoprevention; Primaquine SLD: primaquine single low-dose.

Source: National Malaria Control Program

NMCP strategy by intervention

Senegal has now adopted all the WHO-recommended interventions and remains a leader in piloting and scaling up new recommendations and innovative strategies to increase the reach and effectiveness of interventions. The 2016-2020 National Strategic Plan outlines the following package of activities:

- **Long-lasting ITNs:** Rolling mass distribution campaigns for universal coverage transitioned to a nationwide campaign in 2016, with scale-up of multi-channel routine distribution.
- **IRS:** Focal spraying to target hotspots at the level of the health post in districts or health posts with annual incidence above 15-30 per 1,000.
- **Larval source management:** Bio-larvicides applied in areas where larval sources are few, fixed, and findable, such as the suburbs of Dakar or dry areas where water holes are known.
- **Seasonal malaria chemoprevention:** One treatment of sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ) monthly during the transmission season, up to four months, for children 3-120 months in regions that meet WHO criteria.

- **Malaria in pregnancy:** IPTp with SP (at least three doses) under directly observed therapy, beginning during the second trimester, at every contact with the health facility, at intervals of at least one month. Every pregnant woman is to receive a free long-lasting ITN during her first antenatal care (ANC) visit. Pregnant women with confirmed malaria are treated with quinine in the first trimester and with ACTs thereafter, unless signs of severe disease, when IV quinine or artesunate is used.
- **Case management**
 - Uncomplicated malaria: All suspected cases are to be confirmed with RDT, and patients with positive tests treated with an ACT. Artemether-lumefantrine, artesunate-amodiaquine, and dihydroartemisinin-piperaquine are co-first line therapies.
 - Severe disease: Pre-referral treatment with rectal artesunate if identified at community or health post level. Definitive treatment at the health center or hospital level with injectable artesunate, to be followed with a course of oral ACT. Hospitalized patients should have malaria confirmed by blood smear.
 - Community level: All patients with fever are tested with an RDT and patients with positive tests receive an ACT. Both health hut and home-based care programs are integrated with diarrhea and pneumonia.
- **Health promotion:** Evidence-based behavior change campaigns and activities accompanied by M&E to measure impact, increasing role of communities and private sector.
- **Epidemic surveillance and response:** Epidemic surveillance sites report all data weekly and data are analyzed to identify hotspots. This weekly notification is being expanded to all health structures in the country. Case notification on a weekly basis and reactive case investigation in pre-elimination zones.
- **Monitoring and evaluation/research**
 - Integration of NMCP data into DHIS2 adopted by the MoH, with quarterly data reviews.
 - Introduction of mobile health (mHealth) system to facilitate reporting of data at community level and reporting of weekly case counts.
 - Health facility supervision using tablet computers to streamline analysis and feedback.
 - Reinforce pharmacovigilance.
 - Introduction of low-dose primaquine for transmission reduction in elimination settings.
- **Supply chain management:** Improve storage and transport capacity, strengthen coordination between the NMCP and the Central Medical Stores (CMS), strengthen capacity for supply chain management at all levels, monitor drug quality and efficacy
- **Program management and coordination:** Update the national malaria policy, improve managerial and operational capacity, increase resource mobilization and coordination efforts, decentralize the fight against malaria, strengthen public-private partnerships and manage control activities in the cross-border areas.

USAID/Senegal Health Program

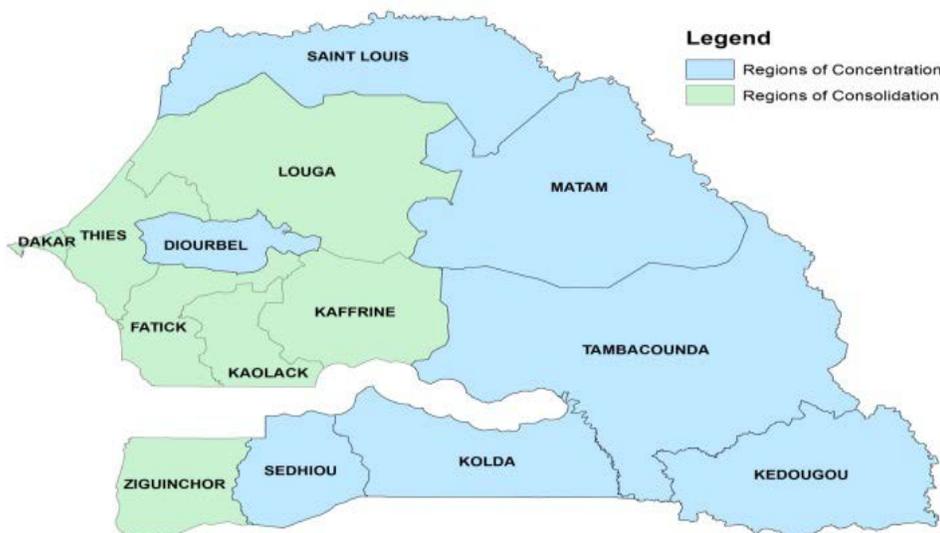
To achieve the vision outlined in the *Plan Sénégal Emergent* of “a Senegal where all individuals, all households and all communities enjoy universal access to promotional, preventive, curative health services of quality, without any form of exclusion,” bold steps will be necessary. USAID is committed to helping Senegal achieve its ambitious health goals by building on more than five decades of success and lessons learned in health sector programming, and by implementing a focused, results-oriented program that fully leverages Senegalese capacity, systems and

resources. USAID has developed a suite of mechanisms—referred to collectively as the USAID/Senegal Health Program (2016-2021)—that together will seek to achieve sustainable, transformative impact.

Historically, USAID has provided technical assistance, training, commodities, and equipment in every region of the country. As maternal and under-five child indicators and capacity have improved, especially in specific regions, USAID has an opportunity to concentrate its investments in lower performing regions, referred to as regions of concentration, to significantly impact the key drivers of child and maternal mortality. Targeted investments in higher performing regions, referred to as consolidation regions, will leverage Government of Senegal (GoS) resources and systems to ensure that gains in child and maternal health are sustained, even as USAID’s physical presence in these regions declines. See map below (Figure 2) showing the classification of regions.

Figure 2. Classification of regions under the USAID/Senegal Health Program for 2016-2021

Health Project Geographic Focus



*Consolidation regions: Dakar, Fatick, Kaffrine, Kaolack, Louga, Thiès, Ziguinchor

**Concentration regions: Diourbel, Kédougou, Kolda, Matam, Saint Louis, Sédhiou, Tambacounda

5. Updates in the strategy section

The NMCP has adopted a strategy that covers 2016-2020 that seeks to achieve pre-elimination by 2020. There were no strategy updates since last year. However, the NMCP has started to implement the managerial, operational and coordination changes required for an effective decentralization of the fight against malaria. This decentralized approach was piloted in the region of Sédhiou in late 2016, where a regional malaria control plan was implemented with local actors and authorities. The NMCP plans on assessing the outcome of this pilot and plans to expand decentralized activities to 5 more regions in the coming year, with technical assistance

and supporting supervision from the NMCP. (further details on PMI support for these efforts included in Health Systems Strengthening section)

6. Integration, collaboration, and coordination

A coordination body was created in 2011, called the *Cadre de Concertation des Partenaires de Lutte contre le Paludisme*, which brings together funding, technical, and non-governmental partners. The president is selected on a rotating basis from among the partners, with the NMCP functioning as the secretariat. This group, currently chaired by a civil society representative, meets several times each year to exchange information and has been instrumental in helping resolve challenges and coordinate efforts.

Funding and technical partnerships

Senegal currently has one active Global Fund malaria grant for approximately \$88 million, awarded to two principal recipients, the NMCP and IntraHealth International. The current 2014-2017 New Funding Mechanism cycle is ending in December 2017. The NMCP, through the Country Coordination Mechanism (CCM) submitted a concept note in March 2017 for additional resources of almost \$40 million to cover the period 2017-2020 in support of the national strategic plan. This funding is expected to support the implementation of the nationwide universal coverage campaign planned for 2019 (including procurement of long-lasting ITNs), the scale-up of PECADOM, and reinforcing surveillance and monitoring and evaluation efforts. The Global Fund was the main contributor to the 2016 long-lasting ITN universal coverage campaign, with a total contribution of more than 4.3 million nets. The NMCP, PMI, and Global Fund Senegal teams enjoy frequent communication and close collaboration.

The **Islamic Development Bank (IDB)** has recently designated Senegal among its focus countries to receive increased resources. As a result, IDB will provide a total amount of \$32 million to the country for the next three years (2017-2020), 70% of which is a loan and 30% of which is a grant. The geographic focus of the IDB funding is in the pre-elimination areas in the north and central regions of the country, namely 25 districts in six regions (Diourbel, Fatick, Louga, Matam, Saint Louis, and Thiès) with a total population of nearly 4 million. The IDB provided 1.3 million long-lasting ITNs for the 2016 universal long-lasting ITN distribution campaign.

Table 1. Major sources of funding for malaria control, 2017-2020

	Geographic focus	2017	2018	2019	2020	TOTAL
IDB¹	North and Center	\$11,520,000	\$15,480,000	\$9,000,000	-	\$36,000,000
Global Fund²	Nationwide	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$40,000,000
PMI³	Nationwide	\$24,000,000	\$24,000,000	\$20,000,000	N/A	\$68,000,000

1. Source: IDB Action Plan 2017-2019. Of the \$36 million, \$32 million (89%) is funding from the IDB, and \$4 million (11%) is funding provided by the Government of Senegal.
2. Source: Senegal Global Fund concept note, submitted March 2017. Assumes disbursements will be the same for each year of implementation.
3. Source: FY 2016, FY 2017, and FY 2018 Malaria Operational Plans.

The **World Bank** provides support for malaria through the Senegal River Basin Development Organization and the Nutrition Enhancement Project. The World Bank contributed a total of 600,000 long-lasting ITNs for the 2016 universal coverage distribution campaign and supports activities such as communication and education to promote net use.

The **World Health Organization** (WHO) provides limited technical and financial support for the implementation of treatment and prevention policies, planning, M&E, research, surveillance, and management of the NMCP.

The **United Nations Children’s Fund** (UNICEF) provides support for district-level health plans in the regions of Kédougou, Kolda, Matam, Sédhiou, and Tambacounda. UNICEF collaborated with USAID-funded Community Health Program Component to support various community health interventions in more than 500 health huts. They also contributed to the scale-up of integrated PECADOM in four regions, and supported some operational costs for the 2013 SMC campaign (funding given by the Japan International Cooperation Agency (JICA)).

In addition to multilateral institutions, Senegal benefits from the support of various bilateral donors. The **French Cooperation** contributes to research activities through the *Institut Pasteur Dakar* and the *Institut de Recherche pour le Développement* (IRD) and places a technical advisor at the MoH. **JICA** and USAID have developed a joint partnership in Tambacounda and Kédougou regions; JICA donated \$1 million for malaria activities in these regions through UNICEF in 2013. The **Chinese Cooperation** makes periodic donations of drugs for the treatment of uncomplicated and severe malaria, and the **Embassy of Thailand** has supported the participation of health personnel at malaria training courses in Thailand. The **Belgian Technical Cooperation** is supporting the overall development of the health sector primarily in Fatick and Kaolack regions as well as contributing to strengthening the human resources capacity of the Central Medical Stores.

Senegal’s non-governmental and faith-based partners are also numerous. *Medicos del Mundo* and several Spanish non-governmental organizations are active in Sédhiou and Kolda regions. They have supported outreach activities by health post staff, rehabilitation of health huts, and long-lasting ITN distribution campaign operations.

Speak Up Africa is a local non-governmental organization dedicated to mobilizing African leadership, resources, and individual action against malaria, diarrhea, and pneumonia in several countries. In Senegal, the group has supported various communications/advocacy activities and helps to draw in national celebrities to support the malaria control cause.

The **International Committee of the Red Cross** supports outreach activities and long-lasting ITN distribution campaign operations in conflict zones in Ziguinchor and Sédhiou regions, as well as in the mining areas of Kédougou Region.

The **Malaria Control and Evaluation Partnership for Africa** (MACEPA), which began work in Senegal in 2009, has implemented a pre-elimination project in one northern district, including enhanced and integrated surveillance and case investigation, and a mass screen and treat program in hotspots in three additional districts. In collaboration with the NMCP, MACEPA defines hotspots as health posts with an incidence greater than 15 per 1,000. As the country makes its way towards pre-elimination, MACEPA has become a major partner of the NMCP.

Senegal is fortunate to have strong academic and research capacities in epidemiology, parasitology and entomology at the NMCP, *Université Cheikh Anta Diop* (UCAD), the **Parasite Control Service** (*Service de Lutte Anti-Parasitaire-SLAP*), *Institut de Recherche et Développement* (IRD), and the *Institut Pasteur Dakar* (now an independent Senegalese Foundation). These groups have strong collaborative relationships and together have published much of the recent literature on malaria in Senegal.

Private sector

In recent years the NMCP has been working with an increasing number of private enterprises on outreach and sensitization programs, long-lasting ITN distributions, and malaria case management. For example, collaboration with the **Senegalese Sugar Company** in the northern city of Richard Toll led the company to introduce RDTs in their clinic, to screen all seasonal workers for malaria, and to provide them with long-lasting ITNs. The company continues to be active in pre-elimination activities in the district. **BICIS Bank** (BNP/Paribas) has become more active in recent years, supporting the printing of a popular children's comic book on malaria and airing spots/messages on the video screens in their branches. EcoBank contributed 5,000 nets to the 2016 universal coverage distribution campaign. The fuel company **Total** has supported communications activities and sells socially-marketed long-lasting ITNs in their stations' shops. Additionally, socially-marketed long-lasting ITNs can also be purchased in the chain of *City Dia* supermarkets and in private pharmacies. Nevertheless, meaningful, longer-term partnerships have proven to be challenging due to the time commitment and skills required to develop them.

Within United States Government (USG)

The **United States Peace Corps** and PMI embarked on a new partnership in 2011. In Senegal, PMI staff and implementing partners continue to regularly participate in pre-service and in-service training sessions and over the past years supported three third-year malaria volunteers to oversee malaria PCV malaria activities and liaise with PMI. Peace Corps volunteers also support PMI and the NMCP through SBCC activities and by participating in M&E and operational

research (OR) activities. Two innovative strategies piloted by Peace Corps, universal coverage distribution of long-lasting ITNs targeting every sleeping space, and PECADOM Plus, a community-based active fever detection program, have been adopted by the NMCP. Another innovative pilot includes the development of a smartphone-based mobile application to help community health workers with limited literacy appropriately apply a differential diagnosis and collect community-level malaria data and indicators.

7. PMI goal, objectives, strategic areas, and key indicators

Under the PMI Strategy for 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination. Building upon the progress to date in PMI-supported countries, PMI will work with NMCPs and partners to accomplish the following objectives by 2020:

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80% reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40% from 2015 levels.
3. Assist at least five PMI-supported countries to meet the World Health Organization's (WHO) criteria for national or sub-national pre-elimination.⁴

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

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

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key indicators recommended by the Roll Back Malaria Monitoring and Evaluation Reference Group (RBM MERG) as listed below:

- Proportion of households with at least one ITN
- Proportion of households with at least one ITN for every two people
- Proportion of children under five years old who slept under an ITN the previous night
- Proportion of pregnant women who slept under an ITN the previous night
- Proportion of households in targeted districts protected by IRS
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs

⁴ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

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

8. Progress on coverage/impact indicators to date

The table below (Table 2) shows that steady progress has been made for most standard malaria indicators in Senegal from 2005 until 2010, as measured by two Demographic and Health Surveys (DHS) (2005 and 2010), four rounds of the continuous DHS (2012-2013, 2014, 2015, and 2016), and two malaria indicator surveys (MISs) (2006 and 2008). As the number of respondents for the case management of children indicator was so low as to make the estimate of this indicator unreliable, the table also includes some non-standard indicators which allow to more accurately track progress in appropriate case management of children with malaria. Coverage indicators have improved again in 2016 after having plateaued for a few years, while parasite prevalence, anemia, and all-cause mortality continue to fall. Of note, most of the surveys have taken place primarily during the dry season, when ITN use and parasitemia are generally lower, though this should not affect ITN ownership, IRS, and IPTp coverage, or child mortality.

Household ownership of at least one ITN rose from 20% in 2005 to 82% in 2016. Intra-household access to an ITN increased from 11% in 2005 to 76% in 2016. Utilization of ITNs by children under five rose from 7% in 2006 to 67% in 2016. Similar trends in utilization were observed with pregnant women and in the general population.

The proportion of pregnant women receiving two doses of IPTp with sulfadoxine-pyrimethamine (SP) increased from 12% in 2005 to 52% in 2008, but fell to 39% in 2010 due primarily to stockouts of SP. The most recent cDHS (2016) shows a notable improvement in IPTp2 to 60%. Comparing the proportion of children with fever who received prompt treatment with an ACT across the surveys is difficult given the introduction of RDTs in late 2007 and the falling incidence, with treatment being given only to patients with a positive test. In addition, the diagnostic algorithm mandated that only those without an obvious alternate cause for fever be tested with an RDT. In 2016, 13% of children had a fever in the last two weeks, 1.1% of which received an ACT within 24 hours.

As a result of the scale-up of malaria control interventions, parasitemia in children under five has fallen from 6% nationwide in 2008 to 1.2% nationwide in 2014 and to 0.9% in 2016. The mortality rate for children under five has fallen from 121 deaths per 1,000 live births in the 2005 DHS to 51 in the 2015 cDHS. These indicators are available at the national level annually through the continuous Demographic and Health Survey (cDHS).

Table 2: Evolution of Key Malaria Indicators in Senegal from 2005 to 2016

Indicator	2005 DHS	2006 MIS	2008 MIS	2010 DHS	2012-3 cDHS*	2014 cDHS*	2015 cDHS*	2016 cDHS* ₁
% Households with an at least one ITN	20	36	60	63	73	74	77	82
% Households with at least one ITN for every two people	11	19	36	41	30	36	41	56
% General population who slept under an ITN the previous night ²	6	12	23	29	41	40	66	63
% Children under five who slept under an ITN the previous night	7	16	29	35	46	43	55	67
% Pregnant women who slept under an ITN the previous night	9	17	29	37	43	38	52	69
% Households with an ITN or sprayed within previous 12 months	--	--	--	66	76	76	-	83
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	12	49	52	39	41	40	49	60
% Children under five with fever in the last two weeks for whom advice or treatment was sought	40	--	--	44		54	49	50
% Children under five with fever in the last two weeks who had a finger or heel stick	--	--	9	10	15	12	10	13
% Children under five with fever in the last two weeks who received treatment with an ACT within 24 hours of onset of fever	--	3	2	3	0.5	0.3	0.3	1.1
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs ³	--	--	50.4	41	21.2	10.6	12.5	29.4
Under-five mortality rate per 1,000 live births	121	--	85	72	65	54	59	51
% Women of childbearing age with anemia (<11 g/dL)	59	--	64	54	--	--		--
% Children 6-59 months with severe anemia (<8 g/dL)	20	--	17	14	10	5.3	7.4	5.6
% Children under five with parasitemia (<i>P. falciparum</i>), by microscopy	--	--	6	3	3	1.2	0.3	0.9
% Children under five with parasitemia, by RDT	--	--	--	--	--	1.1	0.6	0.9

¹Results listed are from the cDHS 2016 preliminary tables; the full report is not yet available (as of May 2017)

²If the household had a minimum of one ITN for every 2 people in the household

³ Proportion obtained from low number of respondents (<100 since 2012)

* cDHS data collection takes place from February to September.

Data collected through routine surveillance systems show that steady progress has been made for most malaria indicators in Senegal over the past five years. As Table 3 and Figure 3 highlight, Senegal has made solid progress in ensuring appropriate data collection and reporting by health facilities, with a completion rate increasing from 93% in 2012 to 99% in 2016. A 94% decrease in total number of clinical cases over the past five year (Table 3) indicates that a larger proportion of malaria cases are benefitting from a proper laboratory diagnosis and fewer care providers are relying on clinical diagnosis and presumptive treatment. Indeed, most reported malaria cases in Senegal are confirmed cases (Figure 3a). The increased number of confirmed cases reported by health facilities, coupled with a decreasing test positivity rate indicates that more patients suffering from a fever are being tested for malaria, yet by 2016 only about 22.5% were testing positive (compared to about 50% in 2012). Thus the program is making progress in reaching every suspected case. The decreasing number of malaria deaths (a 50% decrease in deaths during the period 2012-2016), coupled with an increasing number of confirmed cases indicates that malaria patients are receiving prompter treatment with appropriate medication and the illness outcomes are increasingly favorable. Indeed, aggressively pursuing prompt diagnosis and treatment of uncomplicated malaria and the expansion of pre-referral treatment is showing its positive impact. Despite this progress, the proportion of malaria cases among children under five years of age remains relatively constant, ranging from 12-15% over the past five years (Figure 3b). All Senegalese population is considered vulnerable to malaria and the national strategic plan promotes universal access to antimalarial interventions and does not specifically target children less than five years of age, which could explain why the proportion of malaria cases among children in this age group remains relatively constant over time. Indeed, the Senegalese population at large has benefitted from the great progress made in the fight against malaria.

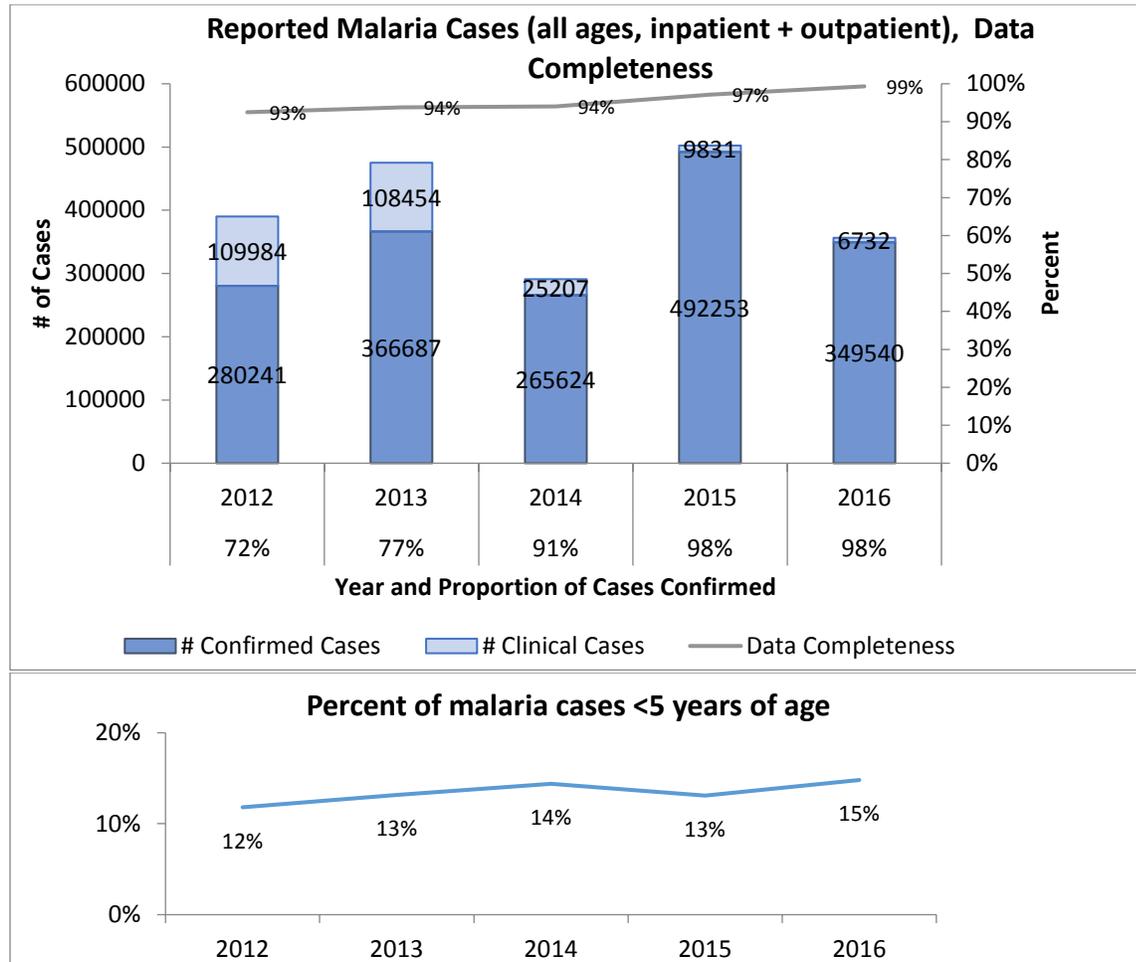
Table 3. Evolution of Key Malaria Indicators reported through routine surveillance systems in Senegal from 2012 to 2016

Indicator	2012 ¹	2013	2014	2015	2016
Total # cases (reported)	390,225	475,141	290,831	502,084	356,272
Total # confirmed cases (reported)	280,241	366,687	265,624	492,253	349,540
Total # clinical cases	109,984	108,454	25,207	9,831	6,732
Total # <5 cases	46,091	62,633	41,807	65,682	52,759
Total # inpatient malaria deaths	649	815	500	526	325
Data completeness ² (%)	92.5%	93.8%	94.0%	97.1%	99.3%
Test positivity rate (TPR)	50.4%	48.3%	38.1%	34.9%	22.5%

¹ Due to data strike in 2010-2012, the indicator data quality for 2012 is questionable.

² Percentage of health facilities reporting each month.

Figure 3: Trends in Key Routine Based Malaria Indicators



9. Other relevant evidence on progress

A PMI-supported impact evaluation, which covered the period from 2006-2010, was completed in late 2013. All-cause under-five child mortality fell 40% during that period, coinciding with dramatic increases in coverage of ITNs and IPTp and a 50% decrease in malaria parasite prevalence. Strikingly, the most dramatic decreases in mortality were seen in the populations in which the increases in intervention coverage and decreases in parasite prevalence were the most pronounced: in the southeastern regions, in the poorest three quintiles, and in rural populations, suggesting that the decrease in mortality correlated with increase in intervention coverage and decrease in parasite prevalence. Routine data corroborated the picture from nationwide surveys, demonstrating a dramatic decrease in confirmed malaria cases and deaths due to malaria, even as the numbers of total consultations and total hospitalizations increased, suggesting a simultaneous increase in access to health services. The NMCP identified the need to repeat a similar exercise to study and document the achievements in malaria control for the period 2011-2015. This evaluation of impact will be initiated in 2017 and will be coordinated with current evaluation

efforts by the Global Fund. PMI's role in this evaluation will be the participation of the in-country PMI team in any discussions about the malaria program with the NMCP.

Routine data available in 2013 showed an increase in incidence from 14 per 1,000 in 2009 to 27 per 1,000 in 2013, with the most pronounced increase in the southeast. Contributing factors included increased access to care and/or increased data completeness, particularly at the community level (342% increase in consultations reported by the community level from 2010 to 2013), with a 23% increase in total consultations among children under five from 2010 to 2013; increased rainfall; and degradation and attrition of long-lasting ITNs distributed in 2010 in the four southeastern regions that were scheduled to have been replaced prior to the rainy season in 2013. In 2014, a dry year, incidence fell to 18 per 1,000, with the greatest decreases in the regions in which seasonal malaria chemoprevention was implemented for the first time in 2014, and parasite prevalence among children under five years in the cDHS fell to 1.2%. The proportion of the population that received a diagnostic test doubled from 2014 to 2015 (also a year of record rainfall), and incidence rose to 35 per 1,000, then fell to 24 per 1,000 in 2016. Test positivity rate fell from 48% in 2013 to 23% in 2016, with 42% of the districts seeing a decrease in incidence of more than 50% from 2015 to 2016. In 2016, the district-level incidence rates ranged from 0.7 per 1,000 in the north to 353.6 per 1,000 in the south-east.

III. OPERATIONAL PLAN

PMI supports the NMCP's 2016-2020 Strategic Plan and objectives for each of the major malaria prevention and control interventions. While PMI supports the majority of the activities in the Strategic Plan, IRS and larval control are not PMI-funded. More detailed descriptions of PMI's area of support for each intervention are provided in the sections below.

1. Vector monitoring and control

NMCP/PMI objectives

Senegal's 2016-2020 Strategic Plan includes a vector control plan with three major objectives:

- Increase the percentage of the population sleeping under a long-lasting ITN to at least 80%,
- Protect at least 90% of the population in zones targeted for IRS, and
- Treat at least 95% of productive larval sites in selected zones. But PMI does not support larviciding.

The overarching strategy for malaria prevention related to long-lasting ITNs is to increase access to nets by strengthening distribution mechanisms. Two distinct approaches are employed:

- Mass distribution of long-lasting ITNs to achieve/maintain universal coverage every three years, quantification based on one long-lasting ITN per 1.8 persons; and
- Routine distribution to allow ongoing access to long-lasting ITNs and maintain high coverage.

The NMCP has adopted a targeted approach for IRS: a) districts with a yearly incidence of less than 30 per 1,000 will not receive IRS, b) districts with an incidence between 30 and 50 per 1,000 may have targeted IRS in the health post zones where malaria incidence is greater than 50 per 1,000 (hotspots) and c) districts with an incidence greater than 50 per 1,000 will receive IRS over the whole district. Routine health system data and entomological parameters such as indoor biting and resting rates will be used to assist in determining where IRS may be appropriate. In addition, the entomologic evaluation of the IRS includes cone bioassays of sprayed walls, entomologic monitoring of effects on vector population and susceptibility of populations to insecticides.

a. Entomological monitoring and insecticide resistance management

Progress since PMI was launched

Prior to the inception of PMI in Senegal, the NMCP had a history of working with the *Laboratoire d'Ecologie Vectorielle et Parasitaire* of UCAD, SLAP and *Institut Pasteur Senegal* for entomological monitoring activities and thus when PMI activities began, the collaboration with these laboratories was a natural continuation. After IRS began in Nioro, Richard Toll, and

Vélingara in 2007, teams composed of entomologists, technicians, and graduate students conducted periodic entomological monitoring activities, including species composition and assessments of insecticide longevity on walls in all three districts. Entomological monitoring activities were extended to new IRS districts as these were added. Teams are based in Dakar but periodically (every four to six weeks during the rainy season) spend two weeks in each district to conduct entomological monitoring activities. Standard operating procedures are reviewed at the beginning of each rainy season.

Species composition: Molecular analyses revealed that four members of the *An. gambiae* complex (*An. arabiensis*, *An. coluzzii*, *An. gambiae* s.s. and *An. melas*) are found in Senegal. Only *An. arabiensis* is found in all areas of the country, including the north in the area of Richard Toll. *An. coluzzii* and *An. gambiae* s.s. are found in almost equal abundance as *An. arabiensis* in the central and southern regions of Senegal. The other member, *An. melas*, was only detected in the salt marshes near Nioro, but published reports have noted its presence in Saint-Louis and Ziguinchor. Species composition can vary depending on the time of the year and the location. For example, in Vélingara, *An. gambiae* s.s. was the predominant species in July, whereas *An. arabiensis* became more abundant as the rainy season progressed. Other vectors were also detected, including *An. funestus* s.l., *An. nili*, *An. pharoensis* and *An. rufipes*.

Sporozoite rates: PMI has supported the testing of sampled mosquitoes to determine their sporozoite rates since 2007. Of the districts where IRS was conducted and in neighboring unsprayed control districts, sporozoites were only found in members of the *An. gambiae* complex in Kolda (2012: 1.9%), Nioro (2009: 0.2%, 2011: 0%, 2012: 0%), and Vélingara (2009: 0.2%, 2011: 0.9%, 2013: 2.6%). In the other districts, insufficient numbers of *An. gambiae* s.l. and other anopheline mosquitoes were collected to give meaningful estimates of sporozoite rates.

Feeding preferences: Five different vertebrate blood meal sources were identified in the mosquitoes: human, chicken, cow, horse, and sheep. In some cases mixed blood meals were detected. In general, the most common blood meal source was human; however, in some areas, a large portion of mosquitoes fed on horse blood.

Resistance testing: Initially, insecticide resistance monitoring conducted by entomologists from the NMCP and UCAD was funded by a WHO/Bill and Melinda Gates Foundation project to monitor the insecticide susceptibility in 12 sites located throughout the country. When the project ended, PMI funding supported monitoring at those sites, including sites in the zones where IRS activities were taking place. PMI supported the testing for susceptibility to five pyrethroids, three organophosphates, two organochlorines, and one carbamate. Because of the high resistance to pyrethroids in the IRS districts, the NMCP and partners decided to switch from pyrethroids to carbamates for the spray campaign of 2011.

Until 2015, only the WHO paper-based assay was being used to detect insecticide resistance. In 2015, the CDC bottle bioassay was also introduced to determine resistance mechanisms. Mosquitoes from Richard Toll and Rufisque were tested with piperonyl butoxide (PBO) and permethrin or with ethacrynic acid and DDT. In both sites, a partial increase in susceptibility was observed with PBO, suggesting oxidases are one of the mechanisms of resistance acting in these populations of mosquitoes. With ethacrynic acid, the mosquitoes from Richard Toll showed a

partial increase in susceptibility, whereas in Rufisque no change in percentage mortality was noted. Glutathione-S-transferase activity may be responsible for some of the resistance noted in the Richard Toll mosquito population.

Some level of resistance to pyrethroids and DDT has been detected in all districts (see Table 4, below) with the highest levels of resistance detected in Guédiawaye, a suburb of Dakar with market farms. Mosquitoes from Dakar Center, Pikine, (data not shown) and Guédiawaye also showed resistance to bendiocarb whereas in all other districts the mosquitoes still appeared susceptible to this insecticide. Resistance against the insecticide pirimiphos-methyl has not been detected.

Table 4. Insecticide susceptibility test results listed as percent mortality from WHO Tube Bioassays for various insecticides in select districts of Senegal.

District	Year	DM	LC	PM	DDT	Bendio	Pir-Met
Koumpentoum ¹	2014	83	75	80	87	99	100
	2015	63	56	77	74	99	--
	2016	94	62	91	82	98	100
Koungheul ¹	2014	100	85	97	78	100	100
	2015	85	98	92	91	100	100
	2016	82	74	98	91	100	100
Malem Hodar ¹	2014	85	71	82	87	100	100
	2015	60	--	47	65	100	100
	2016	90	97	85	75	100	100
Nioro ¹	2014	80	76	46	73	100	--
	2015	83	82	64	79	100	100
	2016	62	72	69	82	100	100
Guinguinéo ²	2014	--	--	--	67	100	100
	2015	94	--	84	64	--	--
	2016	75	85	74	31	100	100
Vélingara ²	2014	86	--	--	77	95	--
	2015	88	77	92	83	100	100
	2016	83	54	82	75	100	100
Richard Toll ²	2014	91	97	78	87	100	100
	2015	78	100	23	54	--	100
	2016	80	48	72	15	100	100
Guédiawaye*	2014	43	39	5	2	64	100
	2015	47	17	3	1	35	100
	2016	44*	16*	3*	--	27*	100*
Ndoffane	2014	82	70	45	45	95	--
	2015	88	--	60	43	96	100
	2016	71	50	70	67	100	100

DM=Deltamethrin, **LC**=Lambdacyhalothrin, **PM**=Permethrin, **Bendio**=Bendiocarb, **Pir-Met**=Pirimiphos-methyl

¹Current IRS district

²Former IRS district

*Note: During the 2016 rainy season, the mayor of Guédiawaye ordered all rain puddles to be destroyed. Therefore, the team was not able to sample this district. The 2016 data listed are from mosquitoes collected in the Pikine district.

Progress during the last 12-18 months

One of the principal roles of entomological monitoring is to assess the quality of spraying and the longevity of the insecticidal effect on the sprayed walls. The results of these activities are reported in the IRS section below.

Laboratory analysis of the mosquitoes collected from July 2016-April 2017 has been partially completed. A few mosquitoes were found infected with *P. falciparum* sporozoites. Sporozoite positive *An. gambiae* s.l. individuals were found in the Malem Hodar (4.5% [2/44 tested])

sprayed zones, in the Nioro sprayed zones (1.2% [1/83]) and internal controls (1.4% [2/142]), and in Ndoffane (1.4% [2/143]), the external control of Nioro and Tambacounda (1.3% [4/299]), the external control for the sprayed zone of Koumpentoum. The only non-IRS associated areas where *P. falciparum* infected *An. gambiae* s.l. mosquitoes were found were Vélingara (1.1% [4/362]) and Kédougou (0.6% [8/1329]). One infected *An. funestus* s.l. (0.2% [1/500 tested]) was discovered in Ndoffane. Blood meal analysis of *An. gambiae* s.l. revealed that the predominant blood meal source was almost always horses in the sprayed areas and their control zones, while humans were the second most predominant blood source in those areas. This was true for Richard Toll as well. However, in Vélingara and Kédougou, 86% and 90%, respectively, of the *An. gambiae* s.l. tested fed exclusively on humans. Molecular analysis of species identification for mosquitoes collected from July 2016 to April 2017 is currently underway.

A change in the species composition was noted in Nioro and Ndoffane. More *An. funestus* s.l. than *An. gambiae* s.l. were collected throughout the season in 2016 whereas in 2015, *An. funestus* s.l. was more predominant only in the month of August. It is unclear whether IRS, ITNs, climatic factors such as a change in rainfall, or a combination of these factors is influencing this change.

Insecticide resistance assays using the WHO tube bioassay were conducted with six insecticides in 23 districts in 2016. Insecticide susceptibility data for six insecticides in some of the districts from 2014-2016 are reported in Table 4. In general, pyrethroid and DDT resistance are widespread and bendiocarb resistance appears limited to the Region of Dakar. Mosquitoes in all districts were found to be susceptible to pirimiphos-methyl even in the zones where this insecticide had been used for IRS.

In an effort to possibly discontinue using human landing catches (HLCs) and pyrethrum spray catches (PSCs) (potentially less effective in areas of pyrethroid resistance), comparisons were made between HLCs and CDC light traps and between PSCs and use of the Prokopack® aspirator. In all four districts tested (Kédougou, Ndoffane, Nioro, and Richard-Toll) more mosquitoes were caught with HLCs and PSCs. Therefore, these two methods will continue to be used in Senegal.

In June 2016, the NMCP and UCAD began collecting documents related to and planning a workshop for the development of a national strategy for insecticide resistance management. The workshop was held in May 2017 with the NMCP, entomologists from UCAD, *Institut Pasteur* Senegal, SLAP, and IRD as well as representatives from *Service National d'Hygiène, Ministère de l'Agriculture et de l'Élevage, Ministère de l'Environnement*, and PMI. A final document is expected to be completed by early August 2017.

A Microsoft Access® database has been developed to provide a searchable and more user-friendly system to store entomological monitoring data, which hitherto had been stored in Excel® files on the UCAD team computer. In addition, a dedicated server and two computers have been purchased for database storage and use. Five people were trained on its use in June 2016. The database is currently undergoing modifications.

Among the recommendations during a 2015 country-wide entomological assessment was the establishment of sentinel sites with trained local technicians and installation of equipment such as microscopes and dissecting scopes to avoid the long field visits from the central level. The NMCP has begun a pilot program to train members of the *Service National d'Hygiène* who are based at the district level and will conduct monthly collections with occasional supervision from the national level. In addition, the assessment indicated that the laboratory space at UCAD was limited and needed improvement. The NMCP and UCAD staff are investigating potential options for improving the laboratory capacity for the *Laboratoire d' Ecologie Vectorielle et Parasitaire* and thus for the NMCP.

Plans and justification

Although PMI plans to cease funding for IRS activities, support will continue for entomological monitoring activities with FY 2018 funds in order to support the use of long-lasting ITNs as well as inform the planned IRS activities that will be supported with IDB funds. Entomological monitoring activities include monitoring mosquito abundance, behavior, seasonality, and susceptibility status in the areas where IRS activities have ceased, in areas in the pre-elimination zone in the north and the high transmission areas of the southeastern part of Senegal. Due to reduced funding, however, the number of sites may be decreased.

Proposed activities with FY 2018 funding: (\$345,600)

1. *Entomologic monitoring (\$316,600)*

PMI plans to continue to support entomologists from UCAD, SLAP, *Institut Pasteur Dakar*, and IRD to conduct entomologic monitoring including insecticide resistance assays (15 sites). Vector behavior will be assessed by monitoring indoor and outdoor biting rates and indoor resting densities. Parity rates will aid in determining female longevity and transmission potential. Finally, mosquito strains will be identified and checked for malaria sporozoites. Entomologists will continue to conduct insecticide susceptibility assays in the former spray districts, as well as in a few additional sites throughout the country where entomologists have been following the evolution of insecticide resistance during the past several years. Molecular analyses of the mosquitoes collected will include identification to species level of the members of the *An. gambiae* and *An. funestus* complexes and identification of insecticide resistance genes. Entomological monitoring remains essential given PMI's continued support for long-lasting ITNs and the NMCP's plans to implement IRS with other donor support.

2. *Technical assistance (\$29,000)*

An entomologist from the Centers for Disease Control and Prevention (CDC) will provide technical assistance for the planning and implementation of all PMI-funded entomologic monitoring activities.

b. Insecticide-treated nets

Progress since PMI was launched

The NMCP and partners have supported various approaches to improving accessibility to long-lasting ITNs:

- 1) **Periodic mass free distribution of long-lasting ITNs:** In 2007, the NMCP began implementing large-scale mass “catch-up” distributions of long-lasting ITNs to children under five, culminating in a final national campaign targeting under fives in 2009. Universal coverage distributions targeting every sleeping space began in 2010 and were completed in April 2013, with 6.9 million long-lasting ITNs distributed. This rolling universal coverage campaign restarted in 2013 in Kédougou, and returned to the eight regions covered in 2010 and 2011 during the first universal coverage campaign, distributing 3.8 million long-lasting ITNs between July 2013 and November 2014. In 2016, during the first country-wide universal campaign, over 8 million nets were distributed.
- 2) **Routine distributions:**
 - a. **Long-lasting ITNs for pregnant women:** During 2008 and 2009, PMI supported the subsidized sale of ITNs and later long-lasting ITNs to pregnant women and children under five. This system involved agreements between facility health committees and private sector net distributors, with beneficiaries contributing a small copayment. Beginning in July 2012, free nets were made available to pregnant women during their first antenatal consultation. During 2015, 155,053 long-lasting ITNs were distributed to pregnant women. Although this was an increase from 2014, health facilities often lacked sufficient stocks of long-lasting ITNs due to difficulties with agents in charge of net distribution. These difficulties have been reduced since late 2016 when the 30-ton truck purchased with PMI funds was delivered to the NMCP.
 - b. **Free distribution in schools:** In 2013, PMI supported the NMCP to pilot free distribution to primary school students in two regions, with 75,710 long-lasting ITNs distributed in classes CI and CE2 (six- and nine-year olds) once during the school year. The distributions were accompanied by educational activities. Two additional regions were added in 2014 and 135,117 nets were distributed in 2014. Very few nets were distributed in 2015 in anticipation of the 2016 mass distribution campaign.
 - c. **Untargeted sales of subsidized bed nets:** From 2006 to 2007, the NMCP supported bed net sales to the general population at health facility pharmacies and through community-based organizations (CBOs) at a subsidized price of 1,000 West African Financial Community Francs (CFA) (about \$2 per net), a portion of which was retained by the health districts and CBOs, a policy continued by PMI until 2010. Beginning in July 2012, PMI began supporting a system to make subsidized nets available to all clients frequenting health facilities at a price of

500 F CFA (about \$1). The NMCP set a goal of 217,300 nets to be sold in this manner and achieved and surpassed their goal in 2014 and 2015, respectively, even though health facilities were not receiving sufficient stocks of nets.

- d. **Distribution via Community-Based Organizations (CBOs):** PMI expanded the availability of subsidized nets in 2013 by supporting a pilot in two regions using CBOs. Community “relays” distribute coupons during home visits or from a fixed point and individuals then redeem the coupons at distribution sites. As with the health facility channel, the long-lasting ITNs are sold for 500 F CFA (approximately \$1) and the copay is shared at different levels to cover transport costs and communications activities. The current CBO system is funded by PMI and handled by the NMCP to help ensure nets arrive at the village level. Health facilities obtain nets from the NMCP. CBOs obtain the nets from the health facilities and use the funds generated from net sales to promote nets and net care. The distribution points for this channel are designated by the CBOs.
- e. **Social marketing:** Finally, PMI supports a social marketing program in urban centers (including Dakar and Thiès, for example) where pharmacies and other retail outlets such as grocery stores and gas stations are available. The NMCP and PMI’s implementing partner coordinate these social marketing activities. Nets are sold at a price of 1,000 F CFA and are branded with a unique logo and promoted through a communications campaign that focuses on being a protective head of household. PMI provides the long-lasting ITNs to pharmaceutical wholesalers, who then assure distribution through their normal supply chain. Actors at each level of the supply chain retain the profit from the sale of long-lasting ITNs to cover their operational costs and communications activities. The social marketing program received a boost 2014 from a partnership developed with *City Dia*, which operates grocery stores as well as the shops co-located with Total gas stations and distribution increased in 2015. This distribution channel helps maintain high net coverage in urban areas that are hard to reach with UC campaigns. However, during campaign years, the number of nets that are available via this channel is reduced to ensure that there are sufficient nets to meet campaign needs. This strategy is currently being evaluated to determine whether it reaches those who are really targeted and use findings of the evaluation for future programming. Once the evaluation results are final, the PMI/Senegal team will reassess FY 2018 MOP support for social marketing and reprogram funds if needed.

As a result of implementing these different strategies, household ownership of at least one ITN has increased substantially (from 20% in 2005 to 73% in 2012 and 82% in 2016). Utilization of ITNs by children under five rose from 7% in 2005 to 46% in 2012 and to 67 % in 2016 with similar trends observed among pregnant women and in the general population. However, these data mask significant disparities among regions, reflecting socio-cultural differences as well as the progression of the universal coverage campaign (see Table 5, below). Regional ITN ownership during each cDHS year reflects the rhythm of rolling distribution, with the highest ownership in regions that had most recently received a campaign, and lower coverage among

those that had not yet received the most recent distribution. For example, the West zone, which includes the populous and urbanized regions of Dakar and Thiès, had not yet been covered by the campaign at the time of data collection for the 2012 continuous survey but received nets in 2013. Net ownership in this region increased by 12% in the 2014 cDHS. Regions in the center received nets in a mass campaign 2014 and their net ownership increased by 11% from 2014 to 2015. Possession of ITNs in 2016 is highest among the poorest quintiles (greater than 94%) and in rural areas (94% rural vs 73 % urban).

Table 5: ITN possession and use by zone and population in 2014-2016

Zone - year	Proportion of households possessing at least 1 ITN	Average number of ITNs per household	Proportion of population that slept under an ITN the previous night			In households with at least 1 ITN, proportion of population that slept under an ITN the previous night		
			General popn	Children under 5	Pregnant women	General popn	Children under 5	Pregnant women
North 2014	81	3.2	48	53	35	59	63	44
	2015	78	2.6	53	54	55	68	70
	2016	87	3.7	58	60	69	67	70
West 2014	62	2.3	33	36	28	49	52	51
	2015	61	2.1	36	45	33	53	64
	2016	70	2.8	54	59	62	72	76
Center 2014	82	3.3	37	38	40	45	46	50
	2015	93	5.0	65	67	67	71	72
	2016	96	6.3	73	75	74	77	77
South 2014	89	3.5	53	54	56	60	62	65
	2015	92	4.0	56	54	53	59	57
	2016	96	5.5	73	71	75	75	73

Source: 2012-13 cDHS, 2014 cDHS,, 2015 cDHS, 2016 cDHS

*Data not available at time of MOP writing.

Note: Due to the timing of the surveys, ITN use is measured during the dry season. Usage estimates are therefore probably an underestimation of actual usage.

North=Regions of Matam, Louga, and Saint Louis; West=Regions of Dakar and Thiès; Center=Regions of Diourbel, Fatick, Kaffrine, and Kaolack; South= Regions of Tambacounda, Kolda, Kédougou, Sédhiou, and Ziguinchor.

Progress during the last 12-18 months

During 2016, the NMCP carried out a nationwide universal campaign in three phases, starting in the Axe I (the southern regions of Kédougou, Kolda, Sédhiou, Tambacounda, and Ziguinchor), then to Axe II (the central regions of Diourbel, Fatick, Kaffrine, and Kaolack) with most of Axe III (regions of Dakar, Louga, Matam, St. Louis, and Thiès) covered last due to a delay in receiving ITNs. Organizations contributing nets to the campaign included the Global Fund, the Islamic Development Bank, the World Bank (via the Senegal River Basin Development Organization), and PMI. More than 8 million nets were distributed by June 2016, of which 2.15 million were procured with PMI funding. As a result, the proportion of households with at least

one ITN, average number of nets per household, and usage among all populations increased throughout the country (see Table 5).

During 2016, although routine distribution systems were underemphasized because of the 2016 mass campaign, 343,627 long-lasting ITNs were distributed through the following channels:

Table 6. ITNs distributed through routine channels

Channel	2015	2016
Health facility – ANC	193,205	219,212
Health facility – general consultations	227,569	79,817
Schools	551**	125**
CBOs	131,930	44,273
Social marketing (sold to distributors)	395,022	
TOTAL	948,277	343,427

*Quantities for a partial year (October 2016 through March 2017).

**Not emphasized in anticipation of 2016 mass campaign.

More than 700,000 nets have been sold using social marketing through pharmacies, gas stations and supermarkets in the Dakar Region since 2014. An evaluation of the impact of social marketing was conducted in June-July 2017, via a household survey that obtained demographic information on the buyers of socially marketed nets. The evaluation data will help determine which gaps social marketing can fill, whether adjustments to this strategy are needed, and whether this channel is viable and cost-effective for future ITN distribution.

The NMCP and PMI developed a protocol and began implementing durability monitoring in May 2015 of seven types of long-lasting ITNs distributed during the 2014 mass campaigns in six regions. The six-month, one-year and two-year samples have been removed from the field and hole-counts and cone bioassays have been completed for the six-month and one-year samples and are underway for the two-year samples. Although a local NGO was contracted to carry out the project, UCAD staff are conducting cone bioassays on the nets. Chemical analyses of these nets are underway at CDC in Atlanta.

Commodity gap analysis

Maintaining high long-lasting ITN coverage levels after the mass campaigns will require keeping up long-lasting ITN distribution via the different routine channels across the country. Approximately 1.8 million nets need to be distributed through the routine channels in order to maintain coverage. Under its new Strategic Plan (2016-2020), the NMCP will continue mass campaigns every three years and plans to implement a nationwide replacement campaign in 2019. While previous mass distribution campaigns have taken into consideration the nets in the field, PMI plans to discuss this practice with the NMCP to determine whether future campaign distributions could instead provide a standard number of nets per household and disregard existing nets (in line with WHO guidance). If necessary, PMI will provide technical assistance to the NMCP to review the routine distribution strategy to adjust it to the requirements of the

overarching elimination goal. The different routine channels will continue to operate, providing the population with several options for replacing worn out nets in the interim.

Table 7: Long-lasting ITN Gap Analysis

Calendar Year	2017	2018	2019
Total Population	15,072,407	15,449,217	15,835,448
Routine Distribution Needs			
Pregnant women during first prenatal care visit (4% of the population); assumes 100% attendance for one visit ¹	602,896	617,969	633,418
Other health facility clients; assumes 4% of all clients will purchase a subsidized long-lasting ITN based on 2013 estimate	1,061,243 ²	404,811	95,978
Community-based organizations		447,700 ²	51,175 ²
Primary school students			
Social marketing	187,319	168,372	92,604
Estimated total need for routine channels	1,851,458	1,638,852	873,175
Mass Distribution Needs			
2019 national campaign	0	0	9,907,339
Estimated total need for mass campaigns	0	0	9,907,339
Total Routine and Mass ITN Needs	1,851,458	1,638,852	10,780,514
Partner Contributions			
ITNs carried over from previous year	307,120	2,025	863,173
ITNs from MoH	0	0	500,000
Global Fund	246,363	0	3,726,902 ³
Islamic Development Bank	100,000	0	2,000,000 ³
Senegal River Basin Development Organization	0	0	600,000 ³
Speak up Africa	0	0	50,000 ³
ITNs planned with PMI funding	1,200,000	2,500,000	2,000,000
Total ITNs available	1,853,483	2,502,025	9,740,075
Total ITN Surplus (Gap)	2,025	863,173	(1,040,439)⁴

¹Nets are not distributed during EPI visits in Senegal. The NMCP has determined that EPI channels are not appropriate to reach children eligible for routine vaccination given that those children traditionally sleep with their mothers and would thus be protected by nets that pregnant women receive at ANC visits.

²Nets for school based system are included in the community-based organization channel. If the CBO channel is not functioning well, the school based channel will be used to improve availability.

³Nets are for mass campaign only.

⁴Gap may be covered by the Global Fund grant (TBD)

PMI plans to provide approximately 1.2 million of the needed long-lasting ITNs in 2017 and 2.5 million in 2018, which will be distributed primarily through the routine channels. The surplus of PMI-procured nets in 2018 will be used for the mass campaign of 2019. In addition, with FY 18 funds, PMI will purchase another 2 million nets in late 2018 for use in the latter part of the 2019 campaign.

Plans and justification

With FY 2018 funds, PMI plans to purchase nets to help complete the 2019 mass distribution campaign as well as continue to support routine distribution. PMI also plans to support communications activities to inform the population about mechanisms to acquire nets and their proper use and maintenance. These activities are described in the SBCC section.

PMI will continue long-lasting ITN durability monitoring of nets distributed during the November 2014 mass campaigns. The final collections are scheduled for November 2017. Under this protocol, the same cohort of nets distributed in 2014 will be followed out to 2017.

Proposed activities with FY 2018 funding (\$5,860,000)

1. *Procurement of long-lasting ITNs (\$5,760,000)*

PMI plans to support the routine long-lasting ITN distribution channels as well as the 2019 mass distribution campaign by procuring approximately 2 million long-lasting ITNs. As of the writing of the MOP, there is still a 1 million ITN gap to cover the country's routine and mass distribution needs for the calendar year 2019. In addition, the exact quantities of ITNs to be procured by the Global Fund are not yet confirmed. While the specific proportion of PMI-procured nets for routine vs mass distribution is not yet known, it is likely that the PMI-procured nets will primarily be used for the campaign (given the estimated shortfall) and any nets not used for the campaign will be fed into the routine distribution channel. The NMCP plans to include operational costs for PMI-funded nets in the funding request to the Global Fund (2017-2020).

2. *Operational support for distribution of routine long-lasting ITNs (\$100,000)*

With FY 2018 funds, PMI will support the operational costs for the distribution of routine long-lasting ITNs. PMI has purchased a truck for the NMCP that became functional last year, which is being used to improve the distribution of ITNs via all routine channels in Senegal. In addition to providing this support for the logistical aspects of routine ITN distribution, PMI will work closely with the NMCP to reinvigorate routine distribution channels so that they continue to function and provide a steady supply of ITNs even during campaign years.

c. Indoor residual spraying

Progress since PMI was launched

Senegal has benefitted from IRS since PMI began work in the country in 2007. The first three districts sprayed with PMI support—Nioro (central), Richard Toll (north), and Vélingara (south)—each represented a different ecological zone. One spray round was carried out just before the high transmission season in each district, while in Richard Toll, a district along the Senegal River, another round was done immediately prior to the second seasonal peak in April.

After entomological monitoring demonstrated that the insecticidal activity persisted long enough to cover the second peak, this second round was eliminated in 2010. Also in 2010, IRS operations were expanded to Guinguinéo, Koumpentoum, and Malem Hodar, districts that were among the 16 health districts prioritized for IRS by the NMCP. In 2011, because malaria rates were low and insecticide resistance was high in Richard Toll (north), spray operations ceased in this district and Koungheul was selected as a replacement. In early 2013, the IRS Steering Committee, composed of representatives from the NMCP, entomologists from UCAD, the *Service National d'Hygiene*, the National Directorate of Environment and Agriculture, the IRS implementing partner, and PMI, made the decision to cease IRS operations in the districts of Guinguinéo and Nioro because data indicated that malaria rates had become very low. A plan for post-withdrawal action was prepared, including communications at both administrative and community levels and enhanced surveillance. In November 2014, the IRS steering committee decided to cease spray operations in Vélingara (south) because this district benefitted from a recent long-lasting ITN campaign and the use of SMC and because the entomological and routine health systems data did not provide convincing evidence of a benefit from IRS. The committee decided to return to Nioro where malaria incidence had increased in the past couple of years (incidence of 47 and 31 per 1,000 in 2013 and 2014).

Starting in 2015, the country strategy changed from blanket spraying to focal spraying, targeting health zones or districts where the malaria incidence was 15 or more per 1,000, as a potentially more cost-effective method than blanket spraying. The four districts selected for hotspot spraying are all located in the central area of the country: Koumpentoum, Koungheul, Malem Hodar, and Nioro. A long-lasting organophosphate was chosen for the implementation of IRS in these districts.

The effect of focal spraying on malaria incidence rates was difficult to tease out. In 2015, malaria incidence rates increased in most of the country except in the districts of Guinguineo and Nioro and Nioro's neighboring districts of Dioffior, Passy, and Gossas. In addition, malaria incidence rates differed from year to year in some health zones. The selection of health zones to spray in 2015 was based on the malaria incidence data from 2013. In some health zones the malaria incidence had decreased below the 15 per 1,000 threshold in 2014 whereas in others not selected for spraying it had increased above the threshold. Nevertheless, a slight effect of focal IRS on malaria rates was observed. In Nioro, although average malaria incidence decreased in all health zones, the greatest decline occurred in the sprayed zones (from 26 per 1,000 in 2014 to 8 per 1,000 in 2015) as compared to the unsprayed zones (where malaria incidence decreased from 14 per 1,000 to 7 per 1,000). In Koumpentoum and Malem Hodar, the opposite effect was observed; great increases in malaria incidence were noted in both sprayed and unsprayed health zones. In Koumpentoum, the greatest increase was seen in the unsprayed health zones whereas in Malem Hodar the sprayed zones showed the greatest increase in malaria incidence. Only in Koungheul was there a clear indication that the focal spray had an effect. From 2014 to 2015, the average malaria incidence in the sprayed zones decreased from 27 to 20 but in the unsprayed health zones they increased from 8 to 42 per 1,000.

The population protected during the eight years of IRS ranged from around 650,000 in 2007 to more than 1 million in 2012, with high coverage rates being achieved in most years (see Table 8 for last three years). As malaria incidence decreases, fewer health post zones in the districts

targeted for IRS will meet the NMCP criteria for IRS, therefore the population covered will decrease.

Table 8: PMI-supported IRS activities 2015-2019

Year	Number of Districts Sprayed	Insecticide Used (# districts)	Number of Structures Sprayed	Coverage Rate	Population Protected
2015	4 (hotspots ¹)	Bendiocarb (part of 1) Organophosphate (4)	130,170	98%	514,833
2016	4 (hotspots ²)	Organophosphate	124,757	97%	496,728
2017	4 (hotspots ³)	Organophosphate	156,362	96%	619,578
2018	No IRS planned with FY 2017 funding.				
2019	No IRS planned with FY 2018 funding.				

*Represents projected targets

¹ For the 2015 IRS campaign, hotspots were selected based on 2013 data.

² For the 2016 IRS campaign, the same hotspots as in 2015 were sprayed.

³ For the 2017 IRS campaign, the same hotspots as in 2015 were sprayed. In addition, 10 new zones were sprayed because of the relatively higher malaria incidence rates recorded in 2016.

Spray operations have been organized by PMI implementing partners under the direction of the NMCP, the *Service National d'Hygiene*, UCAD, and district health management teams. PMI support includes training and equipping locally-recruited spraying agents with help from the NMCP and its vector control partners, with supervision by the *Service National d'Hygiène*. All spray rounds were followed by post-spray evaluation meetings to identify lessons learned and opportunities for improving the next round.

Progress during the last 12-18 months

In 2016, the NMCP and partners continued to implement the IRS strategy targeting hotspots in four districts located in the central part of the country: Koungheul, Koumpentoum, Malem Hodar, and Niore. The steering committee selected 51 health post zones with a malaria case incidence of 15 per 1,000 or more. Because of a shorter than expected longevity of insecticide in 2015, the start of spraying activities with the organophosphate insecticide pirimiphos-methyl was moved to July in all four districts. A total of 124,757 structures were sprayed (out of 128,185 targeted) and 496,728 people were protected. Despite the many challenges involved in IRS implementation, routine monitoring of spray operations suggests that high rates of acceptance have been consistently achieved in all spray rounds.

During the 2016 IRS campaign, a community-based approach to IRS was initiated in one zone in Malem Hodar as a means to reduce IRS costs and build country capacity to lead IRS implementation. With this system, the community provides the sprayers and transportation of sprayers. During the national end of spraying evaluation meetings, partners and stakeholders

recommended continuing this approach because of the reduction in cost as well as the commitment from community leaders. It was implemented again in 2017.

Cone bioassays on walls during the 2016 IRS campaign revealed that the insecticide on the walls killed 100% of the mosquitos tested in all four districts within the first month after spraying. The longevity of insecticidal effects of the pirimiphos-methyl endured (greater than 80% mortality) two to six months depending on the district. In Koumpentoum, the insecticidal activity seemed to last six months although an apparent decrease in activity was observed in the third month. In Kounghoul and Nioro, the insecticidal activity dropped below 80% in the sixth and fifth months, respectively. In Malem Hodar, the insecticidal activity declined to around 70% mortality by the second month after spraying and down to 40 % mortality in the fourth month.

The effects of hot spot spraying on malaria incidence rates were still difficult to tease out in 2016 because malaria incidence rates decreased throughout almost 90% of the country as compared with 2015. This was also the case in most of the sprayed zones, the unsprayed zones within the sprayed districts, and the external controls in their neighboring districts. Nevertheless, in the districts of Kounghoul, Koumpentoum, and Malem Hodar, the percentage decrease in malaria incidence rates was greatest in the sprayed zones where malaria incidence rates decreased by 64%, 73%, and 78% respectively, when compared to the unsprayed internal controls (49%, 24%, 48% decrease, respectively) and the external controls (31%, 54%, and 31% decrease, respectively). In general, these data suggest that focal spraying is assisting in reducing malaria transmission. However, in Nioro, the decrease in the average malaria incidence rates (from 5 to 4 per 1,000) was very slight in the sprayed zones and no change was noted in the unsprayed zone (3 per 1,000 for both years).

Preparation for the 2017 spray campaign began in March 2017, including reviewing training tools, preparing soak pits, recruiting seasonal spray operators, and training. This is the third year that hotspots will be targeted and activities continue in the same four districts as in 2015. The long-lasting formulation of the organophosphate pirimiphos-methyl was used in all districts and because of the shorter than expected longevity of the insecticide in 2015, the actual spray activities were moved later in the year to July to cover the entire transmission season. During the 2017 spray campaign, a total of 156,362 structures were sprayed (96% of eligible structures found) and 619,578 people were protected with IRS.

In 2017, Senegal will receive approximately \$5 million in funding from the IDB to carry out IRS in hotspots in 13 districts (two to five hotspots per district) in the pre-elimination areas in the north and central regions of Senegal over a three-year period (2018-2020), which are located north of the areas that were previously sprayed with PMI support. These activities will be carried out in collaboration between the NMCP and the *Service National d'Hygiene*.

Plans and justification

At the time of MOP writing, no PMI FY 2018 funding is planned for IRS support. After three years of implementation, focal spraying of hotspots was only suggestive of a benefit from IRS based on malaria incidence. As long-lasting ITNs are distributed nationwide and community case management is expanded throughout the country along with implementation of SMC,

support of IRS activities in terms of relative cost and geographic coverage does not appear to bring a significant gain in malaria control. Given the reduced funding for the FY 2018 PMI MOP, the need to fill gaps in long-lasting ITNs for the mass campaign in 2019, and continued support of community case management activities with PMI funds, the NMCP and MOP team agreed that no FY 2018 PMI funds would be provided for IRS support. This decision was supported by the IRS Steering Committee during their May 2017 meeting. However, IRS will be supported in 13 districts within the pre-elimination areas of Senegal with funding through the IDB. As part of PMI's post-IRS withdrawal plan, PMI FY 2017 funds have been programmed to support SBCC messaging related to the IRS withdrawal and emphasizing the use of ITNs as well as prompt care seeking by residents in the four former IRS districts. In addition, activities such as entomological monitoring, implementation of PECADOM Plus, and weekly case notification will continue in these areas.

2. Malaria in pregnancy

NMCP/PMI objectives

In line with the previous Strategic Framework, which covered 2014-2018, the NMCP's Strategic Plan for 2016-2020 continues to emphasize the protection of pregnant women from malaria as a key intervention given the health risks that malaria poses to the pregnant woman and her fetus.

The specific objectives outlined in the Strategic Plan are as follows:

- At least 80% of pregnant women will be protected with IPTp3 according to national guidelines by 2020
- At least 85% of pregnant women will sleep under an ITN by 2020
- All malaria cases in pregnant women will be seen at health facilities and treated according to national guidelines by 2020

In 2003, the NMCP adopted intermittent preventive treatment in pregnant women with SP given free of charge as directly observed therapy during focused ANC visits as national policy. This policy is implemented in all ANC sites nationwide, regardless of epidemiologic strata. The Strategic Plan states that all pregnant women should receive at least three SP doses during their ANC visits, starting in the second trimester and with at least one month between doses. The Plan includes advocacy for health workers and the population at large, training and supportive supervision of health workers, and outreach activities by health post staff to provide ANC services at the community level at health huts, all of which are supported by PMI.

The four key IPTp interventions highlighted in the Strategic Plan are:

- (1) Ensuring availability of commodities and materials for the provision of directly observed IPTp;
- (2) Implementing IPTp, with the introduction of IPTp3 as the indicator to be tracked;
- (3) Monitoring of IPTp implementation; and
- (4) Engaging the private sector.

In addition, the NMCP aims to treat 100% of pregnant women with confirmed malaria according to national guidelines, using quinine in the first trimester and ACTs (AL, AS-AQ, and DH-

piperaquine) in the second and third trimesters. There is no second-line treatment for malaria in pregnancy.

Progress since PMI was launched

The NMCP has updated its policy, guidelines, and training manuals to reflect the WHO recommendation to simplify IPTp guidelines and incorporate the recommendation that IPTp-SP be given at each scheduled antenatal care visit starting as early as possible in the second trimester, provided that there has been an interval of approximately one month since the last dose of SP. With PMI's support, updated registers are now being used in health facilities nationwide and these include fields to record all three doses of IPTp as well as whether an ITN was provided. PMI has supported the production, dissemination, and use by health care workers of new ANC registers and ANC cards that allow for accurate recording of IPTp treatments; job aids to promote the correct management of malaria in pregnancy and improve the counseling skills of health care providers; water filters/dispensers and re-usable cups for directly observed treatment with SP; and refresher training and supportive supervision. The PMI-supported MIP training is part of integrated training that covers data collection and record-keeping, prevention of malaria with IPTp and use of long-lasting ITNs, and diagnosis and treatment of malaria in pregnant women. PMI supports a routine long-lasting ITN distribution system that offers free long-lasting ITNs to women attending ANC as well as support for universal coverage mass long-lasting ITN distribution campaigns every three years, in line with the NMCP's Strategic Plan (see ITN section for more details).

The majority of women in Senegal receive antenatal care from a trained provider during their pregnancy. According to the most recent cDHS (2016), attendance at ANC remains high; 96% of pregnant women make at least one visit, while 54% make four or more ANC visits. Coverage of ANC services overall is equitable and homogenous throughout the various regions of the country.

In 2016, according to the NMCP's Annual Epidemiological Bulletin, there were 7,044 confirmed cases of malaria among pregnant women nationwide, a 23% drop as compared with 2015. Furthermore, the NMCP reported that, in 2016, 100% of cases among pregnant women seen at health facilities were correctly treated according to national policy. According to Senegal's routine health information system, a total of 1,008,136 treatments of SP were administered to pregnant women during the calendar year 2016 nationwide.

Coverage of malaria interventions among pregnant women in Senegal has shown steady improvement, as described below:

ITN coverage: ITN use among pregnant women in Senegal has increased from 9% in 2005 to 69% in 2016 (cDHS). Pregnant women in rural areas were more likely to use ITNs (73%) than those living in urban areas (64%).

IPTp2 coverage: Nationwide surveys and routine data show that IPTp2 coverage has also improved. While only 12% of pregnant women received two doses of SP (for pregnancies that occurred in the last two years) in 2005, this percentage increased to 60% in 2016 (cDHS). This finding is corroborated by Senegal's routine health information system, which also reports

improvements in IPTp2 coverage, from 36% in 2010 to 66% in 2016 (see Table 9 below, with breakdown by region). It is important to note that the NMCP calculates this indicator based on first ANC visit rather than pregnant women (see footnote 1 in Table 9).

IPTp3 coverage: In 2015, coverage with IPTp3 stood at 11% according to the cDHS⁵ and at 43% according to the routine data system. Coverage with IPTp3 has improved in the last year, with 37% of pregnant women nationwide reporting having received at least three doses of IPTp according to the 2016 cDHS and 45% according to health facility data (see Table 9, below). While IPTp3 coverage remains fairly low, the NMCP credits the introduction of this indicator as one of the driving factors behind the recent uptick in national coverage with IPTp2.

While Senegal's IPTp coverage is progressing, the large difference between the percentage of pregnant women who receive ANC care and those who receive successive doses of IPTp1, IPTp2, and IPTp3 points to missed opportunities in SP administration. The NMCP considers IPTp as essential to the achievement of its Strategic Plan for 2016-2020 and has set an ambitious target of 80% coverage with IPTp3 by the year 2020. The NMCP recognizes that there remains a gap between ANC attendance and coverage with IPTp and that a concerted effort is warranted to ensure that women receive not only their first dose of SP but that they also return for subsequent doses over the course of their pregnancy. The NMCP has therefore renewed its focus on this intervention and is continuing to implement an "IPTp relaunch plan," which includes ensuring availability of SP and materials (such as cups) to encourage directly-observed therapy, intensifying outreach approaches at the community level (such as actively seeking out pregnant women who may have missed SP doses, training and supportive supervision for health workers, and communication activities to disseminate messages on the benefits of IPTp and the importance of early ANC attendance).

⁵ Note: As the cDHS covers the last two years, IPTp3 measurements from this survey would not reflect an increase that occurred primarily in the last year.

Table 9. IPTp2 and IPTp3 coverage (%) by region (2014-2016)¹

Region	2014 ²		2015 ³		2016 ⁴	
	IPTp2	IPTp3	IPTp2	IPTp3	IPTp2	IPTp3
Dakar	63	N/A	70	45	64	44
Diourbel	65	N/A	74	49	64	45
Fatick	71	N/A	74	43	65	44
Kaffrine	67	N/A	73	42	72	58
Kaolack	70	N/A	72	46	66	50
Kédougou	49	N/A	57	31	56	39
Kolda	59	N/A	64	33	60	33
Louga	67	N/A	72	42	64	42
Matam	62	N/A	67	38	70	45
Saint-Louis	79	N/A	73	46	70	47
Sédhiou	70	N/A	62	31	76	49
Tambacounda	54	N/A	57	28	58	35
Thiès	70	N/A	73	48	67	48
Ziguinchor	65	N/A	75	48	82	56
National	66%	25%	70%	43%	66%	45%

(1) The NMCP calculates this coverage by dividing the SP dose numbers (1, 2, 3) by first ANC visit, for all women enrolled at their first ANC visit.

(2) Source: NMCP Annual Epidemiological Bulletin for 2014, Senegal, available at: www.pnlp.sn.

(3) Source: NMCP Annual Epidemiological Bulletin for 2015, Senegal, available at: www.pnlp.sn.

(4) Source: NMCP Annual Epidemiological Bulletin for 2016, Senegal, available at: www.pnlp.sn.

Progress during the last 12-18 months

Through PMI's implementing partner in charge of health systems strengthening efforts, PMI continued to support performance-based financing activities, which include indicators for IPTp2 and IPTp3. During the 24 month implementation period, all healthcare providers benefiting from the performance-based financing system met their targets with respect to the indicators for IPTp2 coverage in the two supported regions (Kolda and Kaffrine). For example, in 2013, 40% of health posts and health centers achieved their 4th quarter target for IPTp2; this percentage increased to about 95% by the 4th quarter of 2014. In the two regions that received PMI support for performance-based financing efforts during the past year, Kolda and Kaffrine, positive results were noted in terms of IPTp2 coverage. In Kolda, during 2015, 99% of women targeted received IPTp2 (18,955/19,221) while in Kaffrine, this proportion was 94% (23,343/24,958). (See the health systems strengthening section for more information about performance-based financing efforts).

Furthermore, to support the overall decentralization process that is underway in Senegal, contracts were signed with 6 regions with a start date of January 2017. Under these contracts, direct funding (through a G2G mechanism) will be provided to the regions via PMI's health system strengthening partner. The contracts include various maternal and child health indicators, including IPTp3. During the past year, a baseline survey was conducted in 14 regions (both those

receiving direct G2G funding and those not) in order to track these indicators (i.e. number of women who received IPTp3 in 2016) going forward. These direct financing efforts are expected to inform the NMCP's decentralization efforts as plans are underway to set up three regional NMCP offices, one in each of the epidemiological zones (north, central, and south). (See the health systems strengthening section for more information about direct financing efforts).

During the 1st quarter of 2017, two planning sessions were held with the NMCP to strategize on how best to address gaps in IPTp coverage in four southern regions; in particular, the focus will be on drafting action plans to improve IPTp coverage in 12 priority districts which are lagging in this indicator.

During the period October 2015-September 2016, PMI supported training for a total of 193 facility-based health workers on the prevention, diagnosis, and treatment of malaria in pregnancy, in addition to those trained by the NMCP (see Table 10, below). PMI also provided support to the NMCP to finalize and print malaria training manuals (e.g. trainer's manual and participant's manual) for all health workers (except CHWs). These materials now include the recent WHO recommendations with regards to IPTp, as well as SMC and chemoprophylaxis for travelers.

In addition to improving IPTp uptake for pregnant women, PMI/Senegal continues to support efforts to improve ITN ownership and use among pregnant women. During the past year, this included support for the routine distribution of ITNs via ANC as well as support for the 2016 nationwide universal coverage ITN campaign, which resulted in the distribution of more than 8 million ITNs overall. It is anticipated that this large-scale campaign will result in improvements in ITN use among pregnant women.

Table 10. Status of IPTp policy in Senegal

Status of training on updated IPTp policy		Number and proportion of HCW trained on new policy in the last year if training on new policy is not yet completed	Are the revised guidelines available at the facility level?	ANC register updated to capture 3 doses of IPTp-SP	HMIS/DHIS updated to capture 3 doses of IPTp-SP
Completed/Not Completed	Date (If completed, when, if not completed, when expected)				
Completed. New policy was adopted in 2014, with implementation begun in 2014.	N/A	396 trained*	Yes	Yes	Yes

*This total includes:

- 203 health workers trained in IPTp by the NMCP (during the CY 2016);
- 193 health workers trained in IPTp by PMI-supported implementing partners (during the FY 2016)

Sources: NMCP's 2016 Training Report and PMI Annual Report to Congress, April 2017.

Commodity gap analysis

Since the adoption of IPTp with SP as national policy in 2003, the GoS has procured sufficient quantities of SP to provide all pregnant women in Senegal with all of the recommended SP treatments for IPTp. The GoS will continue to procure all of the SP needed for the period 2017-2019. As all SP needs for the entire country are assured through domestic GoS resources, PMI will not procure any SP for Senegal with FY 2018 funding (see Table 11, below).

The quantities of SP that are procured each year are sufficient to cover the needs nationwide. However, while the stocks at the Central Medical Stores are adequate, health facilities do not always have sufficient SP on hand. Health facilities are expected to request all of their drugs (including ACTs, RDTs, SP, etc) from the CMS, under a “pull system.” Facilities must purchase SP from the central level and these costs cannot be directly recovered (as national guidelines stipulate that SP is free to patients during ANC visits). As a result, there is little incentive for health facilities to be fully stocked at all times with SP. With PMI support, some promising results have been achieved in areas using performance-based financing approaches (mentioned above and in the HSS section), which reward districts that perform well with regards to their IPTp coverage.

On average, an estimated 8,000 cases of malaria are reported among pregnant women annually⁶. The ACTs needed to treat these cases are included in the overall ACT gap analysis in the case management section. The CMS also procures quinine for use in severe malaria cases and maintains adequate stocks. Iron/folate supplements (combination pill: 60 mg ferrous sulfate, 400 micrograms folic acid) are provided to pregnant women at ANC visits and are also procured by the CMS.

⁶ **2011:** 6,672 cases, **2012:** 9,648 cases, **2013:** 8,635 cases, **2014:** 6,465 cases, **2015:** 9,154 cases, **2016:** 7,044 cases. Source: NMCP Annual Epidemiological Bulletins for Senegal, available at: www.pnlp.sn.

Table 11. SP Gap Analysis for Malaria in Pregnancy

Calendar Year	2017	2018	2019
Total Population ¹	15,072,407	15,449,217	15,835,448
SP Needs			
Total number of pregnant women attending ANC ²	602,896	617,969	633,418
Total SP Need (in treatments)³	2,794,424	2,864,285	2,935,892
Partner Contributions			
SP carried over from previous year	961,479 ⁴	0	0
SP from MoH	1,832,945	2,864,285	2,935,892
SP from Global Fund	0	0	0
SP from Other Donors (Islamic Development Bank)	0	0	0
SP planned with PMI funding	0	0	0
Total SP Available	2,794,424	2,864,285	2,935,892
Total SP Surplus (Gap)	0	0	0

1. Source: Senegal 2013 population census, assuming 2.7% growth per year.
2. Assumes that 4% of the population becomes pregnant each year and that attendance at ANC is 100%.
3. Total SP needs are based on the quantifications conducted by the NMCP. Quantification of SP needs for IPTp is based on the expected number of pregnant women attending ANC per year multiplied by the 3 required treatments (one treatment consists of three SP tablets). These estimates also include a 6-month buffer stock and a 3% loss assumption. Source: *Plan d'Approvisionnement des Produits Antipaludiques, 2017-2020*.
4. Balance of SP based on inventory on December 31st, 2016.

Plans and justification

With FY 2018 funding, PMI will continue to support activities aimed at reinforcing the provision of effective MIP services in health facilities nationwide. Support will continue for monitoring and supportive supervision for the delivery of MIP services, improving data collection including data on the coverage of IPTp3, and training new staff on MIP. PMI will also continue to encourage collaboration between the NMCP and the Division of Reproductive Health and Child Survival on activities to address malaria in pregnancy.

Given that the Islamic Development Bank funding (covering 2017-2019) includes improvement of IPTp3 coverage as one of the objectives for its 25 target districts located in the north/central areas of the country (pre-elimination zone), PMI support for IPTp-related activities will also be closely coordinated with these efforts to ensure complementarity. While the Global Fund concept note (covering 2018-2020) outlines that GF support is expected to focus on supporting the 2019 mass campaign, the scale up of the PECADOM program, and the reinforcement of surveillance,

monitoring and evaluation; PMI will also ensure coordination with any IPTp-related activities that may be supported via this funding stream.

Proposed activities with FY 2018 funding: (\$300,000)

1. *Reinforce provision of effective malaria in pregnancy services in health facilities and through outreach strategies (\$300,000)*

PMI will continue to support Senegal's efforts around the prevention of malaria in pregnancy to ensure that pregnant women receive the recommended number of IPTp treatments. Support will cover training for new health-facility level providers as needed on prevention and treatment of malaria during pregnancy, which includes topics such as the importance of long-lasting ITN use in pregnancy, diagnosis and management of MIP, and counseling and interpersonal communication skills. PMI funding will also cover the updating of ANC registers so that additional doses of SP can be recorded (ANC registers currently only include space to record three doses). Support will continue for ANC outreach activities to close the gap between ANC attendance and IPTp coverage. Activities related to long-lasting ITN use and SBCC are covered in those sections.

3. Case management

a. Diagnosis and treatment

NMCP/PMI objectives

Diagnosis and treatment remain core priorities in the 2016-2020 national malaria strategic plan. National malaria case management targets for 2020 include:

- Introduce molecular parasite detection in zones of low malaria prevalence
- Test 100% of suspected malaria cases with a RDT and/or blood smear according to national policies
- Treat 100% of confirmed malaria cases with safe and efficacious antimalarial medications according to national policies
- Provide pre-referral treatment to 100% of children less than five years of age with severe malaria

While the introduction of molecular parasite detection in zones of low malaria prevalence is an objective within the NMCP's Strategy, it is not necessarily an activity that the GoS plans to implement immediately. Evaluation plans are under development at the NMCP to determine how this technology could assist in referrals and with active case detection.

In high transmission regions (e.g., Kolda, Kédougou, Sédhiou, and Tambacounda), Senegal's NMCP has implemented the PECADOM Plus strategy. PECADOM Plus uses community health workers providing home-based care (DSDOMs, see definition below) to visit every household in their communities once per week during the high transmission season (July to December) to identify and test fever cases and treat positive cases in all age groups. The DSDOMs are also

trained to identify and treat diarrhea and pneumonia in children under five years of age during their household sweeps.

Senegal also implements seasonal malaria chemoprevention in the same four regions, which meet the WHO criteria for this intervention. The NMCP's objective in the 2016-2020 Strategic Plan is to ensure 95% coverage for children aged 3-120 months in the targeted SMC zones by 2020.

The NMCP has adopted WHO recommendations regarding case investigation and active case detection in districts in which annual incidence is less than 5 cases per 1,000 population. In those areas, a confirmed malaria case triggers an investigation of the patient's household and neighboring houses. All members of the index case's household are tested and, in the neighboring households, anyone who is symptomatic, has traveled recently, or is not using a long-lasting ITN is tested. All who test positive receive an ACT, and, beginning in 2017, confirmed cases will also receive low-dose primaquine, pending arrival of primaquine in country.

Senegal follows the WHO guideline for pre-referral treatment for children aged 6 months to 6 years, and has adopted rectal artesunate for use at health posts and at the community level. Injectable artesunate has been adopted as the first-line treatment for severe malaria at health centers and hospitals.

Table 12. Status of Case Management Policy in Senegal¹

What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria?	Senegal considers artesunate-amodiaquine, artemether-lumefantrine, and dihydroartemisinin-piperaquine as co-first line ACTs, though amodiaquine-artesunate is only for zones in which SMC is not implemented.
What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria?	No second-line treatment is designated.
What is the first-line treatment for severe malaria?	Injectable artesunate is now considered first-line therapy for severe malaria; injectable quinine is being phased out.
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester?	Quinine (injectable or oral) remains first-line therapy for the first trimester of pregnancy.
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters?	ACTs are recommended as first-line therapy for uncomplicated malaria during the second and third trimesters of pregnancy.
In pregnancy, what is the first-line treatment for severe malaria?	1 st trimester: IV quinine is first-line therapy. 2 nd /3 rd trimester: Injectable artesunate is first-line therapy. Policy for 1 st trimester is under discussion.
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	Pre-referral treatment with rectal artesunate is recommended at peripheral health facilities.
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	Pre-referral treatment with rectal artesunate is recommended for use by community health workers.
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years)	Pre-referral rectal artesunate is recommended for children six months to six years of age.

1. Source: 'Directives Nationales de Prévention et de Prise en Charge du Paludisme', August 2013.

Progress since PMI was launched

The NMCP adopted ACTs as first-line treatment in 2006 and introduced RDTs in 2007. Both artemether-lumefantrine (AL) and artesunate-amodiaquine (AS-AQ) were adopted simultaneously as first-line treatments, with AS-AQ being procured from the beginning, and AL procurement starting in 2010. In addition, dihydroartemisinin-piperaquine (DHA-PPQ) donated by the Chinese government is used in the public health sector and is considered a third first-line treatment. Pre-referral treatment with rectal artesunate is recommended for children aged six months to six years of age who present with severe malaria at the community or health post level. While implemented nationwide at health posts in 2014 this approach is being gradually rolled out at the community level, starting with the highest transmission districts. Injectable artemisinin has been adopted as first-line treatment for all age groups; quinine is being phased out as first-line therapy for severe malaria for all but the first trimester of pregnancy.

Rapid diagnostic tests were introduced in formal health facilities in late 2007, along with a diagnostic algorithm specifying that a patient would not be tested with an RDT nor be reported as a suspected malaria case if another obvious cause of fever was present. These cases were treated for the underlying non-malaria illness, but were eligible to return for re-evaluation, including an RDT, if symptoms persisted. A PMI-funded operational research study evaluated this strategy, concluding it missed an unacceptable number of malaria cases, and in mid-2014, the NMCP began phasing in a policy of universal testing of fever cases, starting with children under five years of age during the rainy season. At the community level, RDTs were introduced in 2008, and all fevers are eligible for testing. Positive cases showing no signs of severity are treated with ACTs, while negative and severe cases are referred to the nearest health post.

Malaria RDTs and ACTs are provided for free to patients of all ages at all levels of the health system. Health care for children under five years of age is provided free of charge at formal health facilities, which are reimbursed by the government universal health insurance scheme; however, this has not been extended to the community level, and though testing and treatment for malaria are free of charge, medications for treatment of pneumonia and diarrhea are not consistently available at the community level.

PMI has supported both diagnosis and treatment of malaria through integrated training of health care providers at all levels, supportive supervision, and commodity procurement. In health facilities, PMI has provided microscopes, trained and supervised laboratory technicians, and supported quality assurance/quality control systems for microscopy.

At the community level, PMI supports two different activities: operation of health huts and home-based management of malaria (PECADOM):

1. **Health huts:** Health huts, staffed by community health workers (*agents de santé communautaire*), offer an integrated package of maternal and child health interventions, which has included malaria case management with RDTs and ACTs since 2008.
2. **Home-based management of malaria (PECADOM):** PECADOM was piloted in 2008, and has now been scaled up to 2,111 villages nationwide. Under this model, selected communities with remote or difficult access to health care chose a home-based care provider (*dispensateur de soins à domicile* or DSDOM), who is trained in management of malaria with RDTs and ACTs. Diagnosis and treatment are provided to patients of all ages. In the interim, a number of adaptations of PECADOM have been introduced or are being piloted (For more details see below and refer to section 3 in the Strategy):
 - **PECADOM:** An integrated home-based package (integrated PECADOM), including treatment of diarrhea and acute respiratory illness for children under five years of age was piloted in 2012 and subsequently expanded to 13 out of 14 regions of Senegal.
 - **PECADOM Plus:** Despite the progress made by integrated PECADOM, there were still some limitations with this passive detection of malaria cases at the community level. In 2013, a variation named PECADOM Plus was piloted by

Peace Corps volunteers and the Saraya District (Kédougou Region). In this approach, DSDOMs visited each household in their communities weekly during the malaria high transmission season (July-December) to detect and test any fever cases, and treat or refer any cases of malaria among all age groups, and diarrhea or acute respiratory illness among children under five years of age. The PECADOM Plus strategy was adopted by the NMCP in 2014 and scaled up to Kédougou, Kolda, Sédhiou, and Tambacounda regions (708 villages in 16 districts) by 2016, with plans to expand to a total of 40 districts in 2017 with PMI support.

- **PECADOM *Daara*:** A situational analysis identified that students of Koranic residential schools, or *Daaras*, suffered a disproportionate proportion of severe malaria cases. In 2016, DSDOMs were trained to offer malaria case management at 73 *Daaras* in the district of Diourbel.
- **PECADOM *École*:** In a small number of schools in the region of Kédougou, the district health management teams and Peace Corps volunteers are piloting a strategy to reach students who are in school while weekly sweeps are being carried out in the communities under the PECADOM Plus program.

Seasonal malaria chemoprevention was recommended by WHO in 2012 and Senegal adopted it as policy the same year, including children up to 10 years of age. Much of the existing research on SMC was conducted in Senegal, first in children under five, and subsequently in children up to ten years of age. PMI supported Senegal to begin SMC in Senegal in 2013 in the four highest transmission districts, and since 2014, supported all four regions (16 districts) that meet WHO criteria for SMC (at least 60% of cases occur within four months of the year, at least 10% annual incidence among children), for four months each year in Kédougou Region and three months per year in Kolda, Sédhiou, and Tambacounda. Senegal utilizes the community health platform for the distribution of SP-AQ, using a door-to-door approach targeting children up to 10 years of age. The campaigns have achieved high coverage levels (typically above 98%), which has resulted in protection of approximately 625,000 children each year. The test positivity rate among febrile children under five years of age in the four SMC regions has decreased from 63% in 2013 to 28% in 2016, compared to the decrease among febrile patients five years and older from 69% to 53% over the same period.

Progress during the last 12-18 months

Since July 2016, PMI supported supportive supervision/quality control visits for microscopy covering all publically-supported laboratories with microscopy capacity (146 district health centers and hospital laboratories and 24 sentinel site health posts). During the quality control visits, supervisors complete a supervision checklist, verify five negative and five positive slides that the microscopists have read, and have the microscopists read a panel of pre-selected slides, allowing the NMCP to identify health facilities for remedial training and increased supervision. At the time of MOP writing, the quality control results for last year are not yet available. A subset of slides are sent to a reference laboratory to evaluate the performance of each laboratory. Following recommended WHO standard methodology, 10 positive and 10 negative slides from each laboratory are sent to the reference laboratory at UCAD, to confirm the slide reading, calculate concordance and verify reported parasite density. Laboratories are stratified based on their reading and quantification capacity. In 2016, all 146 health centers and hospitals and all 24

sentinel site health posts with microscopy were visited (in 14 regions) and 2,023 slides were collected. Only 35% of laboratories provided the requested number of slides. Twenty-four (16%) laboratories could not be evaluated for their ability to read positive slides because of the lack of positive slides provided. Overall the laboratories had better concordance in reading negative slides; two laboratories (2%) had a ‘false negativity’ reading rate of >30%, while 42 (29%) laboratories had a ‘false positive’ reading rate of over 30%. All positive slides were properly speciated (100% *P. falciparum*) and 12 (8%) of structures had parasite density readings <30% deviation from the reference laboratory reading. Evaluators recommended a re-training for staff of laboratories with a high percentage of ‘false positive’ or ‘false negative’ readings and the NMCP is planning to support this additional training.

In addition, PMI continued to support the evaluation of quality control of RDTs, selecting two boxes of 25 RDTs from each lot upon arrival in Senegal. These are tested against standard reference samples with either 200 or 2,000 parasites per microliter, and also negative controls. Between June 2016 and May 2017, 11 RDT lots were tested and all RDTs performed as expected, with 100% sensitivity and 100% specificity. In the past year, PMI partners expanded this quality control effort to include collection of tests at different time points from health facilities to evaluate possible changes in test performance related to storage conditions.

As a result of the aforementioned PMI-funded operational research study, the NMCP phased in universal testing of patients with fever or a history of fever at health facilities. Beginning in May 2015, the approach was extended to all children under five years of age presenting with fever during the rainy season. In 2016, universal testing was expanded to include all febrile children under five years of age all year round as well as febrile patients above the age of five during July–January. Starting in July 2017, patients of all age groups presenting with fever or history of fever are to be tested with an RDT. From 2013 (the year of the study), until 2016, the number of patients tested for malaria increased 100%, with an increase of 249% among children under five years and an increase of 73% among patients aged five years and older. In 2016, a total of 1,559,054 suspected malaria cases were detected and 1,552,322 RDTs were used (not including active case detection activities). The projected RDT requirement during calendar year 2018 is 3,640,438 tests, taking into account the increase in proportion of fever cases designated as suspected malaria, as well as the increased reach of the PECADOM program and active case investigation and buffer stocks.

PMI procured 851,315 ACT treatments (509,340 AL targeted primarily to SMC regions and 338,975 AS-AQ for the remainder of the country) and 30,000 artesunate suppositories. Case management activities in the formal health sector included training and supportive supervision, using a strategy of peer supervision and mentoring termed TutoratPlus. During FY 2016, PMI supported the training of 895 health workers at the facility level and 1,554 at the community level on malaria case management including RDTs and ACTs. Through PMI funding, the NMCP trained 708 DSDOMS on PECADOM Plus at the community level and provided supportive supervision to 1,094 health workers at 284 hospitals, health centers, and health posts in the three targeted regions. The NMCP adopted injectable artesunate as first-line therapy for treatment of severe disease at health centers and hospitals and is phasing out the use of quinine.

At the community level, in 2016, the 2,108 health huts tested 112,830 patients with RDTs and diagnosed 46,332 with malaria. In the classic (passive) PECADOM model, 2,111 DSDOMs performed 90,528 RDTs and detected 22,566 cases of malaria. The 708 DSDOMs participating in the PECADOM Plus program (covering a population of approximately 250,000) conducted 13,005 days of active household visits, seeing a total of 83,772 patients during household visits, 64,168 of whom had fever. Of these, 63,603 were tested with an RDT and 30,554 had a positive test; 30,174 received an ACT and 385 were referred for severe disease.

Over the last 18 months (2015-2016 transmission season), a PMI-funded therapeutic efficacy study (TES) was performed in Kédougou, at the Bandafassi and Tomboronkonto sentinel sites. The PCR-corrected 28 day adequate clinical and parasitological response was 98% for AL and 99% for AS-AQ.

During 2016, PMI-supported SMC covered 16 southeastern districts in 4 regions. Three rounds were implemented in the regions of Kolda, Sédhiou, and Tambacounda. A fourth round was implemented in Kédougou Region where the transmission season is longer. During the 2016 campaign, a total of 644,830 children aged 3 months to 10 years of age were targeted to receive SP-AQ. Of these, 624,802 (97% of the 640,458 actually found in households) received at least one treatment and an estimated 93% of children received all three recommended treatments.⁷ PMI procured the drugs and paid for the operational costs. PMI worked closely with the NMCP to develop the implementation and monitoring plan. This new intervention is being rigorously monitored and evaluated using routine morbidity and mortality data, pharmacovigilance, monitoring of molecular markers, and process indicators, as recommended by WHO. An assessment of the coverage disaggregated by age group (e.g. 3-59 month olds vs. 60-120 month olds) is being included as part of the SMC evaluation. Currently, no other donors (aside from PMI) are supporting the SMC campaign for calendar year 2019; PMI is fully funding this intervention.

Table 13. PMI-funded TES

Completed TES'		
Year	Site name	Treatment arms
2013-14	Guédiawaye	ASAQ, AL, DHA-PPQ
2014-15	Vélingara, Ndoffane	ASAQ, AL, DHA-PPQ
2015-16	Kédougou	ASAQ, AL
Ongoing TES'		
Year	Site name	Treatment arms
2016-2107	Vélingara	ASAQ, AL
Planned TES' with FY 2018 funding		
Year	Site name	Treatment arms
2018	2 sites (TBD)	ASAQ, AL, DHA-PPQ ¹
2019	2 sites (TBD)	ASAQ, AL, DHA-PPQ

¹ DHA-PPQ arm planned only if there is a donation from other partners of this drug

⁷ Source: NMCP Annual Activity Report for 2016, available at: www.pnlp.sn

Commodity gap analysis

Table 14: RDT Gap Analysis

Calendar Year	2017	2018	2019
RDT Needs			
Total country population ¹	15,072,407	15,449,217	15,835,448
Population at risk for malaria ²	15,072,407	15,449,217	15,835,448
PMI-targeted at-risk population ³	15,072,407	15,449,217	15,835,448
Total number of projected fever cases ⁴	2,500,000	3,000,000	3,500,000
Percent of fever cases tested with an RDT	100%	100%	100%
Total RDT Needs⁵	3,221,626	3,640,438	4,113,695
Partner Contributions			
RDTs carried over from previous year	957,870	1,240,362	1,317,653
RDTs from Government	0	0	0
RDTs from Global Fund	0	0	0
RDTs from Other Donors ⁶	504,118	517,729	531,708
RDTs planned with PMI funding	3,000,000	3,200,000	3,600,000
Total RDTs Available	4,461,988	4,958,091	5,449,361
Total RDT Surplus (Gap)	1,240,362	1,317,653	1,335,666⁷

(1) Population estimate is a projection extrapolated from the last census, which was conducted in 2013.
(2) 100% of the population is at-risk for malaria.
(3) PMI support is for the entire population at risk; gap analysis is therefore for national RDT needs.
(4) Total number of fever cases is based on the increasing proportion of all fever cases that are designated as suspect cases (to be tested), as well as increased access to care for fever cases with expansion of the PECADOM program
(5) RDT needs for 2018 are based on the PNLN procurement plan 2017-2020, and includes 3 months' buffer stocks at the different levels of the health system and assumption of 5% loss. The NMCP consistently shows 99% testing of suspect cases. Needs include investigation of approximately 30,000 cases in low transmission districts, with a mean of 10 individuals tested per index case (300,000 RDTs).
(6) Others donors are the Islamic Development Bank and the Chinese Cooperation.
(7) While this gap analysis shows an estimated 1.3m surplus in the RDTs available for 2019, there is considerable uncertainty regarding actual RDT needs for Senegal given two important factors: (i) the transition to a universal testing strategy for all fever cases, for all ages, year round; and (ii) the expansion of active case detection activities. Both of these factors are expected to drive RDT needs upwards. In close concertation with the NMCP and other donors, PMI will monitor actual needs and adjust RDT orders accordingly to ensure that no overstock occurs.

Table 15: ACT Gap Analysis

Calendar Year	2017	2018	2019
ACT Needs			
Total country population ¹	15,072,407	15,449,217	15,835,448
Population at risk for malaria ²	15,072,407	15,449,217	15,835,448
PMI-targeted at-risk population ³	15,072,407	15,449,217	15,835,448
Total projected number of malaria cases ⁴	625,000	750,000	875,000
Total ACT Needs⁵	861,000	926,651	997,308
Partner Contributions (to PMI target population if not entire area at risk)*			
ACTs carried over from previous year	890,590	829,590	1,002,939
ACTs from Government	0	0	0
ACTs from Global Fund	0	0	0
ACTs from Other Donors ⁶	0	0	0
ACTs planned with PMI funding	800,000	1,100,000	1,000,000
Total ACTs Available	1,690,590	1,929,590	2002939
Total ACT Surplus (Gap)	829,590	1,002,939	1,005,631
<p>(1) Population estimate is a projection extrapolated from the last census, which was conducted in 2013.</p> <p>(2) 100% of the population is at-risk for malaria.</p> <p>(3) PMI support is for the entire population at risk; gap analysis is therefore for national RDT needs.</p> <p>(4) Total projected number of malaria cases is based on NMCP data and on the increasing proportion of all fever cases that are designated as suspect cases (to be tested), and thus increasing number of cases that will be detected, as well as increased access to care for fever cases with expansion of the PECADOM program with an estimated test positivity rate of approximately 25%.</p> <p>(5) Based on the PNLN procurement Plan 2017-2020. ACT needs include a three-months security stocks at the different levels of the health system to avoid stockouts at the facility level as well as an assumption of 5% loss. The figure for ACT needs also accounts for the additional ACTs that will be needed to treat additional cases that are diagnosed during sweeps conducted by DSDOMs (PECADOM Plus) and those found during case investigations.</p> <p>(6) Others donors are the Islamic Development Bank and the Chinese Cooperation.</p>			

Plans and justification

PMI will maintain its support for the diagnosis and treatment activities (training, supervision, procurement), for both uncomplicated and severe disease. Diagnosis and treatment by

community health workers includes activities at health huts and by DSDOMs, and work by DSDOMs will include both case management in the classic passive PECADOM model and the active case finding of PECADOM Plus, in addition to DSDOM initiatives to offer case management at schools. While the Islamic Development Bank will be supporting the majority of activities in pre-elimination districts (including the implementation of case investigation and treatment with primaquine), PMI will procure primaquine to support these efforts. Introduction of this approach is planned for 2017 in selected districts with annual incidence < 5 per 1,000. PMI will continue to provide procurement and distribution support for SMC in the four regions that have received the intervention to date. Finally, PMI will continue to support therapeutic efficacy monitoring in two sites annually, rotating sites. Social and behavior change communication efforts to improve diagnosis and treatment are described in the SBCC section of this MOP, and active case investigation is described in the surveillance, monitoring and evaluation and pre-elimination sections.

Proposed activities with FY 2018 funding: (\$ 9,080,000)

1. Procurement of RDTs (\$1,908,000)

The NMCP has requested that PMI procure approximately 3.6 million RDTs to contribute to nationwide needs, including diagnosis of symptomatic patients at health facilities, at the community level, and active case detection where indicated.

2. Procurement of ACTs (\$1,000,000)

The NMCP has requested that PMI procure approximately 1.0 million ACT treatments to contribute to nationwide needs. Artemether-lumefantrine will be procured and distributed in the four regions where SMC is implemented to avoid treating confirmed malaria cases with the same drug that is used for chemoprevention (amodiaquine). Approximately 60% of the country's malaria cases have occurred in these regions. Artesunate-amodiaquine will be procured and targeted to the remaining regions.

3. Strengthening microscopic diagnosis of malaria (\$160,000)

Laboratory worker training is part of an ongoing quality assurance program supported by PMI. PMI plans to continue to provide training in microscopic diagnosis of malaria for new microscopists, as well as remedial training for those found not proficient during supervision. PMI plans to provide supportive supervision of malaria diagnosis by microscopy for laboratory and health facility staff and assist the NMCP and its partners to implement the quality assurance and control standards for malaria diagnostic testing. Sites and technicians showing poor performance will be targeted for additional on-site training and quality control visits. This budget will include support for regular slide-reading workshops for group training, as well as support for the accreditation of the national slide reading course. Workers who will benefit from this training are based in approximately 140 healthcare facilities nationwide.

4. Quality control of microscopy and RDTs (\$40,000)

PMI plans to assist in the implementation of quality control programs for both microscopy and RDTs, in conjunction with the NMCP and the *Université Cheikh Anta Diop*. This includes review of a percentage of positive and negative slides as well as the evaluation of RDTs upon arrival in Senegal and at regular intervals thereafter at the point-of-care. In addition to that ongoing quality assurance strategy, PMI will support the expanded use of an updated supportive

supervision checklist that will include user performance of RDTs. This checklist will be scaled-up through current supportive supervision visits that are part of the PECADOM program (costs covered under PECADOM budget line item).

5. *Improve case management at health facilities in concentration regions (\$200,000) and consolidation regions (\$175,000)*

As part of the effort to improve the management of malaria, PMI plans to support training for health care workers in case management with RDTs and ACTs (initial and refresher training, as indicated), as well as management of severe disease. Implementing partners will work with the MoH to provide supportive supervision to promote correct management of malaria at health posts, health centers, hospitals, and in the private sector.

6. *Strengthen community case management in concentration regions (\$280,000) and consolidation regions (\$175,000)*

With FY 2018 funding, PMI plans to continue to provide technical support on correct diagnosis, treatment, stock management, and referral practices for CHWs at health huts, as well as some support to the PECADOM program. Attention will also be given to timely data collection and integration of community case management data into the MoH reporting system. The PMI funding will complement other USAID/MCH funding to support the training, supervision, and monitoring of community-based staff nationwide.

7. *Operational costs of maintaining pre-referral treatment at the community level nationwide (\$50,000), procurement of rectal artesunate suppositories (\$78,000), and procurement of injectable artesunate for treatment of severe malaria (\$443,000)*

PMI plans to procure 72,000 50 mg and 72,000 200 mg artesunate suppositories to ensure that all approximately 6,000 service delivery points using rectal artesunate (~2,000 DSDOMs, ~2,000 health huts, and ~2,000 health posts) are able to receive on average 2 boxes of each suppository dose (6 suppositories per box) for pre-referral treatment for severe malaria to provide sufficient amounts for both health posts and the community level. Pre-referral treatment with rectal artesunate at the community level will have been scaled up nationwide by FY2018; these funds will serve to maintain the program in FY 2019, providing re-training and renewing job aids as needed. Given the phase out of quinine by the GoS, PMI plans to procure injectable artesunate to treat 100% of the estimated severe cases at hospital and health center levels in 2019 (2,412 severe cases in children under five years of age and 8,073 severe cases among patients five years and older, based on 2016 cases recorded), or 175,771 vials (which includes a security stock of 6 months and assumes 10% loss).

8. *Operational costs for the PECADOM program (integrated home-based management of malaria), including PECADOM Plus in 40 districts, and expansion of community case management in schools (\$1,500,000)*

PMI plans to continue to support operational costs of village malaria workers in malaria diagnosis with RDTs and treatment with ACTs as part of an integrated case management package that includes acute respiratory infections and diarrhea, and includes support to health post nurses and DSDOMs. PMI plans to support operational costs for integrated PECADOM Plus in 40 moderate and high transmission districts that were supported in the previous year (covering a population of approximately 600,000). Funds will support DSDOMs, community

supervisors, supervision of all DSDOMs, reinforcing M&E for DSDOMs, and replenishing of their home-based kits. Funds will also support the expansion of case management offered by DSDOMs at schools in targeted high transmission zones, both public (PECADOM *École*) and religious (PECADOM *Daara*).

9. *Procurement of drugs (\$1,600,000) and operational costs (\$1,300,000) for implementation of SMC*

PMI plans to continue to fund SMC with SP-AQ for approximately 721,000 children from three months to ten years in the four highest transmission regions (for four months in the region of Kédougou and for three months in the regions of Kolda, Sédhiou, and Tambacounda). The age groups and geographic zones to be covered during the 2019 campaign may be re-evaluated based on lessons learned from previous years. The operational funds are slated to support training, supplies, and supervision. The costs for the procurement of SMC drugs are higher than previously given the shift to the more expensive co-blister formulation of SP-AQ (rather than loose SP and AQ). This formulation is expected to simplify campaign logistics (and eliminate costs associated with repackaging loose SP and AQ) and further improve children's adherence.

10. *Support for the roll out of low-dose primaquine in pre-elimination districts (\$40,000)*

PMI plans to maintain support for activities surrounding implementation of primaquine in the northern districts in which PMI currently supports active case detection and in which single low-dose primaquine will be introduced in 2017. This support will include training of health workers on how to correctly administer primaquine, including providing information on how to manage potential adverse effects in patients. Per PMI guidance, PMI funds will not be used to fund a comprehensive reporting system to systematically capture and report adverse events (i.e. a 'pharmacovigilance system').

11. *Procurement of primaquine (\$3,000)*

PMI plans to procure primaquine for single low-dose treatment of an estimated 30,000 malaria cases in pre-elimination districts with incidence less than 5 per 1,000. In addition to the previously targeted regions of Saint-Louis and Louga, very low transmission districts in the regions of Fatick, Matam, and Thiès will be added. The Islamic Development Bank will be funding the operational costs of single-low dose primaquine, to be administered to passively detected cases and during reactive case detection activities. Though funding for operations will be provided by another partner, PMI will continue to purchase the primaquine, given the lengthy process for obtaining a waiver to import it, and the relatively low cost.

12. *Therapeutic efficacy monitoring (\$128,000)*

PMI plans to support therapeutic efficacy studies at two sites to monitor the susceptibility of *P. falciparum* to the first-line ACTs (artesunate-amodiaquine, artemether-lumefantrine, and dihydroartemisinin-piperaquine) and monitor molecular resistance markers for SP, amodiaquine, and artesunate. PMI plans to continue to conduct TES in two sites annually, rotating through four sites, and testing the three ACTs in circulation in Senegal each year. The previously used central site (Keur Soce) has had to be abandoned due to low case load, and was replaced with a health post in the central region of Diourbel. The sites of Deggo (Dakar), Vélingara, and Kédougou (south) are still in use. Both southern sites are areas with a great deal of regional population movement, with the Kédougou site also known for a great influx associated with mining.

Funding will be provided to the NMCP for this, and the study will be performed by UCAD and overseen by the NMCP.

A UCAD laboratory has developed advanced molecular capacity to test for K13. This laboratory has the capacity to become a regional testing center, and we plan to conduct K13 testing in Senegal to build capacity and avoid ethical issues associated with exporting samples.

b. Pharmaceutical management

NMCP/PMI objectives

The ultimate goal of PMI's support for the supply chain is to ensure that malaria prevention and control commodities (SP, ACTs, RDTs, SP/AQ, injectable artesunate, and low-dose primaquine) are procured and made available in sufficient quantities at all service delivery points that are in need. In its strategic plan for 2016-2020, the NMCP's specific objective for pharmaceutical management is to:

- Ensure permanent availability of malaria commodities in 99% of service delivery points by 2020

Progress since PMI was launched

To address recurrent stockouts of several commodities, in 2011 PMI supported an assessment of the Central Medical Stores (CMS) aimed at identifying root problems and potential solutions. Challenges identified by the assessment included the lack of a procedures manual, inadequate utilization of the commodity management information system, and insufficient capacity among various personnel. PMI then provided assistance to update the procedures manual, which was disseminated throughout the health system to chief pharmacists, accountants, and other staff. Also, a new drug management software (SAGE) was developed and installed at the CMS. Technical assistance from PMI has also supported efforts to improve stock management at the lowest levels of the system, with an emphasis on ensuring good ACT prescribing and dispensing practices at health posts and health huts.

PMI continued its support to the CMS by providing technical assistance to develop a strategic plan for 2014-2018 that will guide it towards meeting the challenges it is facing, with all stakeholders sharing the same vision. Some specific improvements have been made and new initiatives are being piloted, including a mobile pharmacy for the three regions that do not have a pharmacy structure, and the Informed Push Model for some essential products (including malaria) in one region. In March 2016, an evaluation of the pilot of the Informed Push Model called "*jegesina*" ("*we are getting closer*" in the Wolof language) was conducted; a major recommendation of the evaluation was to scale up this approach.

USAID/Senegal's Health Office takes a holistic approach in addressing ongoing challenges of the health system and in supporting the country to meet the objectives set for the supply chain and pharmaceutical system. This consists of initiating dialogue with the MoH System Strengthening Platform, the CMS, the DPM, the National Laboratory for Quality Control

(LNCM) and key donors involved in health to discuss and agree on major challenges and plans to address them. Following the assistance to the CMS in developing its strategic plan in 2014, PMI has engaged in supporting the country procurement and supply chain management system to assist with overcoming persistent stockouts and management issues identified during the assessment conducted in 2014.

Progress during the last 12-18 months

Availability of stocks at the health facility level has improved during the past eighteen months. During 2016, PMI, through the G2G mechanism with the NMCP, provided seven district health centers with containers in Kolda and Tambacounda regions to improve storage capacity and storage conditions for malaria commodities. A plan to provide the same equipment to 19 other districts in 10 regions (Fatick, Kaffrine, Kaolack Kolda, Louga, Matam, Sédhiou, Tambacounda, Thiès, and Ziguinchor) in 2017 is underway with FY 2015 PMI funds under the same mechanism.

In March 2017, with PMI's support, the NMCP developed a malaria commodities management plan with the aim of ensuring availability of quality antimalarials at least at 99% of public health facilities. The plan will guide quantification, procurement, and distribution of malaria commodities through 2020.

Also, in November 2015, PMI supported training of chief nurses and depot managers in commodities management in Kolda, Kédougou, and Sédhiou. A total of 425 participants from the two staff categories were trained from November 2015 to January 2016 in these three regions. As the NMCP finalizes their commodities procurement plan, more training opportunities will be given to chief nurses and depot managers to enable them meet commodities management requirements at the health post level.

The Informed Push Model, “*jegesina*”, is being scaled up, per the recommendation of the evaluation, with joint support from the Gates Foundation and PMI. Challenges still remain as to how to ensure sustainability of the Informed Push Model, such as a lack of financial capacity at the CMS to ensure a smooth transition and long-term sustainability.

To assist with meeting these challenges, PMI participated in extensive dialogue with the CMS leadership, the General Directorate for Health and other partners supporting Senegal's supply chain and pharmaceutical management system during the past three months. This discussion, held under WHO's leadership, included the Global Fund, GAVI, and the UNFPA, and resulted in the development of an emergency plan to support the supply chain and pharmaceutical system meet its priority needs for the next two years.

These priorities were validated in April 2017 by the key partners involved and include:

- a) Support for the roll-out of the current push model to make commodities available at all service delivery points,

- b) Improvement of storage capacity through the creation of a 4,500 square meter warehouse in Diamiantio, the Dakar urban extension area, for which the GoS has donated a piece of land, and
- c) Improvement of the CMS' current legal or regulatory statutes.

PMI continues to support drug quality monitoring activities in nine sites, as well as advocacy for the enforcement of drug quality standards. Over the course of the past year, PMI's partner has engaged in a number of capacity building activities focused mainly on advancing LNCM ISO 17025 accreditation. To achieve that objective, PMI's partner conducted an assessment of LNCM's equipment and generated a list of needed spare parts, accessories, and other supplies as well as verifying appropriate documentation (job/position descriptions and competency of the laboratory staff). To further increase the technical capacity of the laboratory, PMI supported the procurement and installation of priority equipment including parts and supplies (seals, filters, buffer solutions, electrodes, standard weights kit). A laboratory maintenance visit followed the installation of the equipment. Also, PMI supported the review of the WHO's audit of the laboratory in order to assist with implementing the audit recommendations. Most recently, PMI provided technical assistance to conduct: a) a mock assessment of the laboratory, based on ISO 17025 requirements, and b) an assessment of the laboratory equipment and follow-on installation, troubleshooting, and maintenance of equipment. Additionally, PMI supported training for laboratory staff on equipment maintenance and conducted discussions with the LNCM and the DPM Directors on strategic plan development.

Under the health system strengthening component of the USAID/Senegal Mission's health portfolio, PMI currently supports the development of an integrated strategic plan with the aim of strengthening the regulatory and control functions of the Directorate of Pharmacy and the National Laboratory for Drugs Quality Control. More broadly, PMI is engaged in the supply chain reform that the GoS plans on implementing during the next few months.

Plans and justification

Under its current 2016-2021 health strategy, the USAID/Senegal Mission plans on enhancing its support to the supply chain and pharmaceutical system. The FY 2018 resources of the current MOP will be spent to support the supply chain and pharmaceutical system, which currently faces major challenges including a lack of consumption data to forecast, procure, and distribute commodities. In collaboration with other partners in the Health System Strengthening Platform, PMI plans on strengthening the supply chain and pharmaceutical system, along with the reforms envisioned by the GoS. Assistance will include: a) improving policy, governance, strategy, and coordination, b) strengthening and expanding relationships with the private sector, c) supporting coordination with supply chain partner organizations, d) assisting the DPM in selection and procurement processes for essential medicines, e) promoting best practices for distribution, warehousing, and logistics. These PMI-funded interventions will complement the support to improve storage capacity and conditions, for which resources are programmed in the FY 2016 and FY 2017 MOPs.

Proposed activities with FY 2018 funding: (\$730,000)

With FY 2018 funding, PMI plans to support the following activities to strengthen pharmaceutical management and develop capacity at sub-national and central levels.

1. Support for the NMCP to improve quantification through regular consumption data collection at the peripheral level (\$400,000)

With FY 2018 funds, PMI plans to strengthen the capacity of the NMCP to conduct quantification of malaria commodities using consumption data, instead of epidemiological or demographic data. Support will include building capacity of regional warehouses and district depots to collect quality consumption data to enable accurate quantification and forecasting.

2. Drug quality monitoring and advocacy (\$180,000)

In collaboration with the NMCP, the Directorate of Pharmacies and Medicines and the National Drug Control Laboratory, PMI plans to continue its support to drug quality monitoring activities in nine sites. This activity will include sampling and testing of antimalarials from nine sites nationwide and technical assistance for accreditation and drug quality monitoring. In addition, PMI plans to support advocacy for policy enforcement of drug quality standards. Proposed activities will also include technical assistance to the National Drug Control Laboratory as it seeks to meet the requirements to be a regional reference laboratory, after ISO certification expected in 2017.

3. Cost of commodities management at the PNA (3% of commodities costs, not including nets) (\$150,000)

PMI funds will be used to cover delivery fees for all PMI-procured malaria commodities (with the exception of ITNs as these do not transit through the CMS). This is calculated at 3% of the cost of all commodities imported in Senegal, stored and distributed by the CMS.

4. Health system strengthening and capacity building

PMI supports a broad array of health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management and health information systems strengthening, drug quality monitoring, and NCMP capacity building.

NMCP/PMI objectives

The 2016 –2020 National Strategic Plan identifies the following key objectives for health system strengthening:

- Promote universal access to the package of interventions to facilitate protection of vulnerable groups and under-served populations as well as quality health care. Highly endemic zones will be targeted to achieve objectives set forth in a short time period.
- Contribution to the sustainable strengthening of the health system will also be a priority, including devolving more responsibilities to the regional and operational levels of the health system.

- Promote community-based approaches to increase demand and strengthen the provision of health care by communities themselves. To achieve that objective, coherence will be sought between community-based interventions identified in the plan and the interventions described in the community health strategic plan.
- Improve management and coordination capacities of the health system, in the framework of malaria control, with decentralization and local governance as major pillars to increase participation of local governments and communities in planning, resource mobilization, promotion, and implementation of interventions
- Reinforce partnership with the private sector to optimize opportunities for financing and coordination
- Promote multi-sectoral approaches
- Contribute to sustainable strengthening of the health system. Emphasis will be placed on decentralized planning, improvement of the supply chain, extension of community-based interventions, strengthening of the information system through innovative tools and development of research.

The above-listed objectives for the health system will contribute to achieving the following malaria objectives and lead the country to pre-elimination by 2020:

- a) Reduce malaria incidence by at least 75% compared to 2015 baseline,
- b) Reduce malaria mortality by at least 75% compared to 2015 baseline,
- c) Interrupt local malaria transmission in northern districts.

The Senegalese MoH has a strong record of working collaboratively with other multi and bilateral donors to strengthen the health system. These include the French Cooperation, the African Development Bank, the World Bank, the Belgian Technical Cooperation, AMREF, the Japanese International Cooperation Agency (JICA), the GFATM-HSS, GAVI-HSS, The Luxemburg Development Agency (LuxDev), UNFPA, and USAID. The current 2014-2017 Global Fund grant will end in December 2017. Discussion is underway for the country to accelerate spending of the current pipeline, not only for the three priority diseases, but for the health system strengthening component. The country has submitted a continuation Funding Request for 2017-2019 under the current New Funding Mechanism cycle. The Funding Request has been approved by the Global Fund and the grant making will start soon.

Progress since PMI was launched

Since beginning work in Senegal, PMI has supported health system strengthening and capacity building of the MoH to implement its malaria control program. PMI resources have supported pharmaceutical management activities, training, supervision, drug quality monitoring, and policy reform. In 2014, and to comply with the Global Fund New Funding Model requirements, the NMCP conducted a review of the program's performance that led to the development of the concept note submitted to the Global Fund. Basically, the program's objectives were maintained with the malaria pre-elimination objective by 2018. In 2015, the malaria program review conducted by the NMCP led to the development of a new strategic plan covering the period 2016-2020, with the aim of achieving pre-elimination by 2020.

To strengthen the NMCP's capacity to better coordinate the implementation of its national malaria strategy, PMI has provided direct funding through the G2G mechanism since 2012. Although the management of this mechanism creates a high burden on both NMCP staff and PMI team, it enables achievement of significant progress. A formal evaluation of the G2G direct financing mechanism is scheduled to start by the end of May 2017 to determine factors that have contributed to successful implementation as well as identify challenges and lessons learned.

PMI has reinforced its efforts to build capacity and integrate across programs. The current USAID/Senegal Mission's health portfolio includes PMI funding across all the projects. Moreover, PMI supported the development of the first ever strategic plan for the development of the CMS covering the period 2014-2018. Under this strategic plan, PMI also supported the CMS through the creation of a mobile distribution scheme, a push system that is being experimented and consolidated by the GoS to achieve its health objectives. Pharmacy managers were trained on supply chain management as part of an integrated activity covering principles that apply to all essential drugs. Similarly, malaria drug quality monitoring was integrated with medicines for the treatment of tuberculosis and HIV/AIDS, as well as oral contraceptives, with different programs contributing to support the overall budget.

Support to Performance-Based Financing (PBF): The goal of Performance-Based Financing (PBF) is to ensure that PBF schemes are financially viable and that they drive high impact interventions and motivate health care providers as well as community health volunteers. PMI continues to contribute to the PBF scheme since its inception in Senegal. In 2011, PBF was put in place in two pilot regions (Kolda and Kaffrine) with high malaria prevalence and low coverage indicators. The PBF scheme was extended to all health districts of the medical regions of Kaffrine and Kolda (in 2013, year 3 of the program) and then to the health districts of the medical regions of Kédougou, Sédhiou, Tambacounda, and Ziguinchor (in 2015, year 5 of the program). The malaria indicators tracked in the program are the number of pregnant women who received three doses of IPTp and the number of cases of uncomplicated malaria that received correct treatment.

Capacity building: For the past several years, PMI supported the NMCP to supervise case management at hospitals, health centers, and health posts. Moreover, hundreds of home-based care givers (DSDOMs) have been trained to diagnose and treat malaria. PMI helps build national capacity in malaria control by supporting an annual malariology course as well as Monitoring, Evaluation and Surveillance training. The successful implementation of the malariology course has led to the creation in 2015 of an intermediary class targeting Chief Post Nurses (ICPs) and health care supervisors serving at the district health facility level. In 2012, PMI was closely involved in developing and shepherding policy changes related to case management and prevention. Laboratory technicians were trained or provided refresher training and supervised.

Progress during the last 12-18 months

During the past 18 months, PMI resources have been used to support policy and reforms designed to strengthen the health system and facilitate achievement of malaria results. PMI's support covered the following three main areas:

- a) Institutional support to the NMCP, the Directorate of Pharmacies and Medicines, and the National Laboratory for Quality Control,
- b) Strengthening of the supply chain, and
- c) Support to Performance-Based Financing (PBF).

Institutional support: PMI resources have been used to support the NMCP to conduct supervision activities nationwide and across the health system ensuring that malaria commodities are in stock and in sufficient quantity to avoid stockouts. Through the G2G direct funding mechanism, the NMCP has built a strong network of malaria partners including academics to conduct operational research and engage in dialogue with regional medical offices and authorities (Governors, Prefects) at the decentralized levels to support the implementation of the program. PMI also provided a 30 ton truck to the NMCP to meet the longstanding challenges they face in transporting and distributing routine nets across regions.

PMI also continued its support to the Directorate of Pharmacies and Medicines to develop the register of drugs equivalences.

During the same period, PMI continued to build the capacity of the National Laboratory for Quality Control (LNCM) to improve its performance and ensure that drugs procured and used in the country meet the pharmaceutical requirements and provide data to prevent or fight sub-standardized drugs. PMI support included the procurement of a High-Performance Liquid Chromatography (HPLC) system equipment designed to help the LNCM perform drug quality control according to international norms and obtain ISO 17205 certification. Technical assistance from PMI's partner continues on regular basis to reach that objective.

Support to the Supply Chain: In 2015, as a follow-up to the development of the strategic plan for the CMS, PMI supported a round table for resources mobilization in support of the plan. The effort resulted in commitment by donors such as the Belgian Technical Cooperation Agency to strengthen the human resources capacity of the CMS. In late 2016, given the persistent dysfunctions noticed in the supply chain and pharmaceutical system, PMI initiated a dialogue among key partners to assist the country's engagement in significant reform to improve the performance of the procurement and supply chain management system. Using the Global Fund created Health System Strengthening Platform of the MoH, PMI, the Global Fund, GAVI, and UNFPA, with technical leadership from the WHO, are currently collaborating to assist the country to implement necessary reforms of the supply chain so that it becomes more responsive to the needs of the health system and results in sustainable improvements. Discussion among partners, including the CMS authorities, recently led to the development of an emergency plan to support the CMS to not only meet its short-term challenges, but also lay the groundwork to conduct a reform that will strengthen the supply chain in the long term. The emergency plan includes costed-out objectives such as: a) reinforcement of “*yeksina*”, an advanced step of “*jegessina*” that supplies drugs to health post level (“*we got there*” in the Wolof language) with the aim of sustaining it, b) improving the legal and regulatory statute of the CMS, c) strengthening the quality of drugs, d) reinforcing coordination, and e) strengthening logistics management information system.

Support to Performance-Based Financing (PBF): In 2015, the PBF scheme was extended to four new regions (Kédougou, Sédhiou, Tambacounda, and Ziguinchor) bringing the total to six regions currently. A contract was signed in 2017 with the six regions which includes collecting IPTp3 uptake data. Activities conducted in the PBF districts contributed to the improvement of health care indicators during the past year. For example, the number of children under five years of age who were correctly treated for malaria in the Kolda Region increased from 1,061 in the first semester of 2015 to 2,766 in the first semester of 2016. For IPTp3 results achieved via PMI's support for PBF, refer to the Malaria in Pregnancy section.

An evaluation of the PBF scheme conducted in late 2015, concluded that PBF contributed to improvement of indicators, mainly those related to maternal health (assisted child delivery, postnatal care for example) and child health (immunization, vitamin A, correctly treated malaria, HIV testing among pregnant women). However, the evaluation noted that challenges persist and a series of recommendations were proposed. These include: a) flaws in the verification system, b) decentralization of the PBF management, c) strengthening of supervision and support to the District Health Management Team, d) continuing training for stakeholders, and e) addressing slippages in reporting and better management of information collected by the PBF project.

Building Capacity of the NMCP: Integrated logistics supervision visits were conducted at all regional medical stores and health districts, and PMI also supported the NMCP to supervise case management at hospitals, health centers, and health posts. Upon the NMCP's request and following the organizational audit conducted in 2013, a detailed report was delivered highlighting the weaknesses, the strengths, and the opportunities at the NMCP. Most of the areas identified for improvement include governance, training, management, and partnership. Measures to address these are included in the NMCP's 2016-2020 Strategic Plan. PMI and the USAID/Senegal Mission continue to encourage the NMCP to implement the key recommendations of the audit to strengthen coordination as the country aims to achieve pre-elimination in 2020.

In October 2016, PMI supported the NMCP to conduct a second Monitoring, Evaluation and Surveillance course to strengthen monitoring and evaluation capacity in the country. The first course was offered to 25 participants from different health districts. The NMCP plans on conducting the second edition of the course in the second semester of 2017.

In addition, as indicated in the current national strategic plan, PMI, in collaboration with the GF, is working with the NMCP to take bold steps towards decentralizing the implementation of the program to accelerate achievement of objectives and reinforce ownership by regions, districts and communities. The use of the G2G direct funding mechanism provides an opportunity to transfer more responsibilities to regions and local governments for program operations and foster greater stakeholder participation in malaria control and elimination activities. In October 2016, the NMCP signed the first memorandum of understanding (MOU) with the Regional Medical Officer in Sédhiou Region and provided financial resources to implement activities in the Implementation Letter signed with USAID. PMI continues discussions with the NMCP to evaluate the decentralized approach in involving key stakeholders in coordinating (regional

level), implementing (district and community level), and monitoring the program so as to increase participation in achieving pre-elimination objectives.

Plans and justification

The NMCP requires ongoing skills development to respond to changes in malaria trends. Increased supervision is also necessary at all levels of the health system to ensure that policies and guidelines are implemented as appropriate. Besides concentrating on improving data collection to monitor drug availability and distribution, drug quality control activities and support to the supply chain will continue to receive more attention.

The NMCP/Senegal receives direct funding from its three major partners (PMI, the Global Fund and the Islamic Development Bank). The currently centrally-managed approach of the program has been identified as a major challenge during the organizational audit conducted in 2014, with the expectation that recommendations will trigger decentralization and induce absorptive capacity of the program. Face with the persistent challenge of implementing the recommendations and with the increasing level of PMI resources channeled through G2G, USAID has requested further actions to implement decentralization, with the expectation that operational levels (Regions and Districts) will be allocated more responsibilities and resources to conduct activities in a participatory approach. This is consistent, not only with the national strategic plan, but more importantly with decentralization laws enacted by Senegal.

To address this problem, and with the current slow pace of implementing and evaluating the pilot without stakeholders' participation, which would have ensured timely and transparent implementation of planned activities, PMI is currently considering engaging in discussion with a bilateral partner implementing the Governance for Local Development (GoLD) to focus on the five high transmission regions being targeted by the NMCP to expand the Sedhiou model through a performance-based contract. GoLD currently receives \$200,000 from PMI to increase stakeholders' participation in health activities at the local level. Using this mechanism, PMI intends to focus on malaria prevention and control in the four high transmission regions (Tambacounda, Kolda, Sedhiou and Kedougou) by working "on the other side of the road" with Governors, local elected officials, NGOs and communities to raise awareness on malaria activities and increase their participation in planning, implementation, monitoring and reporting.

Such a strategy is worth PMI's investment as it will sustain results and will support the NMCP ensure accountability in conducting the program. Such a strategy will also enable stakeholders to play an oversight role and help address bottlenecks in implementing the activities. The PMI Team met with the mission Governance Team on August 9, 2017 to discuss feasibility of focusing more their activities on malaria by increasing stakeholders' participation in key prevention and control activities and furthermore on creating spaces for them to discuss malaria planning, implementation and evaluation with the district health management team as well as with the regional health management team. A meeting is scheduled before end of August with the Project leadership to discuss planning implications. Another strategy the PMI is considering might be to cap the funding level allocated to the NMCP through G2G mechanism not only to reinforce risk mitigation, but also to enable them focus on strategic activities and improve coordination. Finally, the PMI will work with the PMI Headquarters Team and the NMCP to

discuss MOP activities in more details during MOP planning, which will reduce the management burden of FARA mechanism.

Also, PMI will continue to advocate for the NMCP to progressively engage in collaboration with health regions and local governments to empower their staff at the decentralized level to plan, manage and coordinate activities and allocate resources as appropriate to achieve expected results. Given the challenges identified in the supply chain and commodities distribution system, including lack of adequate storage capacity, PMI has increased its support in the FY 2016 and FY 2017 MOPs to the CMS at the central as well at the regional levels. PMI will also support the development of a strategic plan for strengthening the policy and regulatory capacity of the pharmaceutical system and the drugs quality control system.

Peace Corps: Active linkages with Peace Corps volunteers are planned to continue, allowing volunteers and their communities to benefit from the technical resources that partners provide. In this partnership, PMI benefits from the committed community presence of more than 200 volunteers, making it the largest Peace Corps program in the world. In May 2016, 64 new Peace Corps Volunteers were sworn in, 40 of whom were assigned to various regions of Senegal to support public health efforts in communities. During the past twelve months, Peace Corps Volunteers conducted three intensive trainings to educate other PCVs about malaria epidemiology in Kolda, Ourrosogui, and Tambacounda. PCVs also collaborated with regional and district-level health management teams to train home-based service providers (DSDOMs) and supervisors. As such 114 community care providers and supervisors were trained in health promotion. Also, PCVs participated in distributing 6,425 nets during the 2016 mass distribution campaign. While malaria funds have not in the past supported the third year malaria coordinator, Peace Corps have just made announcement to fill this position for 2018.

Proposed activities with FY 2018 funding: (\$725,000)

(1) NMCP capacity building

- *Support to NMCP to enable program supervision (\$200,000)*
With FY 2018 funds, PMI plans to support the NMCP to conduct formative supervision visits to regional and health district levels according to supervision guidelines and schedule. Supervision at health posts, health centers, and hospitals will continue to receive increased attention.
- *Support NMCP malariology course (\$100,000)*
Funding will be provided to the NMCP for a third year to support a malariology course that will be offered to health staff at various levels and allow for in-country training opportunities.
- *Bi-annual meetings between the NMCP and PMI implementing partners (\$35,000)*
These proposed meetings will bring together NMCP staff, the Global Fund, the Islamic Development Bank, other donors, and representatives from the different regions, partners, and implementing partners, so as to review planned activities and facilitate information sharing and ensure better coordination of malaria-related activities across the country.

- *State-of-the-art capacity building opportunities (\$30,000)*
Given the ambitious objective of achieving malaria pre-elimination by 2020, NMCP personnel and the country program will greatly benefit from participating in international technical, scientific, and professional meetings that present opportunities to learn best practices, share experiences, and develop networks. Potential meetings include the American Society for Tropical Medicine and Hygiene and the Pan-African Malaria Conference. PMI will also encourage the NMCP to seek funding from the MoH and conference organizers before supporting participation at such events.

(2) Peace Corps

- *Support for specific malaria-related Peace Corps volunteer projects (\$10,000)*
Funds will support specific malaria-related Peace Corps volunteers' projects.

(3) Other

- *Support for Performance-Based Financing for malaria indicators (\$100,000)*
A few malaria indicators were selected as part of the PBF performance management plan. PMI plans on providing continued support for the PBF program in participating districts, including training, supervision, data collection and verification, and payment of performance bonuses.
- *Increase communities' participation (civil societies, local elected officials, women's groups, etc) in the governance of malaria control (\$150,000)*
Activities will include supporting the local government to include malaria and other health priorities in their local development plans and increasing participation of communities in decision making regarding health issues. Some planned activities include developing information sharing processes and procedures (e.g., work plans, participatory budgeting, periodic performance and review reporting, radio programming) as well as sensitizing local government entities about the important role that civil society can play in advocating for quality services. These activities will build upon the findings of the pilot in Sédhiou to inform the rollout of malaria activities that is planned in five additional regions.
- *Technical assistance for the management of Fixed Amount Reimbursement Agreement under the G2G mechanism (TAP) (\$100,000)*
The Technical Assistance Project is a new mechanism designed to support planning, design, and monitoring of the NMCP Fixed Amount Reimbursement Agreement and enable the PMI team to review reports submitted by the NMCP in a timely manner.

Table 16: Health Systems Strengthening Activities

HSS Building Block	Technical Area	Description of Activity
Health Services	Case Management	PMI will continue supporting training and supervision of health workers in case management in health facilities as well as in health huts and households. This includes support for seasonal malaria chemoprevention activities.
Health Workforce	Health Systems Strengthening	PMI will contribute with other health funding streams to train newly recruited health work force staff as the GoS engages in filling the human resources gap in the health system to achieve universal coverage of health services. PMI will also continue building capacity of staff managing commodities at the districts and health post levels.
Health Information	Monitoring and Evaluation	PMI will continue supporting the strengthening of the routine information system through the DHIS2 platform as well as the Logistics Management Information System.
Essential Medical Products, Vaccines, and Technologies	Case Management	PMI will continue supporting the supply chain and drug distribution system through reinforcing the management and storage capacity of the CMS and strengthening the capacity of human resources at the regional level. Activities will include drug quality control and ensuring quality diagnostic and efficacy of treatment drugs.
Health Finance	Health Systems Strengthening	PMI will work with other partners such as the World Bank and the Global Fund to expand the PBF activities to increase access to malaria prevention measures and case management services. Direct funding to selected districts will also continue.
Leadership and Governance	Health Systems Strengthening	PMI will support activities that strengthen the leadership of the NMCP at each level of the health system as well as encouraging local elected officials and communities to prioritize malaria and other health issues in their local development plans.

5. Social and behavior change communication

NMCP/PMI objectives

The overarching goal of Senegal’s current national malaria communication strategy is to bring 80% of the population to adopt healthy behaviors with regards to malaria prevention measures and case management by 2020. More specifically, the communication strategy is designed to:

- Increase the proportion of people sleeping under ITNs to > 80%
- Increase the proportion of pregnant women who take at least three doses of SP under directly observed treatment at ANC to > 80%

- Increase the proportion of people who seek care at health facilities within 24 hours of the onset of fever to > 80%
- Increase compliance in the treatment of uncomplicated malaria
- Protect at least 90% of the population with Indoor Residual Spraying of insecticide in target areas by 2020
- Ensure that at least 95% of children aged between 3 to 120 months in target zones receive all three doses of seasonal malaria chemoprevention care during transmission season
- 100% of suspected malaria cases are diagnosed with RDTs or blood smear according to national guidelines
- Ensure that 100% of confirmed cases are treated according to national guidelines and with effective drugs
- Ensure that 100% of complicated malaria cases among children under 10 years of age have access to pre-reference treatment
- Strengthen partnerships with the private sector, media, local government, Parliament, and other government departments

The objectives of the current yet to-be validated integrated malaria communication strategy are consistent with the NMCP's 2016-2020 National Malaria Strategic Plan. The latter emphasizes that SBCC approaches in Senegal should be evidence-based and tailored to specific populations and geographic areas. The NMCP is keen to ensure that approaches are grounded in formative research that identifies key determinants of behavior for specific audiences, appropriate communication channels, and suitable printed materials.

Communications about malaria are expected to take into account local specificities such as differences in net use culture. Since the NMCP implements different packages of malaria control interventions tailored to the malaria burden of specific areas (e.g., SMC in four regions, IRS in hotspots of selected districts, etc.), communications efforts are also tailored accordingly.

Strategic approaches:

The current communication strategy adopts three main approaches: a) advocacy, b) social mobilization, and c) behavior change communication.

- *Advocacy*
The NMCP plans to reinforce advocacy for resource mobilization in order to scale up interventions proven to be effective and reduce mortality and morbidity. Advocacy efforts will select specific themes included in the national malaria strategic plan and will target stakeholders with specific strategies and activities geared towards increasing resources to achieve specific malaria control objectives.
Using a multi-sectoral approach, advocacy efforts will particularly target the private sector and other sectors associated with malaria pre-elimination objective in Senegal. High-level institutions such as the Parliament will also be targeted to raise awareness of deputies and their commitment to increase budget allocations to health and malaria. In addition, the coordination of partners supporting malaria control (CCPLP) is a forum of stakeholders that meet periodically to discuss best strategies to advocate for improvement of the performance of the program.

- *Social mobilization*
This communication approach will reinforce community participation in malaria control through enhanced collaboration with local NGOs and community-based organizations whose capacities will be strengthened. The strategies of “*Malaria Jambars*” (Malaria Champions) will be reinforced to seek increased commitment from communities for malaria control activities through local events covered by the media. Overall, the NMCP will strengthen the SBCC capacities of civil society groups to contribute to malaria prevention and control. Social mobilization activities will also target individual citizens as well as specific groups such as artists, sport practitioners, local leaders, local elected officials, etc).
- *Behavior Change Communication*
The NMCP will adopt an inclusive approach in designing its behavior change communication strategy. Such an approach will involve partners all levels to identify the targets, the channels and define parameters of campaigns. In order to achieve the objectives of usage of preventive measures by different segments of the population, SBCC efforts will focus on proximity communication, social mobilization around malaria control, communication and information of the general public using TV channels, radios shows at national and community levels, non-traditional media and NTIC as well as billboards). A partnership will be established with the Sociology Department of UCAD in Dakar to conduct formative research and gather a critical mass of information on malaria and behavior change.

Progress since PMI was launched

PMI has supported various community mobilization and SBCC activities in Senegal. These include both ongoing malaria communications (mass and interpersonal) and communication activities promoting specific events, such as IRS or ITN distribution campaigns. Typical communications activities in Senegal have included community meetings on a specific topic, home visits, theater, community radio (radio spots as well as interviews and programming), and social mobilization (setting aside a day to focus on a specific theme or topic and bringing the whole community together around that topic – for speeches, music, skits, with banners and t-shirts with messages, etc.). Topics of ongoing SBCC at community level include the importance of owning and using ITNs, prompt care-seeking in the case of fever, recognition of danger signs, the importance of attending ANC visits, and the importance of receiving the recommended doses of IPTp. Through Peace Corps volunteers and bilateral implementing partners, PMI has supported malaria education and prevention throughout the country.

To date, there has been little if any effort to evaluate the impact of the different communications activities on health/malaria indicators, such as ITN use or care-seeking behavior. This weakness was expressed often as USAID/Senegal was developing its 2011-2016 health strategy and directly led to the creation of a new program to concentrate on streamlining and “upgrading” communications interventions. Going forward, the focus will be on strategic activities with specific objectives, the results of which can and will be evaluated.

In 2012, the NMCP and National Health Education and Information Service (SNEIPS) created a national Malaria SBCC Coordination Committee to promote harmonization of approaches and activities among the numerous partners. This was followed by a workshop to share actual materials and work plans, and to revise the 2011 malaria BCC plan. PMI supported both of these activities and has taken a lead on ensuring rigor in the development of BCC activities. A team from Senegal, composed of the NMCP, SNEIPS, PMI, and two implementing partners, attended the PMI Malaria BCC workshop in September 2013. This provided a good opportunity to share perspectives and experience and develop a common plan for moving forward with more evidence-based communications activities. Given the reduction in malaria burden that has been observed in Senegal and the roll out of specific interventions tailored to different parts of the country based on malaria burden, one complexity of the Senegal program is that communications activities need to be tailored to local contexts to reflect the interventions being implemented.

Progress during the last 12-18 months

In 2016 the NMCP developed a national integrated communication strategy for malaria control designed to guide SBCC interventions supported by all actors involved in promoting healthy behaviors among different segments of the population, mainly for use of malaria preventive measures and control services. PMI resources have been invested to develop the strategy, but also strengthening the capacity of the SNEIPS to coordinate the implementation of the strategy and ensure that messages delivered under various malaria control projects implemented by different partners and in various settings are coherent with the national integrated communication strategy. The NMCP's approach includes identifying the determinants of behaviors related to malaria disease and using the findings to develop communication campaigns with an appropriate mix of messages and channels. Developed with the technical assistance of professional media/marketing firms and based on the determinants of the behaviors PMI seeks to influence, the new messages speak more directly to the targeted populations. This evidence-based approach will allow PMI to more rigorously gauge the impact of the supported SBCC campaigns. Based on the current national integrated communication strategy, PMI major bilateral Flagship partner "Integrated Service Delivery and Healthy Behavior" is working to design local approaches for healthy behaviors in households, targeting youth, traditional or religious leaders, women community leaders, and service providers at each across the health system. During the past six months, 14 focus-group discussions were organized in 13 districts in the 7 concentration regions, most of which are malaria high-transmission regions. The focus group discussions involved 422 participants (98 religious leaders, 117 women leaders, 111 young people and 50 service providers).

SBCC for ITNs:

Social marketing of ITNs: Since 2013, PMI has supported the implementation of a communications campaign to accompany the introduction of subsidized ITNs in the private sector in large urban areas nationwide. The campaign focuses on increasing brand recognition and creating demand through television and radio spots as well as printed media. Building on the results of market research showing that, for many people, nuisance avoidance is a more important factor for net use than malaria prevention, the campaign emphasizes getting a good night's sleep, the protective qualities of the nets ("MILDA: The mosquito net that kills mosquitoes"), their affordability ("1,000 FCFA for 1,000 nights"), and where to obtain them

(pharmacies, grocery stores, gas stations). For this campaign, TV and radio spots were produced and broadcast in major urban areas. Newspaper inserts and internet banners were also used to reach a wide audience. As a result, a total of 407,557 MILDA-branded ITNs were sold over the period of April 2015 through March 2016. The target of 148,731 long-lasting ITNs set for FY 2017 will not be achieved because the NMCP was not able to provide nets to the social marketing organization to distribute through their channel. Also, following the Technical Working Group's (TWG) recommendation on the FY 2017 MOP, an evaluation of the social marketing of long-lasting ITNs in Senegal is underway, the findings of which will serve to inform any future programming for social marketing activities.

Mass ITN communications campaign: PMI continued to provide support for the NMCP's overarching communications campaign to increase use of ITNs in general. The campaign, called the "Three Alls" (*Les Trois Toutes: Toute la famille, Toutes les nuits, Toute l'année*) emphasizes that nets must be used by "the whole family, all year long, every night." The campaign combines mass media and inter-personal communication strategies, all which have been supported with PMI funding. These include the creation of TV spots which have been broadcast on multiple national networks, as well as radio spots and radio shows, and erecting billboards in five major cities. Over the period of September 2015-March 2016, with PMI's support, activities implemented by community-based organizations contracted by PMI implementing partners contributed to reaching 244, 387 people through malaria prevention and control messages. In addition, 28, 018 radio spots and 125 radio shows were broadcast via community radios, a substantial increase from the 8,827 spots and 35 radio shows aired in previous year. In addition, PMI worked with community-based organizations to sensitize communities (e.g. using road shows) about the importance of using nets; these efforts reached 4,800 people.

In July 2015, a formative study was conducted by a PMI implementing partner to identify factors determining the use of malaria prevention measures and control services. For use of ITNs for example, the study targeted factors such availability, expected results, feelings, product features, and social support. Finally, the same PMI implementing partner conducted an evaluation of the malaria communication campaign in 2016 centered on knowledge and use of ITNs. The results of the evaluation showed that 73% of women interviewed would recommend an ITN for their neighbors. Also, 73% were willing to talk about use of ITNs to their neighbors. More specifically, the results of the study indicate that among factors determining the use of ITNs are TV messages (63%) and messages aired through radio channels (26%). With regards to the content of messages that prompt ITN use, the study revealed that the 3T slogan ("*Toute l'Année, Toute la Famille et Toute la Nuit*", i.e. "All year, the entire family, and all night") accounts for 40% in the purchase and use of ITNs while the message "*Milda, la moustiquaire qui tue*" (i.e. "Milda, the mosquito net that kills") contributes to 17% in the decision to purchase and use an ITN. Physical presentation (branding) of the net has also contributed to people's decision to use net. The study showed that 84% of men cited Milda to be a good ITN brand. According to interviewed men, Milda is different from other ITNs because of its comfort (37%), its availability (32%), its affordability (21%), and its resistance (16%). The large majority of interviewed women (81%) also declared the Milda branding to determine their decision to procure and use ITNs, while 19% affirmed having heard about a non-Milda ITN campaign. The key recommendation was to translate the messages into local languages for the Southern regions where malaria transmission is still high.

SBCC for IRS: During the 2016 and 2017 spray rounds, PMI continued to support communication activities in areas targeted for IRS to inform beneficiaries about the timing of spray activities, what to expect, the precautions to take (e.g. removing household items before spraying), and the health benefits of IRS. For the campaigns, materials to support SBCC activities (posters, training guides, and manuals) were produced to support the NMCP's transition from blanket spraying to focal spraying of hotspots only. NCMP staff met with the communication focal points in areas targeted for the spray campaigns and designed a communications strategy that was adapted to the new hotspots approach. Acceptance rate of IRS activities since PMI began spraying in Senegal has been high (97% during the 2016 spray campaign).

SBCC for MIP: The larger part of SBCC activities are being focused on routine ITN distribution and use, IRS, and SMC with specific SBCC activities that include social mobilization. SBCC activities geared towards promoting IPTp uptake are included in the ANC as part of reproductive health services. As indicated in the MOP, PMI's partners, under the new Mission's integrated service delivery-behavior change (ISD-BH) mechanism are working with an institutional SBCC sub-grantee to develop tools that will be used to provide a more comprehensive approach to SBCC activities in the Mission's health portfolio. In late 2016, PMI's partner conducted a study on factors determining uptake and knowledge of IPTp and case management products among service providers. The study revealed that overall knowledge of IPTp among service providers is high. Among pregnant women, knowledge of malaria is widespread, due to a number of factors including the shared experience within the community with the disease, information received from service providers, and education and mobilization activities conducted by community *relais* and "*badianou gox*" (female leaders who provide health advice to other women in the community). The study also identified that pregnant women have a good knowledge of malaria severity and the consequences that contracting malaria can have both on pregnant women and the baby that they carry. The study also identified that although service providers at all levels have a good knowledge of malaria case management products, there are weaknesses among community health workers in their ability to differentiate between ACT formulations; recommendations were made to address this issue and improve case management at the community level.

SBCC for SMC: PMI funded the development of informational materials for the first SMC campaign in four districts in 2013, and UNICEF supported dissemination costs. Materials were reviewed and revised based on that initial experience for the 2014 campaign that was implemented in four regions and these materials continued to be used for the 2016 campaign. Acceptance of SMC campaigns has been high, indicating that the population understands the benefit of the intervention.

Peace Corps SBCC: Senegal has a large Peace Corps presence; of the more than 200 volunteers in-country, at least one third conduct malaria-related activities. Peace Corps volunteers continued to play a significant role in disseminating net transformation techniques to communities and training people on net care and repair. Volunteers also hosted local language radio programs, helped test new communications materials, and organized home visits that touch on various malaria themes. During the past year, PCVs conducted home visits to ensure use of bed nets. As

a result, 1,194 community mobilizers were trained in behavior change communication and 5,014 community members received messages to improve their knowledge of malaria signs, prevention and treatment. Peace Corps volunteers also support the integrated proactive community case management (PECADOM Plus) with all their communication needs, ranging from awareness raising activities in their hot communities, educational radio programs in local languages, training of community health volunteers, and encouraging communication between all the actors engaged in the PECADOM program. Through the small project assistance (SPA) program, and with PMI funding and technical assistance, the Peace Corps have been able to develop some innovative and participatory communication activities at the grass-root level. Some examples include the Malaria Mural tour (FY 2016) where in four villages, murals were painted about sleeping under bed nets, which was coupled with an educational session about malaria transmission and how to prevent it. The project coincided with the universal long-lasting ITN distribution campaign. At least 57 *causeries*, or health talks, were organized by volunteers in their villages, reaching 1,102 community members. The talks were often combined with murals, skits or other activities. Finally, in 2015 a culturally-appropriate education comic was developed by a Peace Corps volunteer, targeting malaria prevention messages to children of Senegal (combining French and local languages). 'Paludisman, the Hero of Malaria Prevention' is still used by Peace Corps volunteers as an educational tool to train students in malaria prevention, treatment and bed net use and care. In FY2016, 350 students and 17 teachers in the regions of Kaffrine and Kaolack were trained with this educational comic and the teachers were also trained on how to incorporate malaria education into their established curriculum. The Peace Corps plans to continue to use the comic and the related educational program every year around World Malaria Day, in a broader region across the country.

In 2015, similar interpersonal communications activities were implemented through the outreach workers at health huts and sites under USAID's community health program, which covers all 14 regions of the country. With PCV, SBCC activities included a variety of interpersonal communication approaches such as home visits, support groups for pregnant women, outreach to grandmothers, care groups, etc. During the past six months, 144 community mobilizers were trained in behavior change communication to deliver messages in households. As a result, 4,400 community members were reached with messages designed to promote healthy behavior and prevent malaria transmission.

As Senegal moves towards the pre-elimination of malaria, a key challenge for communication will be ensuring that populations continue to use malaria prevention tools and seek treatment, even as malaria becomes rarer. PMI's partner under the new flagship integrated service delivery - behavior change is conducting research to develop SBCC tools tailored to the context of regions and to the needs of population.

Plans and justification

With FY 2018 funds, PMI will continue to support a range of communications activities to improve the adoption of key malaria prevention and care-seeking behaviors (e.g., net ownership, proper net use, net care and maintenance, IPTp, when and where to seek care). After the implementation of a universal coverage long-lasting ITN campaign in 2016, PMI will continue supporting intensive communication efforts to encourage the population to use nets. The NMCP plans on focusing on high net ownership via the routine distribution systems (ANC, schools and communities) in the next years. With FY 2018 funds, PMI therefore plans to fund communication efforts that encourage the population to obtain nets through these routine channels. A specific PMI direct funding milestone is designed to monitor the delivery of routine ITNs in target districts. In addition, communication efforts will also encourage other key behaviors, such as prompt care seeking, which is becoming even more important as transmission intensity and acquired immunity decrease. PMI will continue supporting communication activities geared towards maintaining the rise of IPTp coverage as data recently presented at NMCP regional data review workshops indicated significant improvement of the IPTp2 indicator in many regions of the country. PMI will continue to reinforce delivery of messages stressing the need for pregnant women to obtain IPTp-SP at each scheduled antenatal care visit starting as early as possible in the second trimester.

Under the new NMCP integrated communication strategy that values multi-sector approaches, PMI plans to continue to work in close partnership with the SNEIPS, NMCP, the MoH and other ministries (the Ministry of Education, Ministry of the Family, etc.), private sector entities, and various other local partners. Those approaches will maximize the use of effective materials/tools and media products already developed and used successfully in Senegal while also seeking to develop innovative methods. Focused on evidence-based social marketing principles, PMI plans to support the NMCP and its BCC partners use a mix of channels to deliver messages that promote malaria-related products and behaviors to targeted populations. Social mobilization and mass media activities will be conducted to reach large numbers of people, while interpersonal communications will be used at the community and health facility levels to reinforce messages and tailor them to individual contexts.

Through participation in the national Malaria SBCC Coordination Committee, PMI plans to continue promoting coordination across ministries, donors, implementing partners, and the private sector to harmonize the implementation of SBCC programming. All planned SBCC activities will be monitored in order to improve their outcomes and impact.

Proposed activities with FY 2018 funding (\$647,400)

1. *Promotion of long-lasting ITN use (\$75,000)*

PMI funds will be used to cover operational expenses associated with the social marketing of ITNs in the private sector, including packaging (such as providing bar code and logo stickers), transportation from the warehouse to wholesalers, and medical detailers who visit pharmacies to check on stock levels and placement. The implementation of this activity is contingent upon a PMI-funded assessment of Senegal's social marketing program, which will take place in June-July 2017. This assessment will determine the appropriateness of social

marketing in the Senegal context and whether it indeed fills a gap that is not covered by other existing net distribution strategies. The assessment will help clarify if/how social marketing complements the other net distribution strategies that Senegal currently employs (campaigns, routine distribution at ANC, schools).

2. *Development, implementation, and evaluation of SBCC activities (\$472,400)*

PMI plans to continue to support the NMCP's strategy to promote appropriate malaria prevention and care-seeking behaviors. This will include ensuring harmonization amongst the PMI-funded partners who work at different levels of the system, from the community level to the central level at the MoH. These funds will be used to support behavior change activities geared towards promoting use of malaria prevention measures and control tools. PMI FY 2018 resources will also be used to continue support to the MoH Malaria SBCC Committee (jointly coordinated by the NMCP and SNEIPS), ensuring that communications about malaria are of high quality and have a strong impact.

3. *Community sensitization and mobilization for SMC (\$100,000)*

In the four regions where SMC is being implemented, PMI will continue funding the implementation of communications activities to ensure that populations are well-informed of the SMC campaign and acceptance rates continue to be high. Experiences and lessons learned from the previous SMC campaigns (implemented annually with PMI support since 2013) will be utilized to revise and adapt materials as needed. With FY 2018 funds, PMI plans to continue to support the roll-out of the 2019 SMC campaign using a combination of approaches to sensitize communities, including radio spots, community meetings, and house-to-house visits. One potential challenge with communication around SMC is that medicines which are bitter and cause minor side-effect such as vomiting need to be given to children who are not ill. The success of the SMC campaign hinges upon the willingness of parents/caregivers to provide preventive treatment to their child even though the child is well and has no symptoms and to continue to administer the two subsequent daily doses of amodiaquine. PMI therefore particularly emphasizes interpersonal communications to explain the rationale for SMC and the importance of administering all doses.

6. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The NMCP objective for M&E is to ensure 100% prompt and complete routine reporting at all levels and use of data for M&E of the 2016-2020 Strategic Plan. To achieve this objective, the NMCP will focus on building capacity in surveillance, monitoring and evaluation and continue to focus on strengthening the routine information system at all levels: national, regional, district, and facility. The NMCP will continue to work closely with the Division of Social and Health Information Systems (DSISS) to fully integrate the NMCP malaria system into the national HMIS that uses the District Health Information System (DHIS2) platform and work with the MoH to improve the quality of the malaria data.

Progress since PMI was launched

Population-based and health facility surveys:

Multiple national-level household surveys have been conducted to provide information on key malaria indicators, including MISs in 2006, 2008 and 2016 as well as DHSs in 2005 and 2010, and a post-campaign survey in 2009 to assess the ownership and use of ITNs after a campaign targeting children under five years of age. In 2012-2013, Senegal began implementing a Continuous Demographic Health Survey (cDHS) consisting of population-based and service provision assessment (SPA) components, which provides information to guide programming on a regular basis. The cDHS provides annual estimates of all standard household-level malaria indicators (including anemia and parasitemia) as well as information on the availability and quality of services in the health sector (including private providers). Results are available nationally and by urban/rural and epidemiologic strata annually, and by region every two years. The cDHS has been supported by USAID, using malaria and other funds, as well as other partners including the MoH, the World Bank, and UNFPA. The final round of the cDHS is being implemented in 2017. The survey Steering Committee in Senegal has a planned meeting in May 2017 to discuss the future of the cDHS. Any decisions on future donor support for a cDHS will be discussed after decisions about continuation are made by the country survey Steering Committee. Until this decision is made, the NMCP will plan for a MIS in 2020 for coverage estimates nationwide and parasite prevalence in the southern regions.

Surveillance:

A system of epidemic surveillance sites has been operational since 2008, starting in the Senegal River Valley. The system has slowly expanded to now include twelve districts across nine regions that are now enrolled in the program; each district with two sites reporting morbidity, mortality, and stock information on a weekly basis across all 24 sites. There is supervision at these sites every trimester and the NMCP is in the process of implementing an electronic reporting system using a web-based platform. The vision of the NMCP is to have every public health facility in all districts enrolled in the weekly reporting system. In conjunction with the COUS, the NMCP is working with the DSISS to build up a surveillance module in the DHIS2 platform including malaria data aspects.

Routine Health Information System:

Senegal is known for its robust routine malaria information system, providing prompt and complete data to guide and measure scale-up of malaria control activities. The NMCP gathers routine malaria mortality and morbidity data that is collected by all health posts and sent to health districts on a monthly basis. In this Excel[®]-based system, all relevant malaria data flow up from the community level health huts and DSDOMs through hardcopy register workbooks to health posts, which are then synthesized in Excel[®] forms and sent to the districts. From the districts, data are then sent simultaneously to the regional and central levels. The NMCP also organizes quarterly review meetings with health districts to share malaria burden data as well as policy and technical information. The routine malaria information system is currently reporting at 99% from all facilities.

By early 2015, the MoH supported the development of the District Health Information System (DHIS2) platform for their nationwide, integrated health information system. The Global Fund

has heavily supported the roll-out of the DHIS2 with hardware and connectivity along with the GAVI HSS project and the World Bank. For malaria, the NMCP M&E director has been actively engaged in the development and roll-out of the DHIS2 and has incorporated all of the malaria indicators currently collected through the Excel[®] workbooks that are used for the routine malaria information system. There is continued improvement in the completeness of the HMIS system. In 2015, the system was reporting at 70% and by the end of 2016, the system was reporting 93% completeness from all 76 districts. A monthly report on completeness and timeliness is available on the DHIS2 platform for the NMCP to identify regions and districts that may need more support and supervision. The quarterly review meetings that are supported by both the NMCP M&E Director and the DSISS have been cited as an important element to increasing HMIS completeness.

The NMCP and the DSISS continue to collaborate to fully transition the NMCP reporting system to the MoH HMIS. In May 2016, the DSISS expanded the training and use of the DHIS2 to the health facility level in all districts. The NMCP and the DSISS will continue to assess the quality of the malaria data in the system to determine when the NMCP can fully transition to the MoH HMIS. The NMCP is committed to an integrated system in Senegal as they are currently developing a module for weekly notification in the DHIS2 with the DSISS as well as a module for notification by SMS mobile platforms. The reporting by SMS mobile platforms will ensure improved reporting from the community health workers that are being expanded in Senegal. In the private sector, the focus will be put on disease surveillance data, case management, IPTp, and, in some cases, net distribution.

Progress during the last 12-18 months

Population-based and health facility surveys:

The cDHS completed Phase 4 of data collection and the report is being drafted. The last year of data collection for the cDHS, Phase 5, began in March 2017. The future of the cDHS is being discussed by the country survey Steering Committee that is scheduled for May 2017. Until a decision is reached on the cDHS, no further funding will be provided to support the cDHS. With the unknown status of the cDHS, the NMCP is planning a MIS in 2020 to provide estimates of intervention coverage at the regional level and parasite prevalence in the South and South-East regions.

In July 2016, a Global Fund-supported malaria indicator survey was conducted. The purpose of the survey was to collect coverage estimates on ITNs, IPTp, IRS, SMC, and the utilization of services for malaria case management at the district level for all districts. The survey did not include any biomarker testing. As the implementation, design and questionnaire of the survey were not comparable to the malaria modules included in the cDHS, the results are not presented here.

Surveillance:

The 24 surveillance sites continued to send data on a weekly basis with 100% completeness and prompt reporting. Since March 2013, the NMCP has continued to send out weekly surveillance bulletins to a large and varied group of stakeholders that presents data describing trends in malaria burden and commodity availability at each site. Based on experiences gained through a

three-year (2012-2014) MACEPA pilot in Richard Toll, reactive case detection activities were expanded to an additional district in St. Louis region, bringing the total number of PMI-supported districts to four (Podor, Dagana, Pete, and St. Louis). In parallel with this expansion, PMI supported the malaria epidemic surveillance system to expand data collection and improvement to all health posts of the region. Currently, all health posts are reporting to the system in Saint-Louis region, with 88 health facilities in the four PMI-supported districts. To support reactive case detection, it is critical that all health posts continue to report into the system; this has required increasing the number of supervision visits and improving transmission of data through an SMS platform. In 2016, as Saint-Louis Region was fully covered, the NMCP began the expansion of surveillance sites in two regions in the North (Louga and Matam Region) with MACEPA and an additional three regions (Kaolack, Kaffrine, and Ziguinchor) with PMI. Weekly reporting has been introduced as standard procedure to these sites and all health posts in these regions by providing registers for weekly data collection and supporting regional data validation workshops. For more complete data in the three regions, retrospective data is being collected from 2014 to 2016 from the surveillance sites.

Routine Health Information System Strengthening:

The DHIS2 system has improved reporting completeness from 70% in 2015 to 93% by the end of 2016 from all 76 districts in Senegal. In 2016, the DSISS expanded the training and use of the DHIS2 to all health facilities in all districts. A report on completeness and timeliness across all districts is available on the DHIS2 platform for the NMCP to identify lagging regions and districts. Regular quarterly review meetings have continued at the regional and district levels that have been an important element in increasing reporting completeness. The NMCP is working with the DSISS to look at ways to integrate data platforms that have been developed and maintained by other partners such as MACEPA and IntraHealth. The NMCP continues to work with the DSISS to include health hut data in the DHIS2 platform and to develop a module for weekly reporting and reporting by SMS.

M&E Course:

The second workshop on malaria-specific Monitoring, Evaluation and Surveillance was conducted by the NMCP with technical assistance provided by M/Evaluation. There were 25 participants in this workshop that included 10 physicians and 15 superior technicians. There has been a total of 49 health professionals trained from the first and second workshops. Future workshops will be entirely organized and conducted by the NMCP. The long-term plan for these workshops is to train the health management teams in all 76 districts and 14 regions with an expected total of 400 health team members trained as the country heads towards pre-elimination.

Table 17 below summarizes the different data collection activities that have been supported by PMI and other partners.

Table 17. Surveillance, Monitoring, and Evaluation Data Sources

Data Source	Survey Activities	Year								
		2012	2013	2014	2015	2016	2017	2018	2019	2020
Household surveys	Demographic Health Survey (cDHS)		X	X	X	X	X			
	Malaria Indicator Survey (MIS)					X*!				(X)
	Universal Coverage Evaluation		X							
Health Facility and Other Surveys	SPA as part of cDHS		X	X	X	X	X	(X)		
Malaria Surveillance and Routine System Support	Malaria epidemic surveillance	X	X	X	X	X	X	(X)	(X)	(X)
	Case investigation	X*	X*	X	X	X	X	(X)	(X)	(X)
	Support to DHIS2 Integrated Routine Information System	X*	X*	X*	X*	X*	X*	(X)*	(X)*	(X)*
Other Data Sources	Malaria Impact Evaluation		X				(X)*			
	SMC M&E			X	X	X	X	(X)		

! This MIS was funded by the Global Fund and was implemented in July 2016. This survey obtained coverage estimates at the district level, nationally. This survey did not include biomarkers. The cDHS does not provide estimates at the regional or district level on an annual basis. For regional estimates in the cDHS, data from two continuous survey years are aggregated.

*not funded by PMI

() not yet completed

Plans and justification

Using FY 2018 funds, PMI plans to support the planning and design of a MIS in 2020. Since it is unclear if the cDHS will continue in Senegal, PMI will support the NMCP to collect key malaria indicators through a MIS. The MIS in 2020 will provide intervention coverage estimates at the regional level and parasite prevalence in the South and South-East regions (red zones). FY 2018 funds will also supplement FY 2017 funds for a health facility survey in October 2018. The purpose of the facility survey would be to assess the quality of care for fever cases at health posts and confirm that services are in fact being provided as expected regarding testing and treatment. The facility survey will also help identify any potential barriers to quality care such as applied fees. As of the writing of this MOP, a final decision on the future of the cDHS had not been reached by the Government of Senegal. In the event that the cDHS is continued, PMI will not support a separate MIS and HFS from the cDHS.

Support from PMI will continue to contribute to key data collection and analysis activities including continued collaboration with the DSISS in creating new modules for weekly reporting to be integrated into the DHIS2. The NMCP will continue to evaluate the completeness and timeliness of data and perform data quality checks through quarterly reviews at the district level and on-site verification through supervision with the DSISS and the MoH.

Proposed activities with FY 2018 funding: (\$460,000)

1. *Technical assistance and operational support for a 2020 MIS (\$250,000)*

With FY 2018 funding, PMI plans to begin the planning and design of a MIS in 2020. The additional costs for technical assistance and field work will be included in the FY 2019 MOP and the Global Fund may also contribute to this survey.

2. *Health Facility Survey (\$50,000)*

This funding brings the total budget for this survey to \$150K, with \$100K of FY 2017 funding. This facility survey will focus on health posts and assess the quality of care for fever cases; assessing whether or not fever cases are provided a test, what they are prescribed with and how much they are paying for these services.

3. *Monitoring and evaluation course by NMCP (\$150,000)*

This will be the fourth year this course is offered in Senegal. The course is a malaria-specific M&E course with the inclusion of pre-elimination and elimination M&E issues. As the country heads towards pre-elimination, the country plan is to train all medical officers and health nurses who are responsible for running health facilities. The NMCP plans to apply a Training of Trainers (ToT) model to this course and the training curricula will be adapted to fit within two weeks followed by a ToT training.

4. *One technical assistance visit from CDC (\$10,000)*

CDC staff will provide technical support for M&E activities, including the expansion of the surveillance and routine malaria systems. One visit is planned to provide follow-up of planned activities.

7. **Operational research**

NMCP/PMI objectives

The goal of operational research in Senegal, which is grouped with M&E in the NMCP National Strategic Plan, is to provide data for decision making and in particular to evaluate issues related to achieving pre-elimination, both in the low transmission North and the high transmission South. There are two specific objectives related to operational research in the NMCP Strategic Plan for 2016-2020:

- Strengthening coordination and promotion of operational research among partners, and
- Developing operational research projects of national interest

Progress since PMI was launched

Many partners are involved in conducting operational research in Senegal. PMI's support for OR has been complementary to those existing efforts. For example, MACEPA and UCAD are conducting studies of case investigation, MDA, MSAT, etc. in the North, while PMI has supported a study on the burden of malaria in nomadic pastoralists that move between the North and South. In the South, the impact evaluation of SMC campaign, performed by UCAD is being co-funded by PMI and Wellcome Trust. PMI also funded a study to evaluate causes of persistent high transmission in a district (Vélingara) in which all interventions had been scaled up, and to suggest strategies to address the challenges identified. Furthermore, PMI funding supported the operational research study on PECADOM Plus conducted by the NMCP and Peace Corps. Please see the table below for a summary of all PMI-funded operational research studies completed to date.

Progress during the last 12-18 months

The text below provides a brief summary of the results of the operational research projects which were completed in the past 12 months.

A first paper, entitled 'Assessment of the utility of a symptom-based algorithm for identifying febrile patients for malaria diagnostic testing in Senegal' was published in March 2017 in the Malaria Journal. It was the product of a PMI funded operational research project which took place in 2012-2014 (Table 18). The findings from this study supported the decision of the NMCP to move away from a symptom-based testing algorithm and move more aggressively towards a policy of universal malaria testing of patients with fever or recent history of fever, as use of the algorithm excluded a large proportion of patients with malaria from testing.

A second paper entitled 'Malaria burden, prevention and treatment seeking practices among nomadic pastoralists in northern Senegal' which presents the data from an Operational Research study performed in 2014 (Table 18) has been submitted for publication. The study illustrated that while access to and utilization of malaria control interventions among nomadic pastoralists is lower than the general Senegalese population, parasite prevalence was lower than expected and sheds doubt on the theory that they are a source of ongoing transmission in the north of the country.

Qualitative study of seasonal malaria chemoprevention. This study on the acceptability of SMC was performed by researchers from UCAD in close coordination with the NMCP. An activity report was shared with the NMCP and PMI. The major findings of the study were that the SMC campaigns were well accepted by most of the targeted communities, but there were some issues that could affect acceptability that needed to be addressed, such as: the bitter taste of the medicine which causes children to refuse to take it; the most common side effects suffered by children (such as vomiting) that may cause mothers or guardians to be reticent to participate in the campaigns; and stockout of medications, which can demotivate the local actors (volunteers and health officers). A robust communication campaign and proactive planning regarding consumables could resolve most of the issues highlighted in the study. These results should help the NMCP in strengthening their SMC campaigns.

Phase III evaluation of long-lasting insecticide-treated nets (multi-country study with Malawi and Kenya). The majority of activities have been completed including monitoring of long-lasting ITNs in the field, hole counting in the laboratory, cone bioassays and chemical analyses for 6, 12, 18, 24, 30, and 36 months. Data analyses and report writing are underway and the CDC entomologist is providing technical guidance. The data from this study are also being included in an eight country “meta-analysis” to determine if any general trends can be discerned.

Table 18. PMI-funded Operational Research Studies

Completed OR Studies			
Title	Start date	End date	Budget
Phase III evaluation of long-lasting insecticide-treated nets (multi-country study with Malawi and Kenya)	12/2009	12/2015	\$92,000
Longevity of insecticides used for indoor residual spraying (multi-country study with Kenya)	07/2011	12/2014	\$200,000
Evaluation of the diagnostic algorithm	09/2012	06/2014	\$125,000
PECADOM Plus: An active version of the PECADOM model in the context of seasonal malaria chemoprevention	07/2013	12/2013	\$8,000
Burden of malaria among nomadic pastoralists	08/2014	10/2014	\$100,000
Qualitative study of seasonal malaria chemoprevention	09/2014	03/2015	\$50,000
Qualitative study of causes of elevated transmission in Vélingara	11/2014	03/2015	\$40,000
Ongoing OR Studies			
Title	Start date	End date	Budget
<i>No PMI-supported OR is ongoing</i>			
Planned OR Studies with FY 2018 funding			
Title	Start date	End date	Budget
<i>No PMI-supported OR is planned</i>			

Plans and justification

No operational research activities are planned with FY 2018 PMI funding.

Proposed activities with FY 2018 funding: (\$ 0)

No operational research activities are planned with FY 2018 PMI funding.

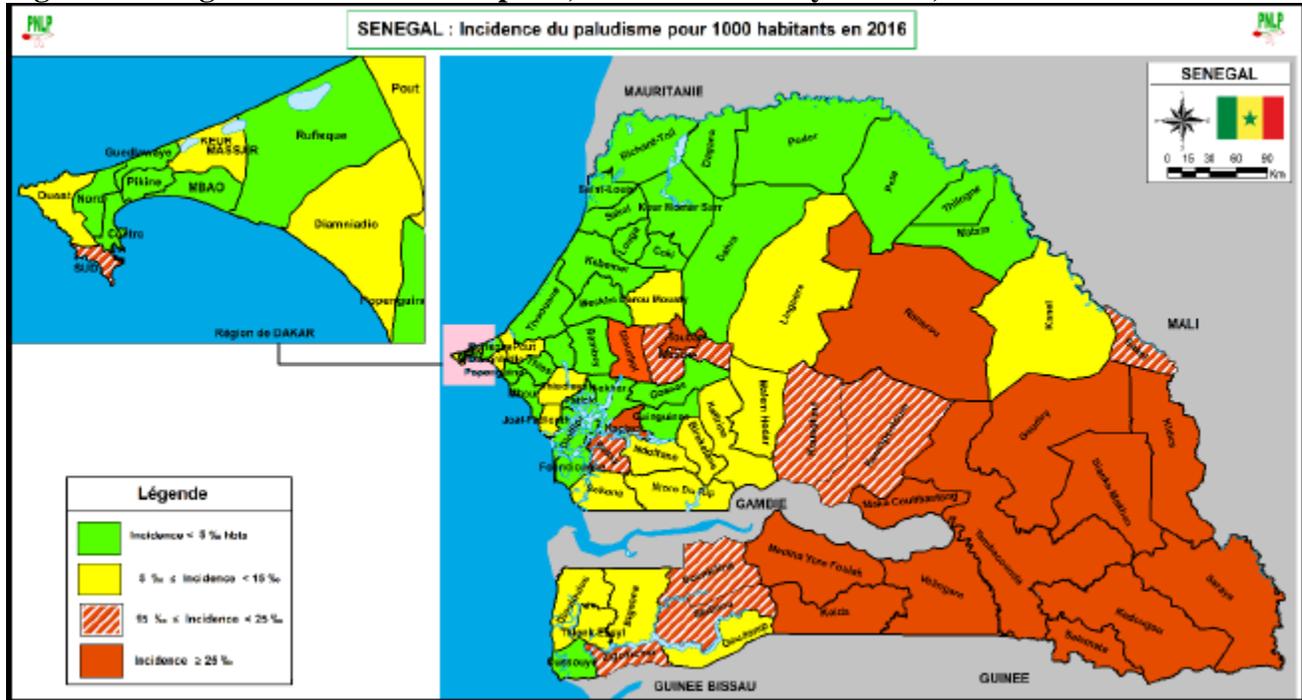
8. Pre-elimination

NMCP/PMI objectives

Senegal, in its 2016-2020 National Strategic Plan, set out a goal to reach “pre-elimination status” (incidence < 5/1,000) by 2020. While there is not a phased plan, districts with annual reported incidence < 5/1,000 are targeted for case investigation and active case detection around passively detected cases, and treatment of all detected malaria cases with single low-dose primaquine. Senegal does an updated risk stratification annually, using incidence calculations on the district

level generated by the routine malaria information system. While Senegal has developed a course for malaria surveillance in the pre-elimination context for district health officers, the Surveillance, Monitoring, and Evaluation Plan has not yet been updated.

Figure 4. Senegal malaria incidence per 1,000 inhabitants by district, 2016



Progress since PMI was launched

In 2011, the Malaria Control and Elimination Partnership for Africa (MACEPA) launched a pilot activity to conduct case investigation and active case detection for all passively detected cases in the district of Richard Toll. All household members of index cases and all household members of the five closest households were tested, and data collected on each individual and on the households. Based on analysis of these data, testing of members of surrounding households was restricted to those with three high risk factors: symptoms, travel history in the last 15 days, or non-use of an ITN. In 2015, PMI began supporting the NMCP to implement active case detection triggered by passively detected cases in three additional northern districts (Dagana, Podor, Pete), using the same model; 380 cases were investigated (82% of eligible cases), finding an additional 70 cases, 57 of whom were in the household of the index case. In Richard Toll, MACEPA continued to support activities, investigating 276 of 325 detected cases and finding an additional 28 cases, 25 of whom were in the household of the index case.

The NMCP uses the acronyms FTAT (focal test and treat) and FSTAT (focal screen test and treat) to refer to the testing of all members of the household of the index case (FTAT), and the screening for risk factors, followed by testing only of those identified to be at high risk, of the five closest households (FSTAT).

In 2014, Senegal adopted the policy of treatment of all detected malaria cases in districts with incidence less than 5/1,000 with single low-dose primaquine in addition to ACTs. However, due to delays in securing approval to import the medication in country, implementation has been delayed.

Progress during the last 12-18 months

In 2016, 33 of Senegal's 76 health districts (an increase from 15 in 2015), representing 47% of the population, had an incidence of less than 5/1,000 inhabitants. The 20,390 cases of malaria detected in these districts represented only 6% of the cases of malaria detected nationwide. In the four districts supported by PMI (St. Louis, Dagana, Podor, Pete), 495 passively detected cases were investigated (of 499 eligible), detecting an additional 77 cases, 72 of whom were found in the household of the index case.

In six districts supported by MACEPA (Richard Toll, Linguere, Matam, Thilogne, Kanel, and Ranerou), all members of the household of the index case were treated with DHA-PPQ, rather than receive testing. Of 1,898 eligible cases, 1,860 were visited, and 26,792 of 31,652 household members received treatment.

After a long process, the NMCP received permission from the DLM to import primaquine, enabling the importation of primaquine for use during the 2017 transmission season in eligible districts. The NMCP has planned to train the district health personnel in these eligible districts before roll-out of the medication.

Senegal has secured significant funding from the Islamic Development Bank, with which it plans to support pre-elimination activities in the rapidly expanding number of districts with incidence < 5/1,000 (currently 25 districts). This funding will support expansion of vector control activities (including IRS), case investigation and active case detection in the new districts. This funding will also support the expansion of PECADOM Plus into these districts, in which PECADOM Plus is not supported by PMI.

Table 19: Pre-Elimination Activities

Technical Area	Description of Activity	Geographic Coverage
Prevention	Pre-elimination districts receive other preventive activities that are delivered nationwide: universal coverage with long-lasting ITNs and IPTp, which are being supported by PMI	Nationwide
Case management	Pre-elimination districts receive the same case management interventions as are implemented nationwide, including at health facilities, health huts, and by DSDOMs. These activities are receiving PMI support.	Nationwide
Case management	PMI plans to support the implementation of primaquine in the northern districts in which PMI currently supports active case detection and in which single low-dose primaquine will be introduced in 2017 (e.g. training of health workers on how to correctly administer primaquine, management of potential adverse effects in patients)	Pre-elimination districts
SM&E	The NMCP, with PMI support, is holding a malaria-specific M&E course, which includes pre-elimination and elimination M&E issues. To support the goal of elimination, the NMCP's objective is to train all medical officers and health nurses who are responsible for running health facilities.	Nationwide
Pre-Elimination	The NMCP is implementing weekly reporting nationwide. PMI will contribute funds to support weekly reporting in pre-elimination districts.	Pre-elimination districts
Pre-Elimination	PMI will support the NMCP in implementing case detection in northern districts with incidence <5 per 1,000. In addition to supporting weekly electronic data transmission through SMS, PMI funding will contribute to the logistics of case investigations and management of cases.	Pre-elimination districts

Plans and justification

The IDB is covering the majority of pre-elimination activities in the 25 districts in the North. PMI will continue to support the four districts that is currently supported, but all additional districts will be covered by IDB. While IDB is supporting expansion of active case detection into newly eligible districts, PMI will continue to support pre-elimination activities in the four currently supported districts. This includes the procurement of primaquine, given the lengthy process for receiving an import permit, as well as some funds to support training of health workers on how to correctly administer primaquine. Procurement of primaquine and funds for implementation are included in the case management section.

As the funding from the IDB is focused on 25 districts in the North that includes the pre-elimination green zones, PMI has scaled back funding in these areas to focus on activities in the red zones. Nevertheless, PMI will continue to support active case investigation in districts within the regions of Louga and Matam that are classified as low transmission by the NMCP, with less than five cases per 1,000 population, as determined by the routine information system that includes the number of confirmed malaria cases identified at the community and facility level. Information on malaria cases will be sent to the district health supervisor and, within three days of notification, a team will be deployed to the community level to conduct a detailed investigation of the index case and screening of the five neighboring households, only testing individuals who are: 1) symptomatic, 2) have traveled recently, or 3) do not sleep under an ITN.

The vision of the NMCP is to have every public health facility in all districts enrolled in the weekly reporting system that is currently rolled out to 24 facilities. With Global Fund and IDB funding, the NMCP is currently working with the DSISS to build a surveillance module in the DHIS2 platform to collect information from every facility in Senegal on a weekly basis. PMI will contribute funds to the transmission of data by SMS at the community level in the northern, pre-elimination districts.

Proposed activities with FY 2018 funding: (\$350,000)

Please see case management section for procurement and programmatic support for primaquine introduction (\$43,000).

1. Strengthening and expanding epidemiologic malaria surveillance (\$200,000)

As Senegal moves toward pre-elimination and expands reactive case detection in the northern regions, PMI will continue to support the malaria surveillance system, including weekly case notification, in both the formal public health sector (hospitals, centers, and posts) and at the community level (health huts and DSDOMs). This system includes electronic transmission of data by short message service (SMS) and is being integrated with the HMIS

2. Case investigation in districts with incidence <5 per 1,000 (\$150,000)

Active case detection activities are currently planned in 33 districts. Both IDB and PMI will be supporting ACD activities but in different districts. The IDB will support activities in 25 Northern and Central Districts that have reached pre-elimination stage. PMI will support pre-elimination activities, including ACD, in the other districts. PMI will continue to support case detection in the currently supported northern districts with incidence <5 per 1,000, for investigation of index cases and neighboring households. Weekly electronic data transmission through SMS will be supported. Results will be collected, analyzed, and shared by the NMCP through weekly bulletins. PMI funding will contribute to the logistics of case investigation and management of cases. PMI funding will include costs for RDT procurements to support ACD activities (budget included in the Case Management section).

9. Staffing and administration

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Senegal, one representing CDC and one representing USAID. In addition, one or more Foreign Service Nationals (FSNs) work as part of the PMI team. All PMI staff members are part of a single interagency team led by the USAID Mission Director or his/her designee in country. The PMI

team shares responsibility for developing and implementing PMI strategies and work plans, coordinating with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for RA positions (whether initial hires or replacements) will be evaluated and/or interviewed jointly by USAID and CDC, and both agencies will be involved in hiring decisions, with the final decision made by the individual agency.

The PMI interagency professional staff work together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluating outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

The PMI lead in country is the USAID Mission Director. The day-to-day lead for PMI is delegated to the USAID Health Office Director and thus the two PMI RAs, one from USAID and one from CDC, report to the USAID Health Office Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta and Washington complements PMI programmatic efforts.

The two PMI RAs are physically based within the USAID health office but are expected to spend approximately half of their time with and providing TA to the NMCPs and implementing partners, including time in the field monitoring program implementation and impact.

The number of locally-hired staff and necessary qualifications to successfully support PMI activities either in Ministries or in USAID will be approved by the USAID Mission Director. Because of the need to adhere to specific country policies and USAID accounting regulations, any transfer of PMI funds directly to Ministries or host governments will need to be approved by the USAID Mission Director and Controller, in addition to the U.S. Global Malaria Coordinator.

Proposed activities with FY 2018 funding (\$1,502,000)

These funds are slated to be used for coordination and management of all in-country PMI activities including support for salaries and benefits for two resident advisors and local staff, office equipment and supplies, and routine administration and coordination expenses.

1. USAID technical staff (\$928,000)

Funding will support the salaries for one USAID resident advisor and local staff. During the past five years the PMI Team has functioned with the two Resident Advisors and one FSN staff member. Given the increasing burden of the G2G mechanism (19% of the FY 2018 budget allocated to the NMCP), one additional Malaria Technical Specialist is under recruitment as well as a G2G Specialist and an Administrative Assistant. PMI funds will be used to partially fund the latest two positions.

2. CDC technical staff (\$574,000)

Funding will support the salary and expenses for one CDC resident advisor.

**Table 1: Budget Breakdown by Mechanism
President’s Malaria Initiative – SENEGAL
Planned Malaria Obligations for FY 2018**

Mechanism	Geographic Area	Activity	Budget (\$)	%
CDC IAA	Nationwide	Support for salary and expenses for one CDC Resident Advisor, technical assistance for SM&E, and entomological monitoring	613,000	3.1
Global Health Supply Chain - PSM	Nationwide	Procurement of LLINs, ACTs, SP-AQ coblisters, artesunate suppositories, artesunate injections, primaquine, and RDTs. Support for commodity distribution fees.	10,942,000	54.7
Francophone Task Order (Chemonics)	Nationwide	Supply chain management and management of antimalarials from central to peripheral level	400,000	2.0
HSS	7 consolidation regions*	Improve case management for malaria as well as malaria prevention services among pregnant women at service delivery level and through outreach strategies. Reinforce community case management. Support for malaria indicators in the performance-based financing model.	600,000	3.0

ISD-HB (Neema)	7 concentration regions**	Improve case management for malaria as well as malaria prevention services among pregnant women at service delivery level and through outreach strategies. Reinforce community case management. Support for malaria indicators in the performance-based financing model. Development, implementation, and evaluation of SBCC activities.	1,102,400	5.5
TBD	Nationwide	Malaria Indicator Survey 2020, Health Facility Survey, entomologic monitoring activities.	616,600	3.1
National Malaria Control Program	Nationwide	Support for surveillance, implementation and supervision of programs such as: SMC (including community sensitization activities) routine ITN distribution, quality control for microscopy and RDTs, pre-elimination activities (case investigations, implementation of primaquine), pre-referral treatment at the community level and PECADOM Plus. Support for the malariology and monitoring & evaluation courses organized by the NMCP. Biannual review meetings between the NMCP and implementing partners and support for participation of central and field staff of the NMCP to participate in state-of-the-art technical, scientific, and professional meetings.	4,283,000	21.4
SHOPS+	Urban centers (Dakar and Thies)	Social marketing of ITNs.	75,000	0.4

GoTAP	Nationwide	Support to the NMCP for the G2G agreement (management, monitoring, reporting)	100,000	0.5
GOLD	Central level and 7 consolidation regions*	Reinforce community participation in governance for malaria control (civil society, elected officials)	150,000	0.8
U.S. Peace Corps	Communities with Peace Corps Volunteers presence	Support for malaria projects implemented by Peace Corps Volunteers.	10,000	0.1
U.S. Pharmacopeia	Nationwide & in 9 sites	Sampling and testing antimalarials from selected sites and technical assistance for accreditation and drug quality monitoring.	180,000	0.9
USAID	Nationwide		928,000	4.6
Total			20,000,000	100

*Consolidation regions: Dakar, Fatick, Kaffrine, Kaolack, Louga, Thiès, Ziguinchor

**Concentration regions: Diourbel, Kédougou, Kolda, Matam, Saint Louis, Sédhiou, Tambacounda

**Table 2: Budget Breakdown by Activity
President's Malaria Initiative – SENEGAL
Planned Malaria Obligations for FY 2018**

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total \$	Commodity \$		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Entomologic monitoring	TBD	316,600	0	Nationwide	Support for entomologic monitoring including insecticide resistance assays, vector behavior (biting rates, resting densities), parity rates, sporozoite rates, and species identification (including molecular analyses).
Technical assistance for ento monitoring	CDC IAA	29,000	0	Nationwide	Technical assistance for entomological monitoring from CDC headquarters (2 TDYs). PMI core funds will cover entomological supplies (\$15,000).
Subtotal Ento monitoring		345,600	0		
Insecticide-treated Nets					

Procurement of ITNs	Global Health Supply Chain-PSM	5,760,000	5,760,000	Nationwide	Purchase of 2,000,000 LLINs for the 2019 mass ITN campaign (nets needed in-country by July 2019).
Operational costs of routine ITN distribution	NMCP	100,000	0	Nationwide	Transport, support materials, supervision.
Subtotal ITNs		5,860,000	5,760,000		
Indoor Residual Spraying					
Subtotal IRS		0	0		
SUBTOTAL VECTOR MONITORING AND CONTROL		6,205,600	5,760,000		
Malaria in Pregnancy					
Reinforce provision of effective MIP services in facilities and through	ISD-HB (Neema)	150,000	0	7 consolidation regions*	Support will include training for new health-facility level providers as needed on prevention and treatment of

outreach strategies	HSS	150,000	0	7 concentration regions**	malaria during pregnancy, which includes topics such as the importance of LLIN use in pregnancy, diagnosis and management of MIP, and counseling and interpersonal communication skills. Support will continue for ANC outreach activities at health huts.
Subtotal Malaria in Pregnancy		300,000	0		
SUBTOTAL PREVENTIVE		6,505,600	5,760,000		
CASE MANAGEMENT					
Diagnosis and Treatment					
Procurement of RDTs	Global Health Supply Chain-PSM	1,908,000	1,908,000	Nationwide	Procure 3,600,000 RDTs
Procurement of ACTs	Global Health Supply Chain-PSM	1,000,000	1,000,000	Nationwide	Procure 1,000,000 ACTs.
Strengthen microscopic diagnosis of malaria	NMCP	160,000	0	Nationwide	Training, supervision, quality assurance, quality control, and maintenance of microscopes

Quality control for microscopy and RDTs	NMCP	40,000	0	Nationwide	Support for the implementation of quality control programs for both microscopy and RDTs (both upon arrival in country and in the field), in conjunction with the NMCP and UCAD.
Improve case management at health facilities	ISD-HB (Neema)	200,000	0	7 concentration regions**	Support for training and supervision of malaria case management at all levels of the health system, including the private sector.
	HSS	175,000	0	7 consolidation regions*	
Improve case management at the community level	ISD-HB (Neema)	280,000	0	7 concentration regions**	Support for community case management of malaria (at health huts by CHWs and by DSDOMs). Includes training, supervision, and monitoring of staff.
	HSS	175,000	0	7 consolidation regions*	
Operational costs for maintaining pre-referral community-level treatment nationwide	NMCP	50,000	0	Nationwide	Support for maintaining nationwide community-level pre-referral treatment.

Procurement of rectal artesunate for pre-referral treatment	Global Health Supply Chain-PSM	78,000	78,000	Nationwide	Procurement of rectal artesunate suppositories to sufficient to ensure supply (box of 6) of 50 mg and 200 mg suppositories for all ~6000 providers (~2000 health huts, ~2000 DSDOMs, ~2000 health posts)
Procurement of injectable artesunate for treatment of severe malaria	Global Health Supply Chain-PSM	443,000	443,000	Nationwide	Injectable artesunate to treat severe malaria cases referred to the hospital or health center level. Estimate is for 100% of need in 2019, i.e. 2,412 severe cases in children under the age of five (requiring 4 vials/tx) plus 8,073 severe cases among older age groups (requiring 12 vials/tx). Estimates of number of severe cases is based on 2016 data (assuming numbers remain constant in out years).
Operational costs for PECADOM implementation	NMCP	1,500,000	0	40 districts	Retraining of existing DSDOMs as needed and logistics for supporting 40 districts to implement PECADOM Plus; PECADOM Daara and PECADOM ecole in targeted zones. Includes equipment and supervision.

Procurement of drugs for SMC implementation	Global Health Supply Chain-PSM	1,600,000	1,600,000	Kédougou, Sédhiou, Kolda, Tambacounda	Monthly doses of SP-AQ for 720,841 children (3-120 months), administered by community volunteers for 3 months in three regions (Tamba, Kolda, Sedhiou) and 4 months in one region (Kedougou) during the high transmission season.
Operational costs for SMC implementation	NMCP	1,300,000	0	Kédougou, Sédhiou, Kolda, Tambacounda	Operational costs of the SMC campaign.
Expansion of low-dose primaquine in pre-elimination districts	NMCP	40,000	0	Pre-elimination districts	Expansion of low-dose primaquine to additional districts within the pre-elimination zone of Senegal. This support will include training of health workers on how to correctly administer primaquine, including providing information on how to manage potential adverse effects in patients.
Procurement of primaquine	Global Health Supply Chain-PSM	3,000	3,000	Pre-elimination districts	Procurement costs for primaquine for single low-dose treatment.

Therapeutic efficacy monitoring	NMCP	128,000	0	2 sites	Therapeutic efficacy studies in 4 sites (2 sites per year on a rotating basis)
Subtotal Diagnosis and Treatment		9,080,000	5,032,000		
Pharmaceutical Management					
Support supply chain management at the central level	Francophone Task Order (Chemonics)	400,000	0	Nationwide	Support for the NMCP to improve quantification through regular consumption data collection at the peripheral level.
Monitoring of antimalarial quality and advocacy	USP	180,000	0	Nationwide & in 6 sites	Sampling and testing antimalarials from 9 sites nationwide and technical assistance for accreditation and drug quality monitoring.
Cost of commodities management at the PNA (3% of commodities costs, not including nets)	Global Health Supply Chain-PSM	150,000	0	N/A	PMI funds will be used to cover delivery fees for all PMI-procured malaria commodities (with the exception of ITNs as these do not transit through the CMS). This is calculated at 3% of the commodity costs and is applied to all partners that procure commodities for Senegal.
Subtotal Pharmaceutical Management		730,000	0		

SUBTOTAL CASE MANAGEMENT		9,810,000	5,032,000		
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Support to the NMCP for program supervision	NMCP	200,000	0	Nationwide	Support visits by national staff to regional and district levels.
Support for malariology course	NMCP	100,000	0	Nationwide	Funding will be provided for a third year to support a malariology course that will be offered to health staff at various levels and allow for in-country training opportunities.
Bi-annual meetings between the NMCP, donors, and PMI implementing partners	NMCP	35,000	0	N/A	These proposed meetings will bring together NMCP staff, the Global Fund, Islamic Development Bank and representatives from the different regions, partners and implementing partners, to review planned activities and facilitate information sharing and ensure better coordination of malaria-related activities across the country.

Capacity building opportunities for NMCP staff	NMCP	30,000	0	N/A	Support participation in international technical scientific and professional meetings to provide NMCP staff (central and field level) with opportunities to learn best practices, share experiences, and develop networks. Potential meetings will include the American Society of Tropical Medicine and Hygiene and Pan-African Malaria Conference, 2-4 trips total.
Support for malaria activities implemented by Peace Corps Volunteers	U.S. Peace Corps	10,000	0	Communities where Peace Corps Volunteers are located	Support for specific malaria-related Peace Corps volunteer projects.
Support for malaria indicators in the performance-based financing model	HSS	100,000	0	Targeted districts	Continued support for the collection of malaria indicators under the performance-based financing model.
Strengthen community involvement (civil society, elected officials) in malaria control	GOLD	150,000	0	Nationwide	Support for the local government to include malaria and other health priorities in their local development plans and increase participation of communities in decision-making regarding health issues.

Technical assistance to ensure effective implementation of the FARA	GoTAP	100,000	0	Central level and 7 consolidation regions*	Preparation and monitoring of the G2G agreement between PMI and the NMCP (Fixed Amount Reimbursement Agreement, FARA). Technical support for management, monitoring, and reporting.
SUBTOTAL HSS & CAPACITY BUILDING		725,000	0		
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					
Social marketing and promotion of LLIN use	SHOPS+	75,000	0	Urban centers (Dakar, Thiès)	Social marketing of LLINs in the private sector, including packaging and transportation to wholesalers.
Development, implementation, and evaluation of social and behavior change communication	ISD-HB (Neema)	472,400	0	Nationwide	Overall support for the development, production, and dissemination of IEC/BCC materials, including support for the national IEC/BCC committee to ensure harmonization of messages among partners.
Community sensitization and mobilization for the 2019 seasonal malaria chemoprevention campaign	NMCP	100,000	0	Kédougou, Sédhiou, Kolda, Tambacounda	Promotion of SMC through radio spots, community meetings, and house-to-house visits in the four regions targeted for this intervention.
SUBTOTAL SBCC		647,400	0		
SURVEILLANCE, MONITORING, AND EVALUATION					

Malaria Indicator Survey 2020	TBD	250,000	0	Nationwide	Planned MIS in 2020. Planning and early design costs. Additional amount will be added in FY2019.
Health Facility Survey	TBD	50,000	0	Nationwide	This facility survey will focus on health posts nationally and assess the quality of care for fever cases.
Monitoring and evaluation course organized by the NMCP	NMCP	150,000	0	Nationwide	The implementation of a M&E course that includes surveillance and monitoring as these relate to malaria pre-elimination/elimination.
Technical assistance for M&E	CDC IAA	10,000	0	N/A	One technical assistance visit to Senegal from CDC to support SM&E efforts.
SUBTOTAL SM&E		460,000	0		
OPERATIONAL RESEARCH					
SUBTOTAL OR		0	0		
PRE-ELIMINATION					
Support for surveillance and epidemic response to malaria	NMCP	200,000	0	Pre-elimination districts	Strengthening notification, particularly using mobile communication.
Case investigations in districts with malaria incidence <5/1,000	NMCP	150,000	0	Pre-elimination districts	Support training for the investigation of index cases and neighboring households and weekly electronic data transmission with DHIS2 integration.
SUBTOTAL PRE-ELIMINATION		350,000	0		

IN-COUNTRY STAFFING AND ADMINISTRATION					
CDC	CDC IAA	574,000	0	N/A	Support the salaries and expenses for one CDC Resident Advisor.
USAID	USAID	928,000	0	N/A	Support the salaries and expenses for one USAID Resident Advisor and local staff.
SUBTOTAL IN-COUNTRY STAFFING		1,502,000	0		
GRAND TOTAL		20,000,000	10,792,000		

*Consolidation regions: Dakar, Fatick, Kaffrine, Kaolack, Louga, Thiès, Ziguinchor

**Concentration regions: Diourbel, Kédougou, Kolda, Matam, Saint Louis, Sédhiou, Tambacounda