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Senegal

Malaria Operational Plan FY 2022

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This FY 2022 Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with national malaria control programs and other partners. Funding available to support outlined plans relies on the final FY 2022 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

This document was prepared in the early months of 2021 as the COVID-19 pandemic continued to evolve worldwide, including in PMI-focus countries. The effects of the pandemic on malaria control and elimination work in 2022 are difficult to predict. However, because U.S. Congressional appropriations for PMI are specific to work against malaria and any appropriations for work against the COVID-19 are specific for that purpose and planned through separate future U.S. Government planning processes, this FY 2022 MOP will not specifically address the malaria-COVID-19 interface and will reassess any complementary work through timely reprogramming in countries.

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CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AI	Active ingredient
AL	Artemether-lumefantrine
ANC	Antenatal care
ANSD	*Agence Nationale de la Statistique et de la Démographie*
ASAQ	Artesunate-amodiaquine
BMGF	Bill & Melinda Gates Foundation
CBO	Community-based organizations
CCPLP	*Cadre de Concertation de Partenaires de Lutte Contre le Paludisme* (Malaria Partners Coordination Committee)
CDC	U.S. Centers for Disease Control and Prevention
cDHS	Continuous Demographic and Health Survey
CHW	Community health worker
CVACI	Integrated Community Monitoring and Alert Committees
CY	Calendar year
DHA-PQ	Dihydroartemisinin-piperaquine
DHIS2	District Health Information System
DHS	Demographic and Health Surveys
DOT	Directly observed therapy
DSDOM	*Dispensateur de soins à domicile* (village malaria worker)
DSISS	*Division du Système d'Information Sanitaire et Sociale*
EPI	Expanded program on immunization
FCFA	West African franc
FDA	Focal mass drug administration
FTAT	Focal test and treat
FY	Fiscal year
G2G	Government to government
GDP	Gross Domestic Product
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit*
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
HLC	Human landing catches
HMIS	Health Management Information System
HSS	Health system strengthening
IDB	Islamic Development Bank
IEC	Information, education, and communication
IPC	Interpersonal communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
KKT	Kedougou, Kolda, and Tambacounda regions, the highest-burden regions in Senegal
LMIS	Logistics Management Information System

LLIN	Long-lasting insecticidal net
MDA	Mass drug administration
MIP	Malaria in pregnancy
MBS	Malaria Behavior Survey
MIS	Malaria Indicator Survey
MOH	Ministry of Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
NSP	National Strategic Plan
OR	Operational research
PBO	Piperonyl butoxide
PE	Program evaluation
PECADOM	*Prise en charge à domicile* (home-based management of malaria)
PMI	U.S. President's Malaria Initiative
PNA	*Pharmacie National d'Approvisionnement*
PRA	*Pharmacie Regionale d'Approvisionnement*
PSC	Pyrethrum spray catches
RDT	Rapid diagnostic test
SBC	Social and behavior change
SBCC	Social and behavior change communication
SMC	Seasonal malaria chemoprevention
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
SPA	Service Provision Assessment
SPAQ	Sulfadoxine-pyrimethamine + amodiaquine
UCAD	*Université Cheikh Anta Diop*
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Senegal to end malaria. PMI has been a proud partner of Senegal since 2008, helping to decrease child death rates by 69 percent and increase insecticide treated net (ITN) ownership from 20 percent to 82 percent and the number of children under five years of age who reported sleeping under an ITN from 7 percent to 65 percent (DHS 2005 and cDHS 2019) through investments totaling almost $318.5 million.

The proposed PMI fiscal year (FY) 2022 budget for Senegal is $22.5 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Senegal using FY 2022 funds. Developed in consultation with the national malaria control program (NMCP) and key malaria stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the Government of Senegal as well as other donors and partners.

Malaria is endemic throughout Senegal and 100 percent of the population is at risk of the disease. The country can be divided into two epidemiological zones: the tropical zone in the south and southeast, with year-round transmission peaking during the rainy season and lower transmission during the rest of the year; and the Sahelian zone in the north, with higher transmission toward the end of the rainy season and very low transmission during the rest of the year. During a nine-year period (from 2008 to 2017), the national parasite prevalence decreased from 6 percent to less than 1 percent (Figure 2). There are three administrative regions in the south (Tambacounda, Kolda, and Kédougou) that have the highest malaria burden, with an estimated prevalence of 1 percent, 3 percent, and 7 percent, respectively (Figure 3). The incidence of malaria in Senegal in 2020 ranged from <1 per 1,000 in the northern districts to 607 per 1,000 in Saraya district in the southeast (Figure 4).

PMI will support investments in the following intervention areas with FY 2022 funds:

Vector Control

In CY 2020, PMI/Senegal supported:

- Entomological monitoring between June and December 2020 in 32 sites across 19 districts in five geographical regions using human landing catches (HLCs) and pyrethrum spray catches (PSCs)
- Insecticide susceptibility assessments in 13 districts using WHO tube tests and CDC bottle bioassays
- Community mosquito surveillance in six sentinel sites across four districts (Diourbel, Touba, Richard Toll, and Velingara)
- Indoor residual spraying in the four districts of Kedougou, Koumpentoum, Makacoulibantang, and Koungeul: 136,417 structures were sprayed (98 percent of structures found) and 571,649 people protected including 95,249 children under five years of age and 13,575 pregnant women
- The distribution of 822,750 ITNs through routine channels from January to December 2020
- Procurement of 1,232,345 piperonyl butoxide (PBO) ITNs for the 2022 mass distribution campaign to be distributed in the high-transmission regions of Kedougou, Kolda, and Tambacounda (KKT)
- The completion of an urban landscape analysis including larval habitat mapping and assessment of sleeping behaviors in Touba, Diourbel, and Kaolack

With FY 2022 funding, PMI/Senegal proposes to support:

- Continued support of entomological monitoring in 17 districts
- Withdrawal of IRS from the four targeted districts of Kedougou, Koumpentoum, Makacoulibantang, and Koungeul. There will be reinforced SBC activities in these districts with the withdrawal of indoor residual spraying (IRS) and introduction of new nets through routine distribution channels
- Expanding the introduction of PBO and dual active ingredient (AI) nets, targeting primarily the high-burden regions and surrounding districts

Case Management

In CY 2020, PMI/Senegal supported:

- 6,182 healthcare workers were trained on prevention and case management guidelines
- 50 medical officers were trained on a national malariology course, including malaria case management
- 491 health post chief nurses were trained on a local malariology course organized by Medical Region Staff in collaboration with NMCP
- 431 community health workers (CHWs) from health huts and 35 traditional healers were trained in malaria case management and referral guidelines
- All 2,226 DSDOMs and 699 community supervisors implementing *Prise en charge à domicile* (PECADOM+ [home-based management of malaria]) received training/refresher training on the active detection of malaria cases
- PECADOM+ was implemented in 35 districts with 1,937 *Dispensateurs de soins à domicile* (DSDOM [village malaria workers]) completing 48,712 of 49,208 (99 percent) targeted weekly sweeps, performing 151,192 rapid diagnostic tests (RDTs), diagnosing 55,527 cases of malaria (test positivity rate 36.7 percent), and referring 296 cases of severe malaria

With FY 2022 funding, PMI/Senegal proposes to support:

- Scale-up of PECADOM+ at community level in time (throughout the year) and space (more districts/regions) to better cover the malaria transmission period
- Expansion of DSDOMs to help reach the target of one DSDOM per village in the southeastern region of Senegal
- Improved engagement with the private sector to reduce case management gaps

Malaria in Pregnancy (MIP):

In CY 2020, PMI/Senegal supported:

- Implementation of intermittent preventive treatment for pregnant women (IPTp) at the health facility level and the pilot of community IPTp in five regions (Diourbel, Kolda, Kedougou, Sedhiou, and Tambacounda)
- Orientation of 431 providers in nine health districts on IPTp at the community level
- Training of 827 CHWs (Bajenu Gokh, DSDOM) on the importance of IPTp and malaria prevention and promoted the early antenatal care (ANC) attendance and uptake of sulfadoxine-pyrimethamine (SP) to prevent malaria in pregnancy

With FY 2022 funding, PMI/Senegal proposes to support:

- Training and supportive supervision for ANC providers
- SBC interventions focused on early and regular ANC to address missed opportunities to provide IPTp

Seasonal Malaria Chemoprevention (SMC):

In CY 2020, PMI/Senegal supported:

- The implementation of 2020 SMC campaigns in five medical regions and 16 districts from June to October
- 711,551children 3 to 120 months of age were treated with a coverage of 95 percent
- 13,292 CHWs were involved in the SMC campaign

With FY 2022 funding, PMI/Senegal proposes to support:

- Continue to support planning, coordination, and implementation of the 2023 campaign among children 3 to 120 months of age in 16 target districts as in previous years (target population of 918,588 children)
- Procurement of social and behavioral change (SBC) tools and implementation of communication activities
- Supervision of field activities
- Additional sweeps in priority districts based on updated analysis of the epidemiological profile: there will be five rounds in the Kedougou region, four rounds in the Kolda region and in up to three selected districts in Tambacounda region (which includes Dianke Makha district), and three rounds in selected districts of Diourbel, Kaolack, and the remaining districts in Tambacounda region, with increased communication activities to support SMC implementation

Supply Chain:

In CY 2020, PMI/Senegal supported:

- The improvement of warehouse operations at three regional warehouses (Diourbel, Fatick, and Saint-Louis); completion of renovations has increased the overall storage capacity of these warehouses from 402 to 757 pallets
- Improved coordination among the different actors in the supply chain by helping to organize supply committees with the Direction of Pharmacy and Medicines (DPM [*Direction de la Pharmacie et du Médicament*]), the Central Medical Stores (*Pharmacie National d'Approvisionnement [PNA]*), the NMCP, and private wholesalers
- The rollout of the ERPX3 logistics management information system to district depots, including the purchase of 77 computers and software licenses
- The NMCP staff to conduct the quantification and malaria commodity forecast for the 2021–2025 strategic plan, as well as assisting with supply planning; support was also provided for the quarterly data analysis process with the PNA

With FY 2022 funding, PMI/Senegal proposes to support:

- Improving visibility and use of logistics data including regular quantification and supply chain exercises, collection of consumption data at the district and health facility levels, and reinforcing malaria commodity distribution through the national system

Surveillance, Monitoring, and Evaluation (SM&E):

In CY 2020, PMI/Senegal supported:

- Technical, planning, and data analysis assistance to a subnational Malaria Indicator Survey (MIS) in 2020, sampled to provide district-level coverage estimates in KKT
- Case investigations and training of health staff in investigated procedures in pre-elimination zones with annual incidence <5/1,000

- Weekly reporting from sentinel sites and routine Health Management Information System (HMIS) data collection with the production of the annual bulletin
- Weekly reporting from sentinel sites and dissemination of progress reports
- DHIS2 implementation with a specific emphasis on data quality
- Implementation of the health information system readiness assessment to assess if systems are ready for elimination activities and identify areas of need and priorities

With FY 2022 funding, PMI/Senegal proposes to support:

- Increased strengthening activities at regional, district, facility, and community levels to improve data quality and use
- Supervision and training at the regional and district levels, focused in higher-burden regions
- Elimination of surveillance activities in expanded districts because financial support from the Islamic Development Bank will be ending, and their funding has supported surveillance activities in these districts

Program Evaluation & Operational Research (PE & OR):

In CY 2020, PMI/Senegal supported:

- The planning and implementation of the OR study on mass drug administration (MDA) with dihydroartemisinin-piperaquine (DHA-PQ) and primaquine

With FY 2022 funding, PMI/Senegal proposes to support:

- No new OR topics are being proposed
- One program evaluation activity is proposed to evaluate the training courses in malariology and malaria SM&E that have been supported by PMI

Social Behavior Change (SBC):

In CY 2020, PMI/Senegal supported:

- Broadcasting of 86 TV spots and 258 radio spots at the central level for social support for the use of long-lasting insecticidal nets and early access to care
- Broadcasting of 3,164 radio public service announcements in the seven regions on bed net use, IPTp, and early care-seeking; additionally, 870 messages were inserted in the largest broadcasts
- Training of 524 mutuelle members and 2,114 Integrated Community Monitoring and Alert Committees (CVACI) members, more than 70 percent of whom were women
- 332 action plans of CVACIs, mainly focusing on social and behavior change communication (SBCC)
- SBC activities for 2020 IRS campaign in the four spray districts including organizing awareness caravans in each district, conducting advocacy sessions with opinion leaders, contracting community radio to broadcast a package of activities (over 600 spots, 15 interactive radio broadcasts and 30 interviews), and organizing over 200 radio talks

With FY 2022 funding, PMI/Senegal proposes to support:

- Various SBC channels including broadcasting, 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, and skits, banners and T-shirts with messages, etc.)

Health Systems Strengthening (HSS) general/other:

In CY 2020, PMI/Senegal supported:

- Technical assistance to NMCP for the implementation of government to government (G2G) activities. This assistance was also extended to the three G2G regions (Kaffrine, Kaolack, and Ziguinchor) and four concentration regions (Diourbel, Tambacounda, Kédougou, and Kolda). Key elements of the support included verification of milestones by regional committees and a focus on the quality and use of health system and logistics data
- Local governments to include malaria and other health priorities in their development plans and increase participation of communities in decision-making regarding health issues. This included participatory budgeting, training of local elected officials of the Health Technical Commissions, and promoting synergy and multisectoriality of interventions by actors in the fight against malaria at the institutional and territorial levels
- Five departmental training workshops were held in the Kolda and Sedhiou regions on the role of women's associations and elected women in improving the provision of malaria control services; 120 women, 50 percent of whom were local elected officials, were trained to strengthen their roles in the fight against malaria

With FY 2022 funding, PMI/Senegal proposes to support:

- Quarterly malaria partners coordination meetings to review planned activities, facilitate information sharing, and ensure better coordination of malaria-related activities across the country
- The successful malariology course to increase the cadre of trained staff at the district level capable of leading program implementation of malaria control and elimination activities
- Technical assistance for the management of Fixed Amount Reimbursement Agreement under the G2G mechanism to support the preparation and monitoring of the G2G agreement between PMI and the NMCP
- Peace Corps Small Project Assistance grants. Specific projects that require funding will be submitted to the Small Project Assistance committee for approval. Projects that have been funded in the past include net care and repair activities, piloting the active detection of fever cases, training women's groups/community care groups, and organizing malaria fairs

I. INTRODUCTION

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Senegal to end malaria. PMI has been a proud partner of Senegal since 2008, helping to decrease child death rates by 69 percent and increase insecticide treated net (ITN) ownership from 20 percent to 82 percent and the number of children under five years of age who reported sleeping under an ITN from 7 percent to 65 percent (DHS 2005 and cDHS 2019) through investments totaling almost $318.5 million.

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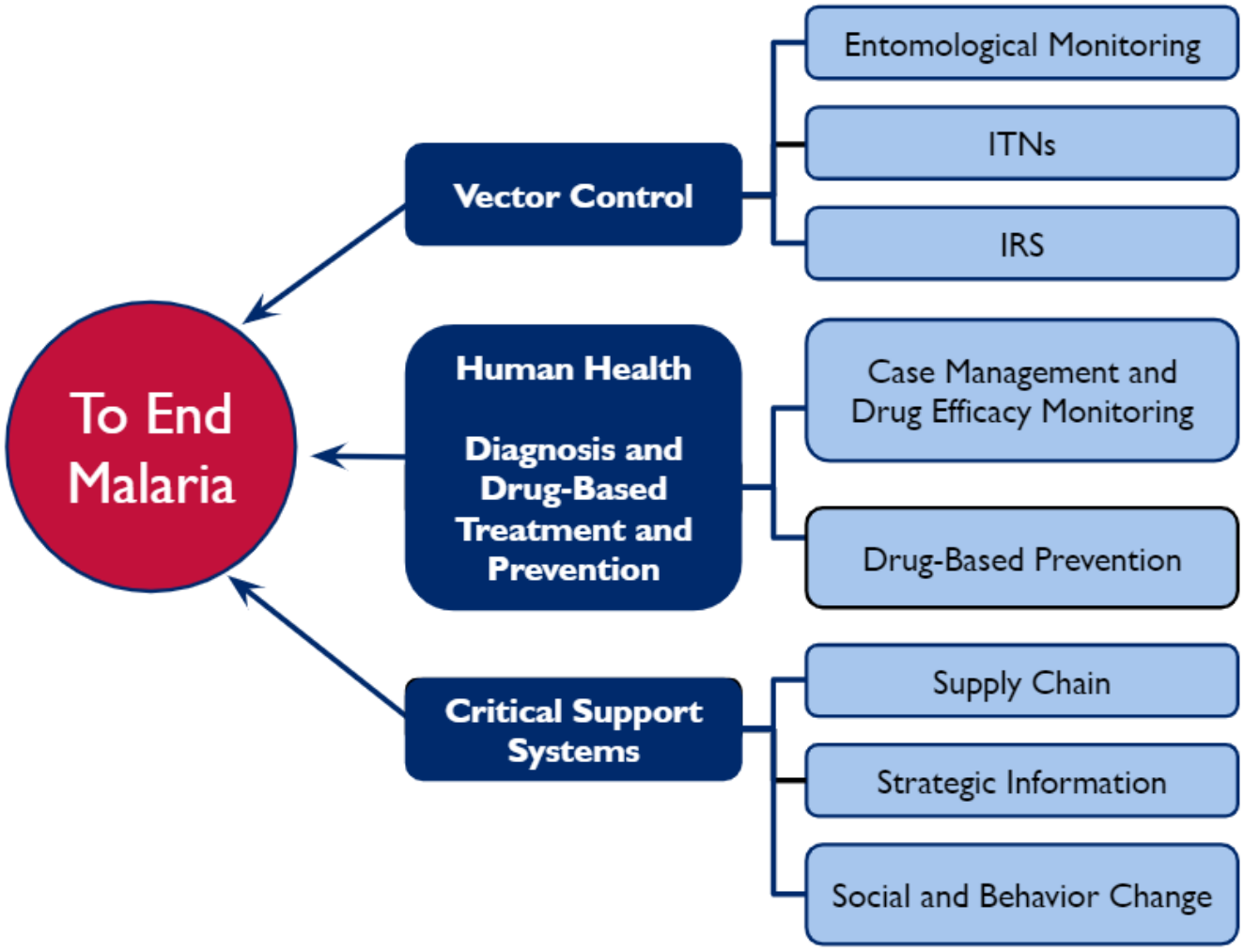
Senegal at a Glance

- **Geography:** The Republic of Senegal is a country in West Africa, located just above the equator. Senegal is bordered on the north by Mauritania, Mali to the east, Guinea to the southeast, Guinea-Bissau to the southwest, and the Atlantic Ocean to the west. The Gambia also occupies a narrow piece of land, along the banks of the Gambia River, which separates the southern region of Senegal from the rest of the country. Rolling, sandy plains constitute the majority of the country, apart from the Fouta Djallon foothills in the southeast and Bambouk Mountains on the Mali border. On the coast between Dakar and Saint-Louis in the north, there is a strip of shifting dunes. The northern part of the country is a hot, dry Sahelian plain with little vegetation. South of Dakar, there are shallow estuaries along the coastline, fringed with palm trees.
- **Climate and Malaria Transmission Seasonality:** Senegal has a warm and tropical climate with temperatures ranging from warm to extremely hot throughout the year. The coolest temperatures are on the coast with the hottest temperatures in the east on the Malian border. The dry season runs from December through April. The rainy season can run from May through November
- **Population in 2020:** 16,705,588 (National Statistics and Demographic Agency – ANSD)
- **Population at Risk of Malaria:** 100% (Malaria Atlas Project)
- **Principal Malaria Parasites:** *Plasmodium falciparum* (University of Cheikh Anta Diop – UCAD)
- **Principal Malaria Vectors:** *Anopheles gambiae senu strictu* and *An. coluzzii* predominate in the humid zones of the south, and *An. arabiensis* predominantly in the dry seven zones of the north and central regions. Other vectors include *An. melus, An. funestus, An. nili, An. pharoensis* (UCAD)
- **Malaria Case Incidence per 1,000 Population (2020):** 26.7 (Senegal Annual Malaria Epidemiology Bulletin)
- **Under-Five Mortality Rate:** 37 deaths per 1,000 live births (Senegal, cDHS 2019)
- **World Bank Income Classification and GDP (2019):** Senegal is a lower-middle income country with a GDP per capita of $1,447 (https://data.worldbank.org/indicator/ny.gdp.pcap.cd)
- **Government Health Budget:**348,572,267$ in 2020 and 393,783,080 $ in 2021

- **Trafficking in Persons Designations, 2017–2020:** Tier 2 (https://2017-2021.state.gov/reports/2020-trafficking-in-persons-report/index.html)
- **Malaria Funding and Program Support Partners Include:**
  - U.S. President's Malaria Initiative (PMI)
  - Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund)
  - World Health Organization (WHO)
  - Islamic Development Bank (IDB)
  - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- **PMI Support of National Malaria Control Strategy:** PMI-funded interventions are in line with Senegal's national malaria control strategy and build on investments made by PMI and other partners (mainly The Global Fund and the IDB) to improve and expand malaria-related services in Senegal. PMI adopts a two-pronged approach in Senegal, with procurement of commodities for nationwide coverage and a tailored approach that is responsive to region- or district-specific epidemiologic profiles and programmatic needs. (See III. Overview of PMI's support of Senegal's Malaria Control Strategy for additional details.)
- **PMI Investments:** Senegal began implementation as a PMI focus country in FY 2007. The proposed FY 2022 PMI budget for Senegal is $22.5 million; this brings the total PMI investment to nearly $341 million.

PMI organizes its investments around the activities below, in line with the Senegal national malaria strategy [2021–2025].

Figure 1. PMI's approach to end malaria[1]



Building and strengthening the capacity of Senegal's people and institutions—from the central level to communities—to effectively lead and implement evidence-based malaria control and elimination activities is paramount to PMI. The majority of PMI's planned support for FY 2022, across the areas of vector control, case management, and health systems such as supply chain and health information systems, contains elements of capacity-building and system strengthening. PMI/Senegal will continue to rely on and engage with local partners such as the University Cheikh Anta Diop (UCAD), the University of Thies, the Research for Development Institute, and the Institut Pasteur Dakar, and is expanding its local partner base to reach the private health sector (both for profit and non-for-profit) as well as local communities by supporting more effective engagement of their local authorities. Finally, PMI/Senegal will rely on private sector partnerships spearheaded by Speak Up Africa and

[1]A number of actions are cross-cutting in nature. For example, social and behavioral change (SBC) is embedded in all vector control and human health work; program evaluation (PE) and operational research (OR) are relevant in all of the fieldwork; finance and management support and the introduction of new tools/interventions are critical for all programs; and elimination requires work across the full spectrum of transmission.

the Ecobank to mobilize local business leaders and to promote the leveraging of domestic resources for sustainable funding for malaria control and elimination.

The activities proposed in this MOP are tailored to draw on these strengths and address weaknesses; activities will be monitored to evaluate the effectiveness of capacity-building efforts. In addition, while PMI understands it will take time for Senegal to fully finance its development priorities, PMI will work with other partners (e.g., the Global Fund) to jointly track Senegal's funding commitments across the malaria portfolio.

II. MALARIA SITUATION AND PROGRESS

Malaria is endemic throughout Senegal and 100 percent of the population is at risk of the disease. The country can be divided into two epidemiological zones: the tropical zone in the south and southeast, with year-round transmission peaking during the rainy season and lower transmission during the rest of the year, and the Sahelian zone in the north, with higher transmission toward the end of the rainy season and very low transmission during the rest of the year. During a nine-year period, the national parasite prevalence decreased from 6 percent in 2008 to less than 1 percent in 2017 (Figure 2). There are three administrative regions in the south (Kolda, Kédougou, and Tambacounda [KKT]) that have the highest malaria burden, with an estimated prevalence of 1 percent, 3 percent, and 7 percent, respectively (Figure 3). The incidence of malaria in Senegal in 2020 ranged from <1 per 1,000 in the northern districts to 607 per 1,000 in Saraya district in the southeast (Figure 4).

Figure 2. Trends in malaria prevalence

Children 6 to 59 months of age who tested positive for malaria by microscopy or RDT 2008–2017

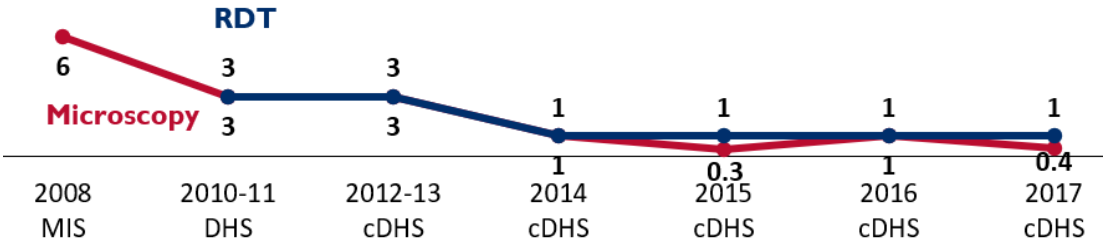


Figure 3. Malaria prevalence by geographic area

Children 6 to 59 months of age who tested positive for malaria by microscopy [2017 cDHS]

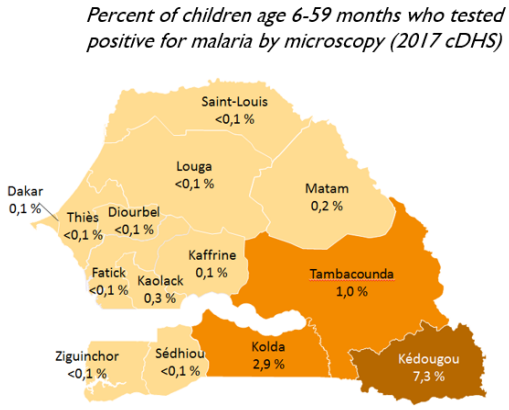


Figure 4. Malaria incidence by geographic area – health districts (2019 and 2020)

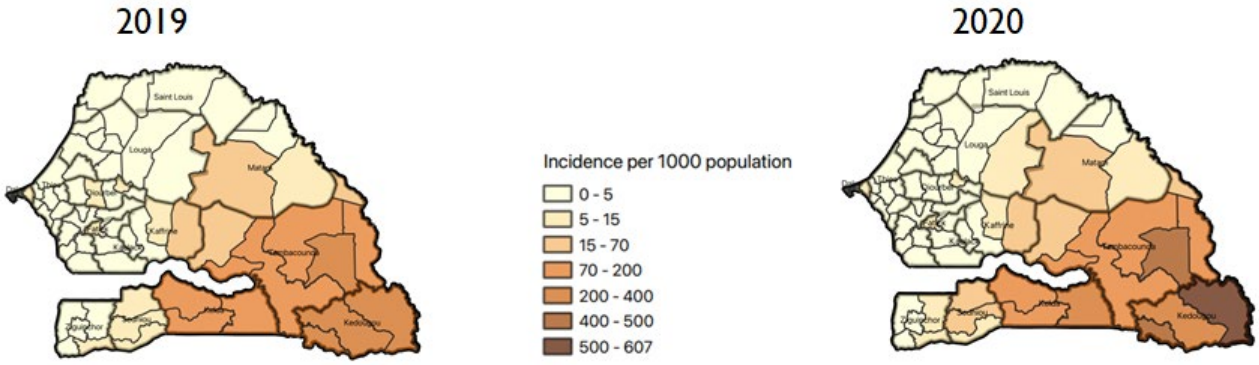


Table 1. Key indicators from Demographic Health Surveys (DHS) and Malaria Indicator Surveys (MIS)

Indicator	2005 DHS	2010 DHS	2014 cDHS	2017 cDHS	2019 cDHS
% Households with at least one ITN	20	63	74	85	82
% Households with at least one ITN for every two people	3	17	36	50	57
% Population with access to an ITN	10	38	58	73	74
% Population that slept under an ITN the previous night	6	29	40	57	63
% Children under five years of age who slept under an ITN the previous night	7	35	43	61	65
% Pregnant women who slept under an ITN the previous night	9	37	38	62	68
% Children under five years of age with a fever in the last two weeks for whom advice or treatment was sought	40	49	54	51	50
% Children under five years of age with a fever in the last two weeks who had a finger or heel stick	n/a	10	7	16	16
% Children receiving an artemisinin-based combination therapy (ACT) among children under five years of age with a fever in the last two weeks who received any antimalarial drug	n/a	41	11	66	n/a
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	12	39	40	63	63
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	n/a	13	3	22	20
<5 mortality rate per 1,000 live births	121	72	54	56	37
% Children under five years of age with parasitemia by microscopy	n/a	3	1	0.4	n/a
% Children under five years of age with parasitemia by RDT	n/a	3	1	1	n/a
% Children under five years of age with severe anemia (Hb<8gm/dl)	20	14	5	8	n/a

Table 2. Evolution of key malaria indicators reported through routine surveillance systems

Indicator	2016	2017	2018	2019	2020
# Suspect malaria cases[1]	1,559,054	2,035,693	2,096,124	2,010,398	2,206,842
# Patients receiving diagnostic test for malaria[2]	1,552,322	2,033,022	2,090,323	2,005,860	2,199,171
Total # malaria cases[3]	356,145	398,377	536,745	359,246	452,984
# Confirmed cases[4]	*349,540*	*395,706*	*530,944*	*354,708*	*445,313*
# Presumed cases[5]	*6,605*	*2,671*	*5,801*	*4,538*	*7,671*
% Malaria cases confirmed[6]	98%	99%	99%	99%	98%
Test positivity rate (TPR)[7]	23	19	25	18	20
Total # <5 malaria cases[8]	52,759	53,547	90,098	37,941	47,035
% Cases in children under five years of age[9]	15%	13%	17%	11%	10%
Total # severe cases[10]	9,912	10,463	13,350	9,352	9,179
Total # malaria deaths[11]	325	284	555	260	373
# Facilities reporting[12]	1498	1535	1591	1645	1945
% Data completeness[13]	99%	100%	98%	99%	96%

1 Number of patients presenting with signs or symptoms possibly due to malaria (e.g., fever). 2 RDT or microscopy, all ages, outpatient and inpatient. 3 Total reported malaria cases; all ages, outpatient and inpatient, confirmed and unconfirmed cases. 4 Diagnostically confirmed; all ages, outpatient and inpatient. 5 Clinical/presumed/unconfirmed; all ages, outpatient and inpatient. 6 # confirmed cases divided by total # cases. 7 Confirmed cases divided by # patients receiving a diagnostic test for malaria (RDT or microscopy). 8 Outpatient and inpatient, confirmed and unconfirmed. 9 Total # <5 cases divided by total # of cases. 10 Severe malaria; Total # hospitalized for malaria. 11 All ages, outpatient, inpatient, confirmed, and unconfirmed. 12 Total # of health facilities reporting data into the HMIS/DHIS2 system that year. 13 # monthly reports from health facilities divided by # health facility reports expected.

III. OVERVIEW OF PMI'S SUPPORT OF SENEGAL'S MALARIA STRATEGY

The Senegal National Strategic Plan (NSP) was updated and covers the years 2021–2025. The stated vision is for a Senegal without malaria to support sustainable development by ensuring universal access to the most effective and affordable malaria prevention and treatment interventions to the entire Senegalese population. The NSP objectives were set relative to 2019 levels, to reduce malaria incidence by at least 75 percent, reduce malaria mortality by at least 75 percent, and interrupt local transmission in at least 80 percent of eligible districts as identified in 2019.

As stated in the country's NSP 2021–2025, Senegal's goal is to reach elimination by 2030. There is one general objective related to elimination in the updated NSP 2021–2025, as stated above. With this objective in mind, several specific objectives related to elimination have been included in the NSP 2021–2025 and are listed below:

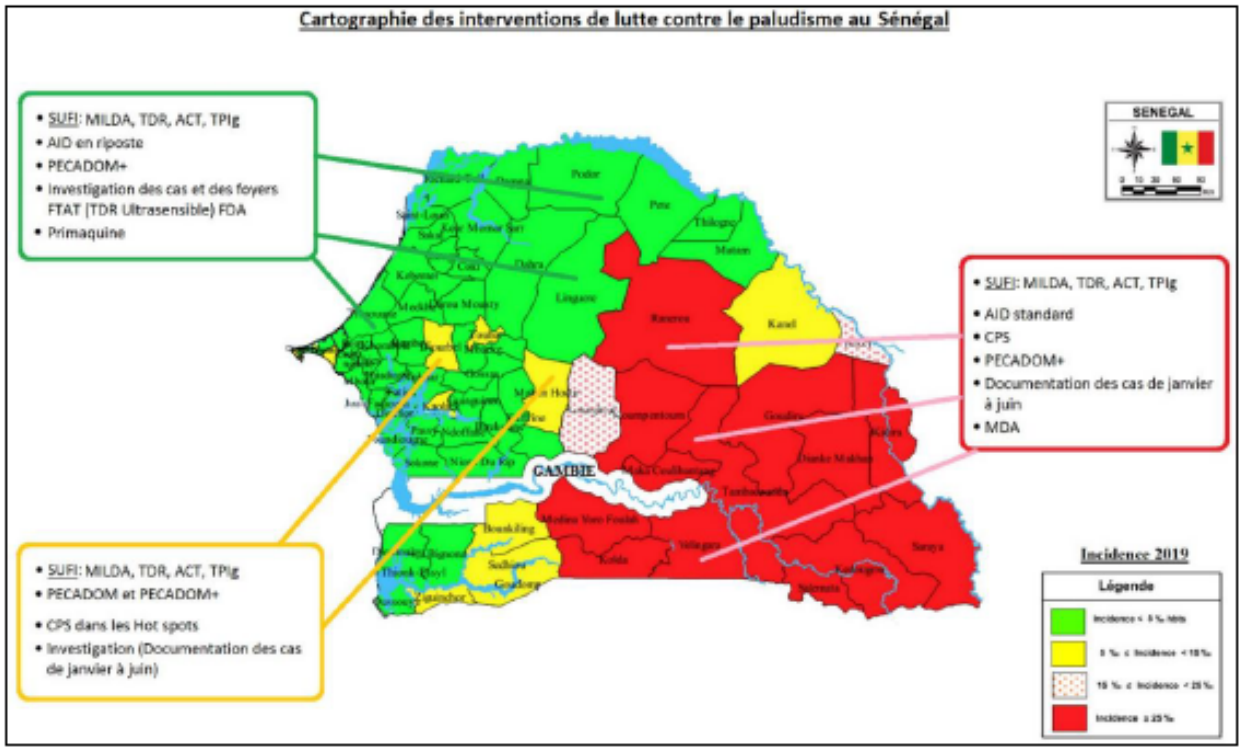
- Introduce molecular biology in the investigations of all districts in pre-elimination zones
- Ensure MDA coverage of 95 percent of the target population in the areas concerned
- Have at least 80 percent of embassy, airport, hotel, and port officials share aspects of traveler malaria chemoprophylaxis according to NMCP guidelines

- Detect, within one week, 100 percent of epidemics and emergencies with an early warning system
- Control 100 percent of epidemics and emergencies within one week of detection

The NSP focuses on improving malaria control in higher-burden zones and initiating malaria elimination efforts in the very low-burden zones of the country. In line with the national strategy, USAID/Senegal is implementing a suite of new mechanisms referred to as the USAID/Senegal Health Program (2021–2026). With the improvement of maternal and child health indicators in many regions, USAID decided to concentrate its investments in high-burden regions to significantly impact the key drivers of mortality. In low-burden regions, USAID is supporting targeted investments leveraging Government of Senegal resources and systems.

As a result, PMI has adopted a two-pronged approach in Senegal. More than half of PMI funding in Senegal supports a comprehensive package of malaria prevention and treatment activities targeting the high-incidence south-eastern regions of KKT, which includes the following: active case management (PECADOM+) in 35 districts; SMC campaigns during the high- transmission season; and cross-cutting interventions such as health systems strengthening, capacity-building, SM&E, and SBC focused in those three regions. PMI funding is also used to support some elimination related activities in three northern regions (Saint-Louis, Matam, and Louga). The remaining PMI budget covers the procurement of commodities (ITNs, sulfadoxine-pyrimethamine + amodiaquine [SPAQ] for SMC, RDTs, ACTs, rectal artesunate, injectable artesunate) for nationwide coverage and support for SM&E and health system strengthening activities at the central level. See Figure 5 for details indicating the classification of regions as defined by the NMCP.

Figure 5. Senegal NMCP supported malaria interventions across transmission zones, in 2019

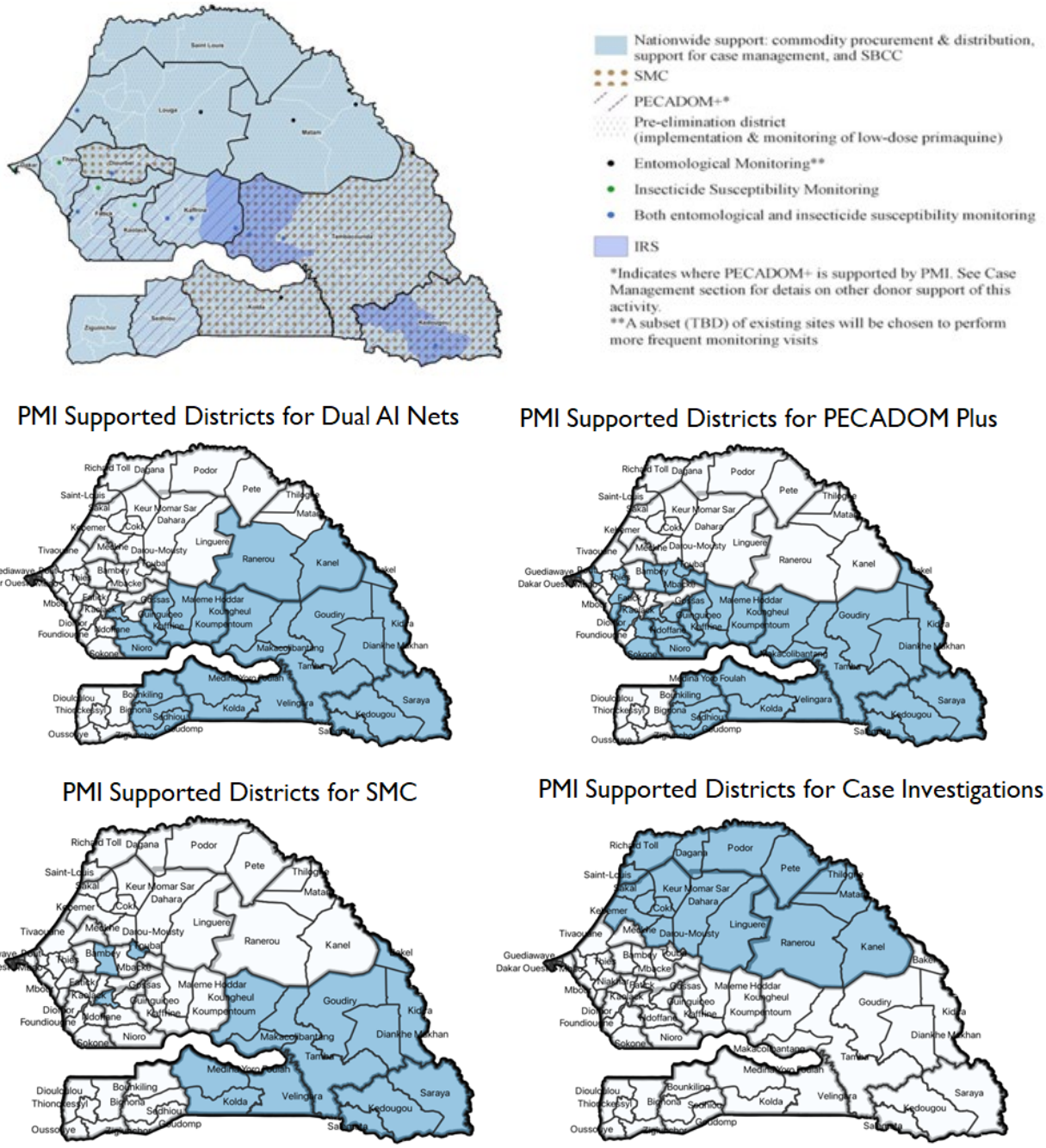


Green region activities: ITNs, RDTs, ACTs, IPTp, IRS, PECADOM+, Case investigations, Primaquine

Yellow region activities: ITNs, RDT, ACTs, IPTp, PECADOM and PECADOM+, SMC in hot spots, Case investigations

Red region activities: ITNs, RDTs, ACTs, IPTp, IRS, SMC, PECADOM+, Case reporting, MDA

Figure 6. PMI intervention support maps



IV. PARTNER FUNDING LANDSCAPE

PMI emphasizes the importance of partner alignment for malaria control, recognizing that different partners bring complementary expertise and resources. In recent years, PMI, the Global Fund, and the Bill & Melinda Gates Foundation (BMGF) have harmonized financial, supply chain, and programmatic data. In particular, PMI and the Global Fund agreed to a harmonized financial taxonomy to aid comparison of our investments to better identify potential overlap or gaps.

Due to the U.S. Government fiscal year budget cycle and approximate timing of annual appropriations, PMI MOP resources fund activities that largely occur during the following fiscal year (FY). For example, this FY 2022 MOP is anticipated to largely fund implementation of activities starting in 2023. Global Fund resources are based on the calendar year (CY) and planned for a three-year grant cycle. Most partner country governments and other partners also budget based on the calendar year.

The tables below summarize contributions by key external partners and partner country governments in CY 2020–2022, providing insight into total country investments. Because new grants funded through the Global Fund 2021–2023 grant cycle are just beginning, or will begin later in 2021, Global Fund country investments may still evolve in some countries. The partner country government invests substantial funding into the national-to-local infrastructure and service delivery that benefits malaria programs and many others. However, it is not always possible to attribute funding for malaria specifically from the partner country government without a standardized method. There may be similar challenges for attributing other partner funds.

Table 3a. Annual budget by Level 1 category for FY 2019/CY 2020

Funder	Vector Control	Case Manage-ment	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$9.2M	$3.6M	$5.2M	$0.8M	$1.1M	$4.2M	$24.0M
Global Fund	$4.0M	$1.2M	$1.3M	$0.0M	$1.4M	$2.7M	$10.7M
Gov[4]							$0.0M
IDB		$2.5M				$1.5M	$4.0M
BMGF					$3.3M	$8.0M	$11.3M
University of California, San Francisco					$0.9M		$0.9M
GIZ							0.29
Total Per Category	$13.2M	$7.3M	$6.5M	$0.8M	$6.7M	$16.4M	$51.19M

Table 3b. Annual budget by Level 1 category for FY 2020/CY 2021

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$8.9M	$4.1M	$3.8M	$0.8M	$1.2M	$3.6M	$22.5M
Global Fund							$0.0M
Gov							$0.0M
IDB							$18.7M
GIZ							$0.6M
Total Per Category	$8.9M	$4.1M	$3.8M	$0.8M	$1.2M	$3.6M	$41.6M

Table 3c. Annual budget by Level 1 category for FY 2021/CY 2022

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$6.7M	$6.0M	$4.0M	$0.7M	$1.7M	$3.4M	$22.5M
Global Fund							$0.0M
Gov							$0.0M
Total Per Category	$6.7M	$6.0M	$4.0M	$0.7M	$1.7M	$3.4M	$22.5M

1. Drug-based prevention, including SMC and MIP where applicable. 2. Covers management of in-country warehousing and distribution of malaria commodities, except for ITNs which are separately captured under Vector Control. 3. HSS = health systems strengthening.

Table 3d. Annual budget, breakdown by commodity, FY 2019/CY 2020

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$4.0M	$0.9M	$3.3M	$0.2M	$0.8M	$0.4M	$1.6M		$11.3M
Global Fund[3]								$1.3M	$1.3M
Gov									$0.0M
Total	$4.0M	$0.9M	$3.3M	$0.2M	$0.8M	$0.4M	$1.6M	$1.3M	$12.6M

Table 3e. Annual budget, breakdown by commodity, FY 2020/CY 2021

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$2.0M	$2.5M	$2.8M	$0.5M	$0.9M	$0.1M	$1.5M		$10.4M
Global Fund[3]									$0.0M
Gov									$0.0M
Total	$2.0M	$2.5M	$2.8M	$0.5M	$0.9M	$0.1M	$1.5M	$0	$10.4M

Table 3f. Annual budget, breakdown by commodity, FY 2021/CY 2022

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$1.1M		$4.3M	$0.5M	$1.9M	$0.3M	$1.6M		$9.6M
Global Fund[3]									$0.0M
Gov									$0.0M
Total	$1.1M	$0.0M	$4.3M	$0.5M	$1.9M	$0.3M	$1.6M	$0	$9.6M

Note: Categories reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative but may continue to evolve. 1. IRS insecticide: for PMI, commodity costs may be inextricable from IRS implementation costs in historical data – field identified as ND where this is the case. 2. PMI commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs. 3. Global Fund commodity costs in the table above only include ex-works commodity value; additional costs, including quality control, freight, insurance, and customs are not included.

V. ACTIVITIES TO BE SUPPORTED WITH FY 2022 FUNDING

The FY 2022 budget tables contain a full list of activities that PMI proposes to support in Senegal with FY 2022 funding. Please visit www.pmi.gov/resource-library/mops for these FY 2022 budget tables. Key data used for decision-making for this MOP planned investments is provided in Annex A of this document.

ANNEX A: INTERVENTION-SPECIFIC DATA

This section outlines key data that helped inform decision-making around FY 2022 MOP funding allocations to PMI-supported activities.

1. VECTOR CONTROL

NMCP Objective

Senegal's 2021–2025 Strategic Plan includes a vector control plan with four strategic objectives:

- Update the key vector control documents that govern vector control by the end of 2021: These include the Vector Control Plan, the entomological profile of the country and the vector resistance management plan
- Increase the percentage of the population sleeping under a long-lasting insecticidal nets to at least 80 percent by increasing the coverage and the availability use of ITNs
- Protect at least 90 percent of the population in zones targeted for IRS
- Treat at least 95 percent of productive larval sites in selected zones

The country's national policy for ITNs is universal coverage. IRS is implemented only in targeted districts.

NMCP Approach

The Senegal vector control approach is based on three main interventions: (a) increased availability and use of ITNs nationwide, (b) a targeted indoor residual spraying, and (c) larval control in targeted areas.

To accelerate universal coverage with ITNs, a mass distribution campaign will be organized in 2022 over a period of four months. The universal coverage mass distribution campaign is defined as 1.8 nets for every two people. ITNs are provided free of charge to the general population during mass distribution campaigns.

The NMCP envisions synchronizing mass distribution campaigns in 2022 and 2025 with neighboring countries of Gambia, Guinea-Bissau, Mali, and Mauritania. To maintain high coverage between mass distribution campaigns, the country will continue routine distribution through ANC and the expanded program on immunization (EPI). In addition, the methodology guide proposes the improvement of other routine channels such as school, community, and social marketing. ITNs are provided free of charge to pregnant women during their first ANC visit and children during EPI visits. ITNs are also offered at a subsidized price of 500 FCFA (approximately $0.90) to clients visiting health facilities for any reason and at the community level through health huts and community-based organizations. Socially marketed nets are sold for 1,000 FCFA (approximately $1.80) in pharmacies in Dakar and eight other urban centers across the country.

For the promotion of ITN use, the NMCP will develop and implement an annual communication plan from central to operational levels. The messages, targets, and channels will be identified during the development of the national communication plan, which will be developed after an assessment, to provide the main orientations for malaria SBC for all the interventions.

Given the high levels and widespread insecticide resistance to standard pyrethroid ITNs, NMCP will start the deployment of PBO and/or dual AI ITNs in 2021 with the ambition of maintaining coverage via annual routine distribution.

The NMCP has adopted a targeted approach for IRS: (a) districts with a yearly incidence between 15 and 30 per 1,000 may have targeted IRS, and (b) districts with an incidence greater than 30 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.

For the larval control intervention, the NMCP will organize a workshop to share information on the assessment of larval habitats in peri-urban Dakar, Diourbel, Touba, and Kaolack regions. An advocacy document will then be developed involving key stakeholders and national expert entities to mobilize resources for the intervention because currently there are no donors supporting larval source management. A plan for larval control will be developed and larval habitats will be geo-identified, treated, and/or destroyed.

PMI Objective in Support of NMCP

PMI continues to support entomological monitoring including bionomics and insecticide resistance monitoring. PMI has long supported and will continue to support mass campaigns and the following routine distribution channels: antenatal care, health facilities, and community-based organizations. PMI has supported school-based distribution in the past and this resumed in 2020 to maintain high levels of coverage following the 2019 national mass campaign. PMI currently supports social marketing of ITNs in the private sector, but this activity will end in 2021. Given the widespread and high level of resistance to pyrethroids, PMI is shifting progressively from standard pyrethroid ITNs to next-generation nets, starting in the KKT regions and surrounding health districts. PMI resumed IRS in 2020 after suspension of the IRS in 2019, and committed to support the intervention for at least three calendar years (2020–2022) targeting four health districts. PMI does not support larval control interventions in Senegal.

PMI-Supported Recent Progress (CY 2020 implementation)

- PMI supported the training of 31 entomologists in field entomological collection, molecular laboratory methods, and insectary maintenance methods
- Entomological monitoring was conducted between June and December 2020 in 32 sites across 19 districts in five geographical regions using human landing catches (HLCs), light traps, outdoor resting collections and pyrethrum spray catches (PSCs)
- Insecticide susceptibility assessments were conducted in 13 districts using WHO tube tests and CDC bottle bioassays
- Urban landscape analysis including larval habitat mapping and assessment of sleeping behaviors in Touba, Diourbel, and Kaolack was completed
- PMI supported the indoor residual spraying in the four districts of Kedougou, Koumpentoum, Makacoulibantang, and Koungeul; 136,417 structures were sprayed (98 percent of structures found) and 571,649 people protected including 95,249 children under five years of age and 13,575 pregnant women
- PMI supported the distribution of 822,750 ITNs through routine channels from January to December 2020

PMI-Supported Planned Activities (CY 2021–2022 implementation)

- Conduct insecticide resistance monitoring in 32 sites

- Conduct vector bionomics monitoring monthly in 32 sites across 19 districts using HLC, PSC, CDC light traps, and outdoor resting collections
- Monitor larval sites for *An. stephensi* in Dakar
- Pilot community mosquito surveillance in six sentinel sites across four districts (Diourbel, Touba, Richard Toll, and Velingara)
- Procure 1,232,345 PBOs for the 2022 mass distribution campaign to be distributed in the high-transmission KKT regions. PMI will also procure 300,000 dual AI nets for the continuous distribution channels (ANC and EPI) in the high-transmission KKT regions in 2022. In addition PMI will continue the distribution of approximately 1,000,000 standard ITNs already in the country as part of 2021 routine distribution
- Distribute about 121,100 standard ITNs via community based organizations in 2021
- Conduct IRS in four districts in June 2021
- Conduct community mobilization activities in conjunction with IRS or ITN campaign

1.1. ENTOMOLOGICAL MONITORING

Key Goal

Determine the geographic distribution, bionomics, and insecticide resistance profiles of the main malaria vectors in the country to inform vector control decision-making.

Key Question 1

Where is entomological monitoring taking place, what types of activities are occurring, and what is the source of funding?

Supporting Data

Figure A-1. Entomological monitoring sites in Senegal in 2020

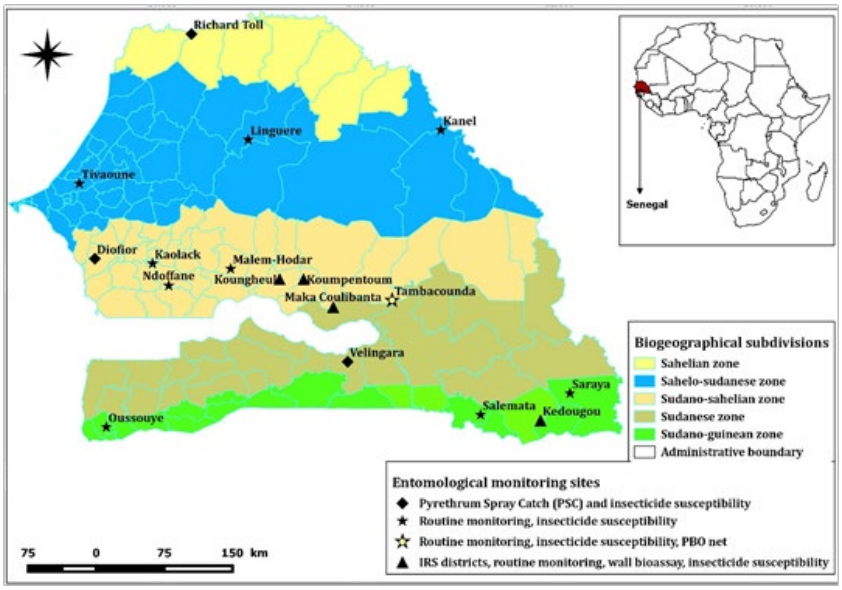


Table A-1. Entomological monitoring activities in 2020

Biogeographical Zones	Sentinel Districts	Sentinel Sites	Activities	Supported by
Sahelian	Richard-Toll	Mbagame, Gankette Balla	PSCs, IR	PMI
Sahelo-Sudanese	Kanel	Haouré, Dembankané	HLCs, PSCs, IR	PMI
Sahelo-Sudanese	Linguere	Barkedji, Ouarkhokh	HLCs, PSCs, IR	PMI
Sahelo-Sudanese	Tivaouane	Diambalo, Ngadiaga	HLCs, PSCs, IR	PMI
Sudano-Sahelian	Diofior	Palmarin FACAO, Simal	PSCs, IR	PMI
Sudano-Sahelian	Koungheul	Ida Mouride, Pakala	WB, HLCs, PSCs, IR	PMI
Sudano-Sahelian	Malem Hodar	Maka Belal, Ndiote Mor Coumba	HLCs, PSCs, IR	PMI
Sudano-Sahelian	Kaolack	Ndorong	HLCs, PSCs, IR	PMI
Sudano-Sahelian	Ndoffane	Tawa Mboudaye	HLCs, PSCs, IR	PMI
Sudanese	Koumentoum	Darou Salam 2, Kouthiaba	WB, HLCs, PSCs, IR	PMI
Sudanese	Makacoulibantang	Sinthiou Bouré Banna Ndao, Souarécounda	WB, HLCs, PSCs, IR	PMI
Sudanese	Tambacounda	Koussanar, Lycounda	HLCs, PSCs, IR	PMI
Sudano-Guinean	Kedougou	Tomboronkoto, Bandafassi	WB, HLCs, PSCs, IR	PMI
Sudano-Guinean	Saraya	Bembou	HLCs, PSCs, IR	PMI
Sudano-Guinean	Salemata	Diara Pont	HLCs, PSCs, IR	PMI
Sudano-Guinean	Velingara	Medina Dianguette, Bonkonto	PSCs, IR	PMI
Sudano-Guinean	Oussouye	Mlomp, Cadjinolle	HLCs, PSCs, IR	PMI

Note: PSCs = pyrethroid spray catches, WB = wall bioassay, HLCs = human landing catches, IR = insecticide resistance monitoring (once during rainy season)

Table A-2. Distribution and bionomics of malaria vectors in 2020

Site/District	Vector*	Season (month)	Preferred Biting Location	Peak Biting Time	Preferred Host	Biannual EIR† (June-Nov)
Richard-Toll	***An. gambiae* s.l.**	Rainy (July-Oct)	ND	1:00-3:00 a.m.	Animal	ND
Richard-Toll	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	Animal	ND
Kanel	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.64)	10:00 p.m.-12:00 a.m.	Animal	0
Kanel	*An. funestus* s.l.	Rainy (July-Oct)	Indoor~	ND	ND	ND
Linguere	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.56)	10:00 p.m.-12:00 a.m.	Animal	0
Linguere	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Tivaouane	***An. gambiae* s.l.**	Rainy (July-Oct)	Equal (.50)	10:00 p.m.-12:00 a.m.	Animal	0.02
Tivaouane	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Dioffior	***An. gambiae* s.l.**	Rainy (July-Oct)	ND	1:00-2:00 a.m.	Animal	ND
Dioffior	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Touba	***An. gambiae* s.l.**	Rainy (July-Oct)	ND	1:00-2:00 a.m.	ND	ND
Touba	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Diourbel	***An. gambiae* s.l.**	Rainy (July-Oct)	ND	1:00-2:00 a.m.	ND	ND
Diourbel	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Koungheul	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.59)	1:00-2:00 a.m.	Animal	0

Site/District	Vector*	Season (month)	Preferred Biting Location	Peak Biting Time	Preferred Host	Biannual EIR† (June-Nov)
Koungheul	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Malem Hodar	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.60)	1:00-2:00 a.m.	Animal	0
Malem Hodar	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Kaolack	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.52)	1:00-2:00 a.m.	Human	0
Kaolack	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Ndoffane	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.56)	1:00-2:00 a.m.	Animal	0
Ndoffane	*An. funestus* s.l.	Rainy (July-Oct)	Outdoor (0.55)	2:00-3:00 a.m.	Animal	ND
Koumentoum	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.52)	1:00-3:00 a.m.	Animal	0
Koumentoum	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Makacoulibantang	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.52)	1:00-3:00 a.m.	Human	0.03
Makacoulibantang	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Tambacounda	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.64)	1:00-3:00 a.m.	Animal	0.012
Tambacounda	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Kedougou	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.58)	2:00-3:00 a.m.	Human	0.06
Kedougou	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Saraya	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.53)	2:00-3:00 a.m.	Human	0.24

Site/District	Vector*	Season (month)	Preferred Biting Location	Peak Biting Time	Preferred Host	Biannual EIR† (June-Nov)
Saraya	*An. funestus* s.l.	Rainy (July-Oct)	Outdoor (0.60)	2:00-3:00 a.m.	ND	ND
Salemata	***An. gambiae* s.l.**	Rainy (July-Oct)	Indoor (0.51)	2:00-3:00 a.m.	Human	0.32
Salemata	*An. funestus* s.l.	Rainy (July-Oct)	Equal (0.50)	2:00-3:00 a.m.	ND	ND
Velingara	***An. gambiae* s.l.**	Rainy (July-Oct)	ND	ND	Human	ND
Velingara	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND
Oussouye	***An. gambiae* s.l.**	Rainy (July-Oct)	Outdoor (0.54)	2:00-3:00 a.m.	Human	0
Oussouye	*An. funestus* s.l.	Rainy (July-Oct)	ND	ND	ND	ND

*Primary vector listed first, in bold, followed by secondary vectors

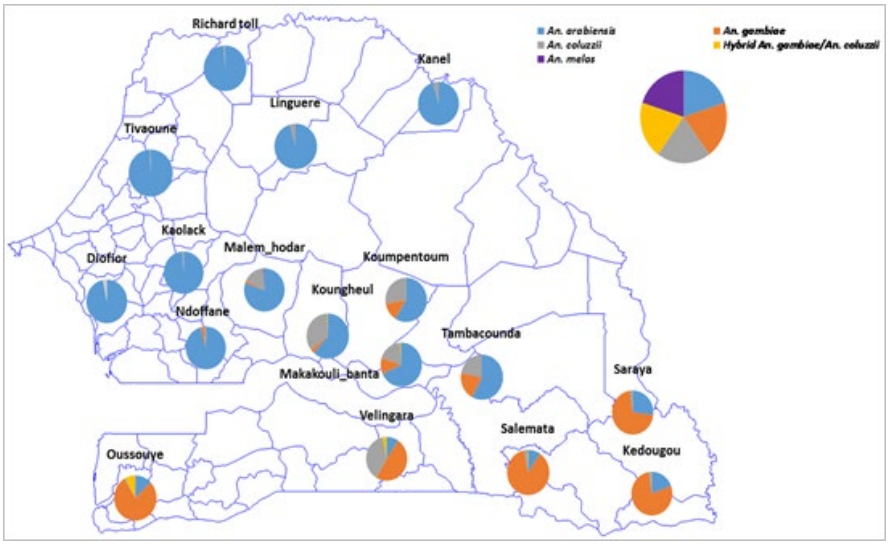
** Marked as NA if simultaneous indoor and outdoor collections are not conducted

~Small sample size, cannot be determined

ND indicates not determined

†Entomological inoculation rate

Figure A-2. Composition and distribution of *An. gambiae* s.l. by sentinel district, 2020



Overall, 23,958 *Anopheles* mosquitoes were collected from June to December 2020 including seven species (*An. gambiae* s.l., *An. funestus* s.l., *An. pharoensis*, *An. rufipes*, *An. squamosus*, *An. nili,* and *An. coustani/ziemanni*). *Anopheles gambiae* s.l. (n = 20,867, 87.1 percent) was the major vector collected in all geographical zones of the country followed by *An. funestus* s.l. (n = 2,544, 10.6 percent), which was mostly found in the Sudano-Sahelian zone. *Anopheles arabiensis* was identified as the main vector in four of the geographical zones, except in the Sudano-Guinean zone where *An. gambiae* was predominant. The presence of *An. coluzzii* was also noted in all study areas with a predominance in the Sudanese zone while few hybrids (*An. gambiae/coluzzii*) were recorded in low numbers mainly in the Sudanese and Sudano-Guinean zones. Only one specimen of *An. melas* was identified in Malem Hoddar (Sudano-Sahelian zone) within the samples analyzed.

Additional data can be found in the PMI VectorLink Senegal Annual Entomology Report (January 2020–December 2020).

Key Question 2

What is the current insecticide resistance profile of the primary malaria vectors?

Supporting Data

In 2020, insecticide susceptibility was monitored in 13 sites.

Figure A-3. Percentage mortality of *An. gambiae* s.l. exposed to deltamethrin at 1x, 5x, and 10x, permethrin at 1x, 5x and alpha-cypermethrin, lambda-cypermethrin, and bendiocarb at 1x

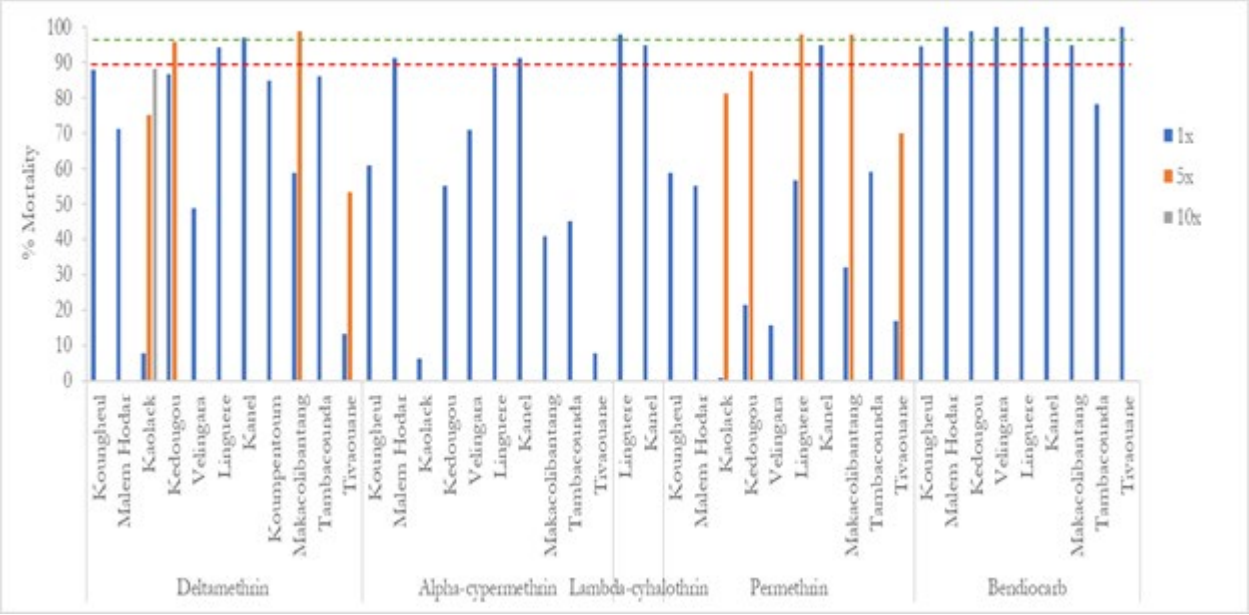


Figure A-4. Percentage mortality of *An. gambiae* s.l. exposed to deltamethrin and permethrin before and after exposure to PBO

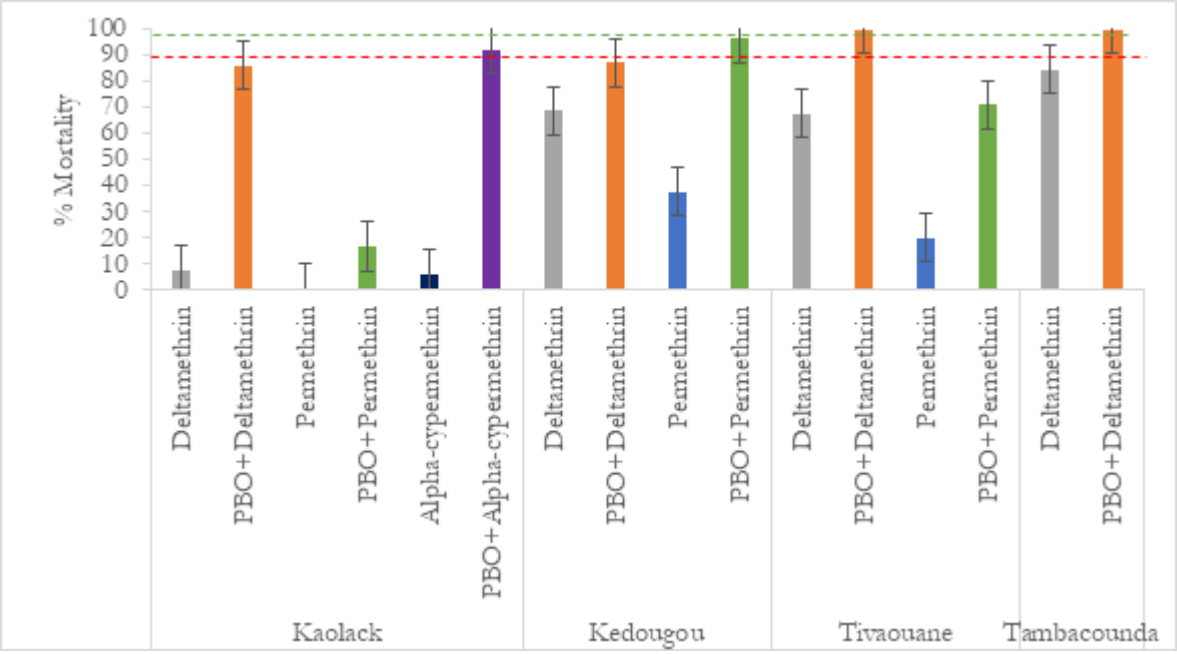
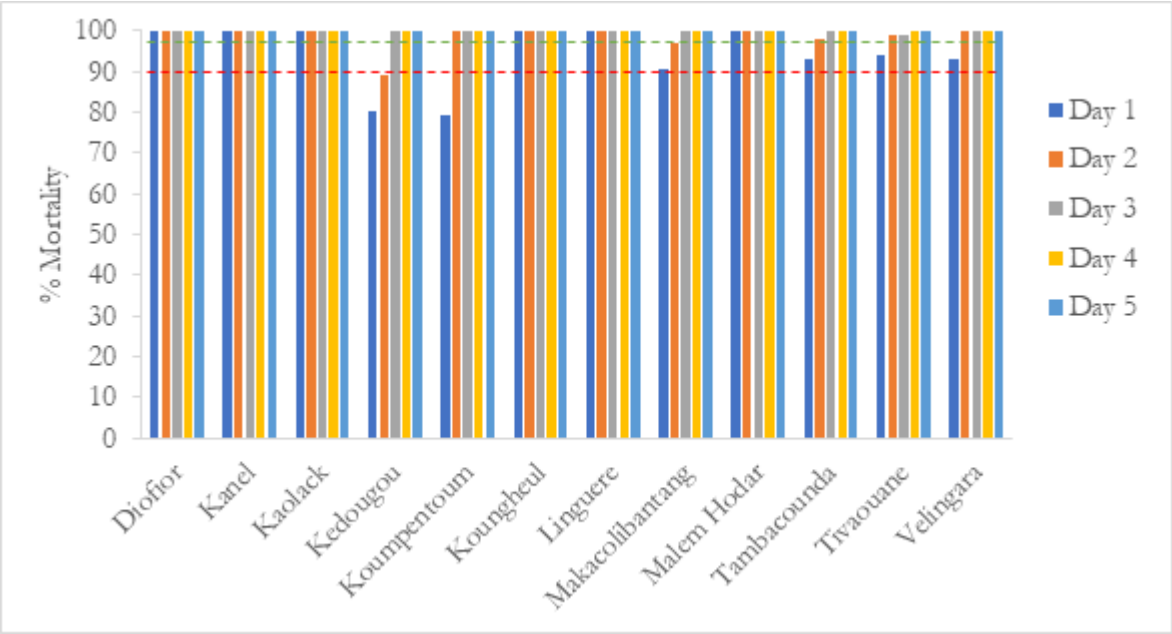
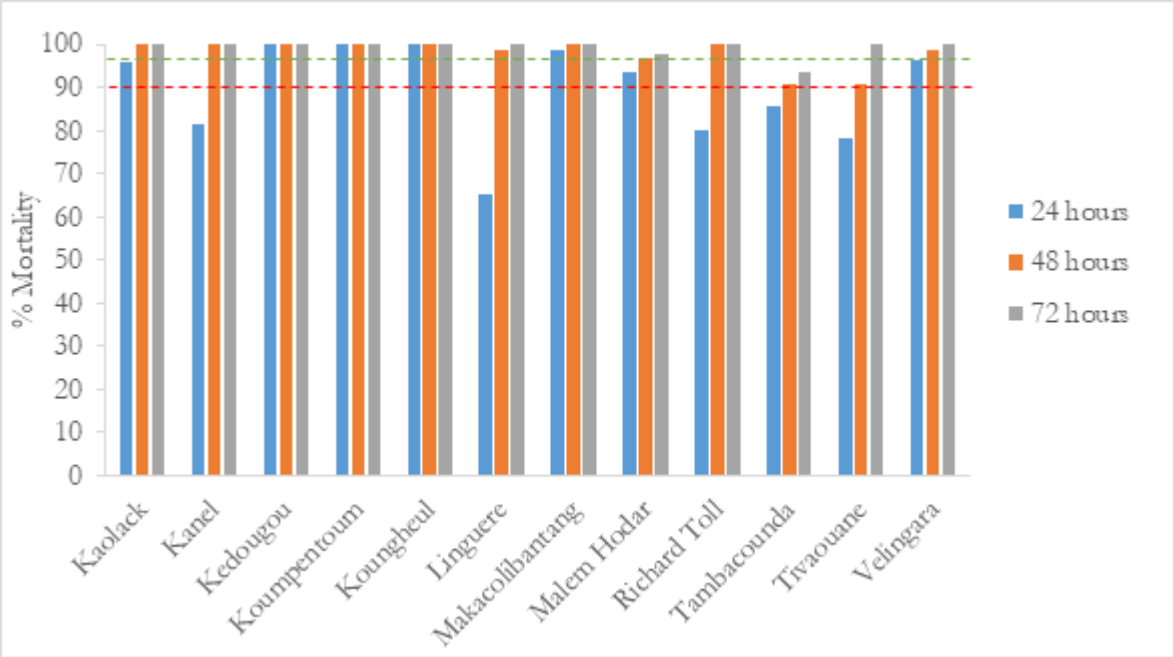


Figure A-5. Percentage mortality of *An. gambiae* s.l. exposed to chlothianidin 2 percent by sentinel site in 2020



In 2020, susceptibility to clothianidin 2 percent was recorded at all 12 sites tested, with 100 percent mortality recorded from day three and day four post exposure in most sites.

Figure A-6. Percentage mortality of *An. gambiae* s.l. exposed to chlorfenapyr (100µg/bottle) by sentinel site in 2020



One hundred percent mortality of *An. gambiae* s.l. was recorded following exposure to chlorfenapyr (100 µg/bottle) between 24h and 72h in 11 out of 12 sites surveyed. In Tambacounda, 93.5 percent of the mosquitoes were dead at 72h.

Conclusions for Entomologic Monitoring Investments

- Challenges in 2020 included delayed arrival of insecticide-impregnated papers, and a large number of longitudinal monitoring sites with limited capacity. This led to delays in insecticide resistance monitoring. Therefore only 13 sites were monitored for insecticide resistance instead of the targeted 19 sites. To address this, an effort can be made to reduce vector bionomics sampling frequency and shift efforts toward ensuring that resistance monitoring can be conducted for all targeted sites. This strategy will ensure that the insecticide resistance monitoring data necessary for vector control decision-making are available, especially as the shift to PBO and dual AI ITNs occurs.
- A limited number of sites (four) were tested for PBO synergy in 2020 due to challenges with COVID-19 and the delayed arrival of reagents. Increased emphasis on PBO synergist assays will be considered with expanded insecticide resistance monitoring mentioned above.
- Susceptibility to chlorfenapyr was observed in all sites, data that supports the use of dual AI nets, such as Interceptor G2s. The widespread pyrethroid resistance detected in all sites supports the shift toward PBO and dual AI ITNs for mass and continuous distribution in 2022 to ensure that appropriate vector control tools are implemented.
- In IRS sprayed and control districts, *An. gambiae* s.l. is the predominant vector, making up over 95 percent of *Anopheles* collected in these sites. *An. arabiensis* was the main vector in Makacolibantang, Koumpentoum, and Koungheul, where Fludora Fusion was sprayed, and *An. gambiae* s.s. was the main vector in Kedougou where SumiShield was used. Vector bionomics of *An. gambiae* s.s. in Kedougou in

coming years can be used to help understand any changes in the vector population following the withdrawal of IRS.

- A pilot of community entomological surveillance in six sites in 2021 will reveal whether community-based entomological engagement can be used to fill gaps in surveillance capacity in future years.
- The completed urban landscape analysis provided detailed geospatial and seasonal data on larval habitats and indoor and outdoor sleeping behaviors in households and *daaras* (religious schools) in the urban areas of Diourbel, Touba, and Kaolack. These data should be used to develop packages of vector control, SBC, and case management interventions through OR or PE. The entomological data suggest that targeted outdoor vector control, such as seasonal larval source management may be effective and targeted IRS, specifically in *daaras*, where severe malaria cases have been reported, could also be considered. Residents in *daaras* spend a large amount of time outdoors in crowded conditions and very large ITNs or housing modifications are strategies that may be considered for OR to address these unique living conditions.
- Outdoor biting behavior was detected in many sites. Further analyses of entomological collection data combined with data on the hourly proportion of humans indoors, indoors and under ITNs, and outdoors across seasons will provide information on human-adjusted vector biting behaviors where outdoor biting has been detected. This will provide NMCP with data on bites prevented by ITNs to determine if complementary vector control tools may be necessary to address outdoor biting.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.2. INSECTICIDE-TREATED NETS (ITNs)

Key Goal

Achieve high ITN coverage and use targets with effective nets, based on insecticide resistance data, in PMI-supported areas; and maintain high coverage and use with consistent ITN distribution (via campaigns and/or continuous channels).

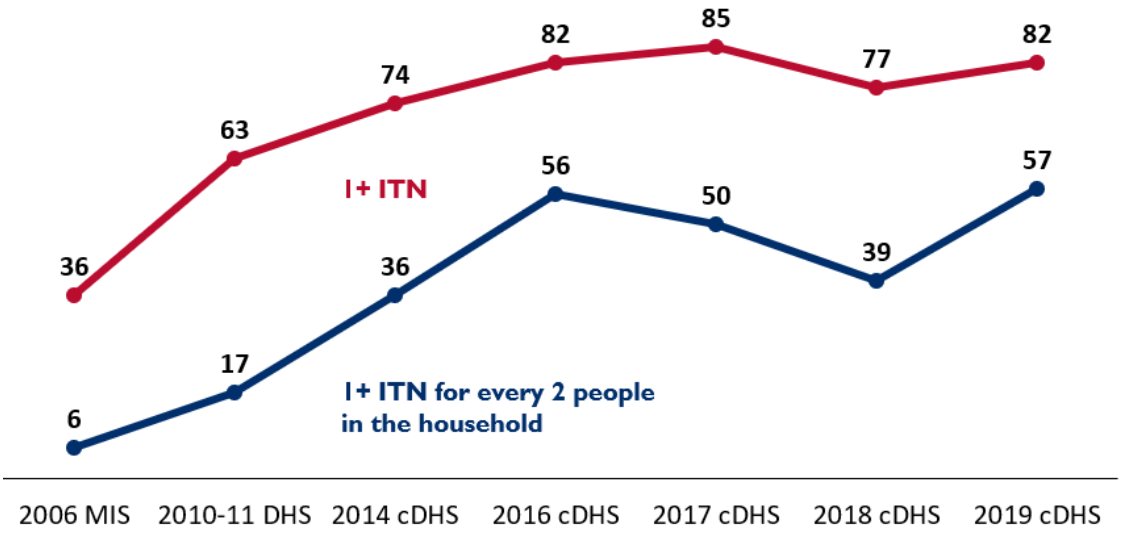
Key Question 1

How has net ownership evolved since the start of PMI in the country?

Supporting Data

Figure A-7. Trends in ITN ownership

Percentage of households that own ITNs



Key Question 2a

What proportion of the population has access to an ITN? Of those who have access, what proportion of the population reports using an ITN?

Figure A-8. Trends in ITN access and use

Percentage of household population with access to an ITN and percentage of those who slept under an ITN the night before the survey

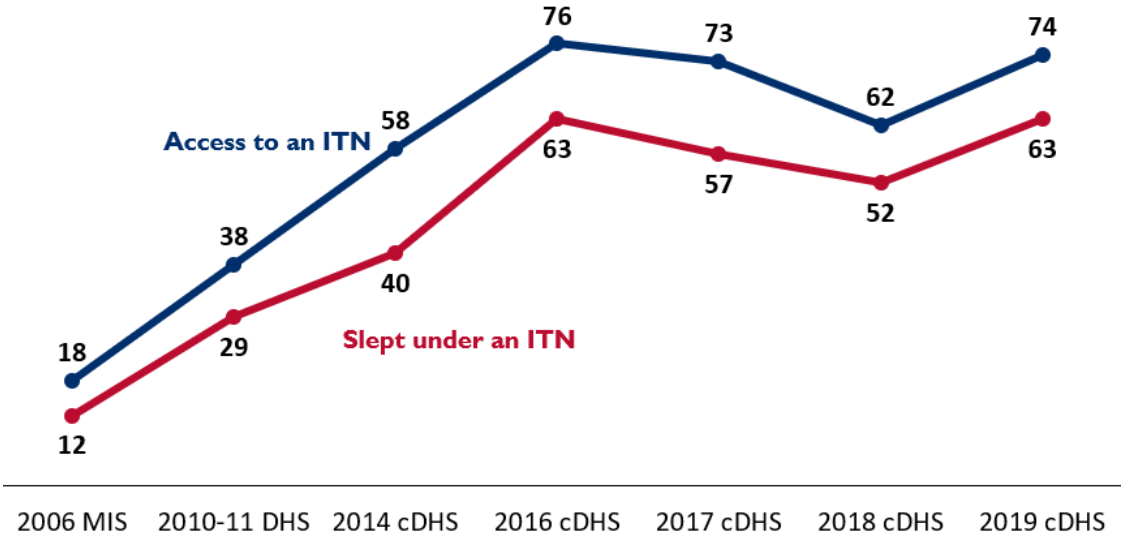
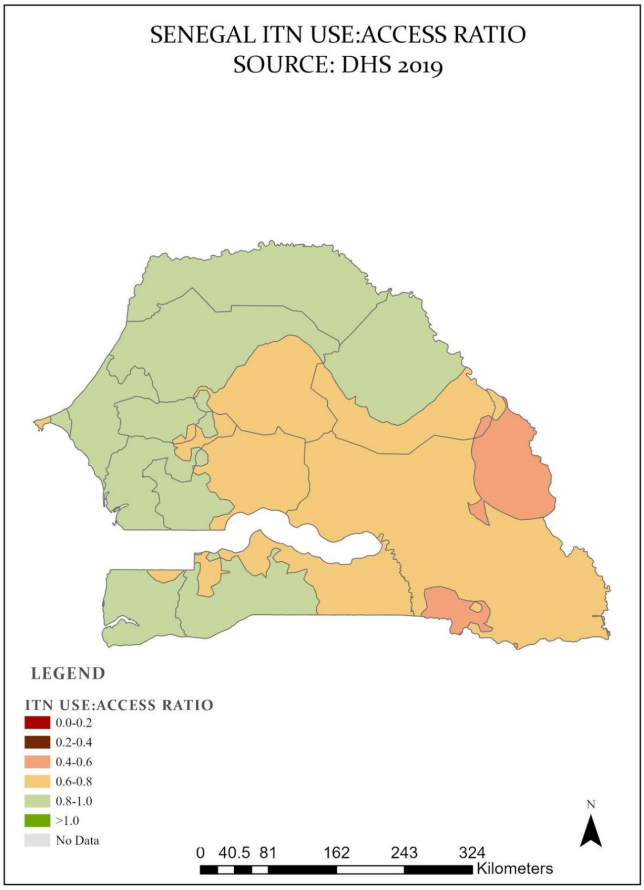


Figure A-9. Senegal map of ITN access and use:access ratio



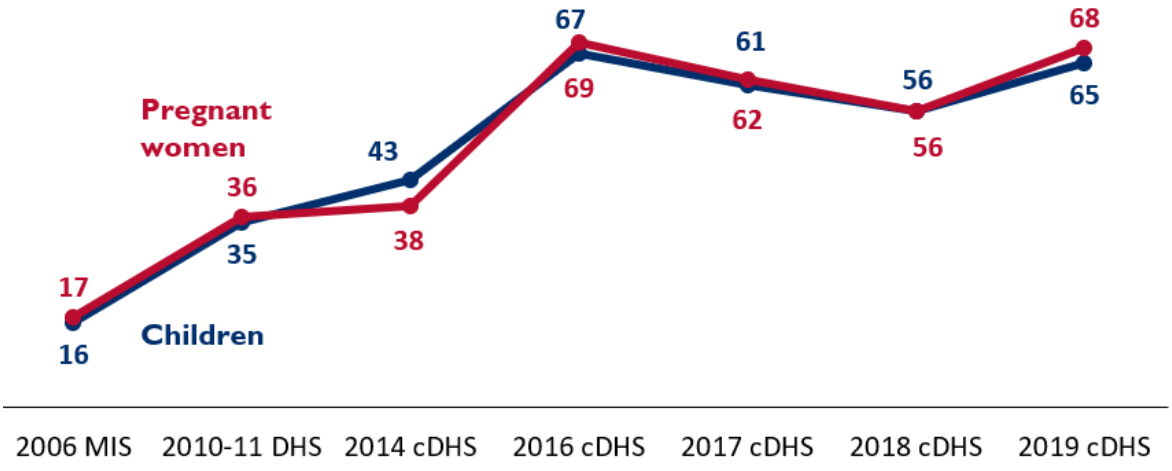
Key Question 2b

What percent of pregnant women and children under five years of age report sleeping under an ITN?

Supporting Data

Figure A-10. Trends in ITN use among children and pregnant women

Children under age five and pregnant women 15 to 49 years of age who slept under an ITN the night before the survey



Key Question 3

If ITN access is high but use is low, what significant structural and/or behavioral challenges affect the adoption and maintenance of ITN use and care behaviors?

While a small gap exists between use and access of nets, there has been a cultural adoption of ITNs in Senegal. As burden continues to decline in Senegal, an important component of SBC messaging will be focused on maintaining use of nets as the perception and risk of malaria decreases in the community with the success of intervention efforts. The primary focus of SBC activities for ITNs is on the introduction of PBO and dual AI nets as the vector control strategy shifts from IRS to next-generation nets.

Supporting Data

Please refer to Section 3.4. for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 4

What type of nets are being distributed via which channels?

Supporting Data

PMI is distributing standard ITNs: Olyset™ Nets (permethrin).

Table A-3. Insecticide treated net (ITN) distribution in CY 2020

Level Nationwide/Region/State/Province	Mass Campaign [month/year]	ANC	EPI	School	Community	Other
Nationwide		296,190	526,560			

Key Question 5

What is the estimated need for ITNs during CY 2021–2023? How many, and what types, of ITNs will be procured, and by what partners? Through what channels will ITNs be distributed? Are there any projected ITN gaps?

In 2021 Senegal will not have a mass campaign, so estimated needs are based on routine distribution through ANC, EPI, and other community based organizations. The estimated ITN need for the entire country for 2021 is 1,850,059. PMI will procure 723,632 permethrin nets (Olyset Net) which in addition to the carryover from 2020 of 902,917 will leave a gap of approximately 200,000.

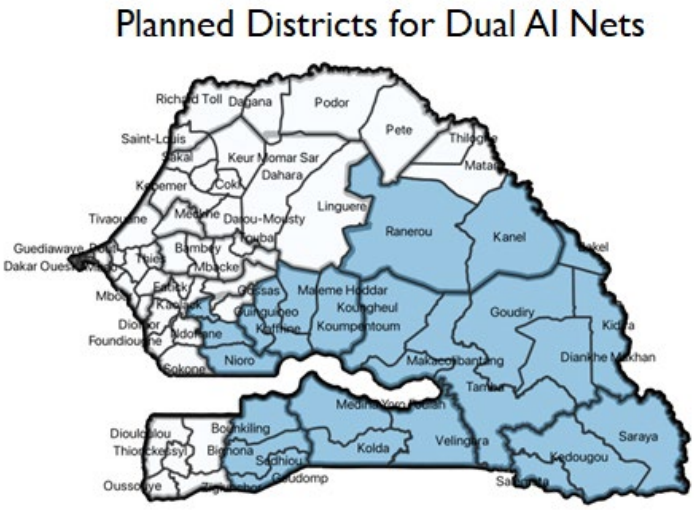
In 2022, Senegal will organize a universal coverage mass distribution campaign. The total number of ITNs needed for the country is 12,700,551 including 10,840,375 for the mass campaign and 1,860,176 for continuous distribution. The IDB is procuring 2,000,000 permethrin nets (Olyset Net): 1,000,000 for mass campaigns and 1,000,000 for routine. The Global Fund is procuring 4,745,200 nets for the mass campaign, all deltamethrin nets (Permanet, Yorkool, and YAHE LN), and PMI is procuring 1,232,345 PBO nets for the mass campaign, targeting the high-burden KKT regions and 300,000 dual AI nets for continuous distribution targeting the same regions. This will leave a gap of 4,423,006 in CY 2022. For now the urban areas of Dakar and Thies will not be targeted during the mass campaign; the country has put the needs for Dakar and Thies in the Global Fund Pre-arrival Assessment Report.

In CY 2023 the Global Fund is not procuring any ITNs and IDB's support to the NMCP ends in December 2021, leaving PMI as the only identified donor contributing to ITN procurement for now. The PMI plans to procure 780,548 dual AI nets focusing initially on the three highest burdened regions and expanding progressively to immediate surrounding health districts and regions and to the other parts of the country.

Table A- 4. ITN Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	17,223,497	17,738,795	18,275,743
Total population at risk for malaria	17,223,497	17,738,795	18,275,743
PMI-targeted at-risk population	17,223,497	17,738,795	18,275,743
Population targeted for ITNs	17,223,497	17,738,795	18,275,743
Continuous Distribution Needs			
Channel 1: ANC	440,060	485,600	533,652
Channel 2: Vaccinations (0-23 months)	951,859	977,559	1,003,953
Channel 3: School	0	0	0
Channel 4: Community-based organizations	121,135	50,914	121,135
Channel 5: Target 24 to 59 months	337,005	346,104	355,449
Additional ITNs required to avoid ITN stockouts			
Estimated Total Need for Continuous Channels	1,850,059	1,860,176	2,014,189
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	10,840,375	0
Estimated Total Need for Campaigns	0	10,840,375	0
Total ITN Need: Continuous and Campaign	***1,850,059***	***12,700,551***	***2,014,189***
Partner Contributions			
ITNs carried over from previous year	902,917	0	0
ITNs from Government	0	0	0
ITNs from Global Fund	0	4,745,200	0
ITNs from other donors Islamic Development Bank (IDB)	0	2,000,000	0
ITNs planned with PMI funding	723,632	1,532,345	774,757
Total ITNs Contribution Per Calendar Year	***1,626,549***	***8,277,545***	***774,757***
Total ITN Surplus (Gap)	***-223,510***	***-4,423,006***	***-1,239,432***

Figure A-11. PMI planned supported districts for dual AI nets



For 2023, the number of ITNs needed for continuous distribution is 2,014,189. PMI will procure 652,405 dual AI nets for the KKT regions, expand to the immediate surrounding health districts to form a belt around the KKT regions, and expand to other health districts depending on the level of the malaria burden. There will be a gap of 1,361,784 for 2023 routine distribution, because the Global Fund procures ITNs only for mass campaigns and IDB support to NMCP will be discontinued in December 2021.

Supporting Data

Table A-5. ITN Gap Analysis

Calendar Year	2021	2022	2023
Total country population	17,223,497	17,738,795	18,275,743
Total population at risk for malaria	17,223,497	17,738,795	18,275,743
PMI-targeted at-risk population	17,223,497	17,738,795	18,275,743
Population targeted for ITNs	17,223,497	17,738,795	18,275,743
Continuous Distribution Needs			
Channel 1: ANC	440,060	485,600	533,652
Channel 2: Vaccinations (0-23 months)	951,859	977,559	1,003,953
Channel 3: School	0	0	0
Channel 4: Community-based organizations	121,135	50,914	121,135
Channel 5: Target 24 to 59 months	337,005	346,104	355,449
Additional ITNs required to avoid ITN stockouts			
Estimated Total Need for Continuous Channels	1,850,059	1,860,176	2,014,189
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	10,840,375	0
Estimated Total Need for Campaigns	0	10,840,375	0
Total ITN Need: Continuous and Campaign	***1,850,059***	***12,700,551***	***2,014,189***
Partner Contributions			
ITNs carried over from previous year	902,917	0	0
ITNs from Government	0	0	0
ITNs from Global Fund	0	4,745,200	0
ITNs from other donors Islamic Development Bank (IDB)	0	2,000,000	0
ITNs planned with PMI funding	723,632	1,532,345	774,757
Total ITNs Contribution Per Calendar Year	***1,626,549***	***8,277,545***	***774,757***
Total ITN Surplus (Gap)	***-223,510***	***-4,423,006***	***-1,239,432***

Key Question 6

What is the current status of durability monitoring?

Supporting Data

PMI Senegal is not currently conducting ITN durability monitoring. With the planned mass distribution campaign in CY 2022, PMI will reprogram FY 2021 MOP funds to support durability monitoring for the 12-month and 24-month assessments and fund the 36-month assessment in the FY 2023 MOP.

Conclusions for ITN Investments

PMI Senegal will continue to support NMCP's objective universal coverage of ITNs through routine and mass distribution campaigns. Given the high level of insecticide resistance to pyrethroids in Senegal and the withdrawal of IRS, PMI support is shifting from procuring standard pyrethroid ITN and expanding the introduction of PBO and dual AI nets, primarily targeting the high-burden regions and health districts. With FY 2022 funds PMI will procure 780,548 dual AI nets to cover the three most malaria affected regions of KKT and expand to the immediate surrounding health districts. With the discontinuation of IDB support in 2022 and Global Fund not procuring ITNs for routine distribution, there will be a gap of 1,233,641 nets to cover the 2023 continuous distribution needs. PMI and NMCP will continue to advocate with the Government of Senegal and other partners to fill this gap.

PMI will provide support to the NMCP to implement innovative urban-adapted interventions for ITN distribution and utilization to address chronic barriers to distribution and use of ITNs in urban settings using Dakar as a pilot area.

SBC activities will be focused on information regarding the phase-out of IRS in PMI-supported districts and the introduction of next-generation nets with reinforced messaging on net use.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.3. INDOOR RESIDUAL SPRAYING (IRS)

Key Goal

Ensure high spray quality and coverage, with an appropriate insecticide, in targeted PMI-supported areas, in alignment with the national insecticide resistance management strategy.

Key Question 1

What areas are targeted for IRS and why?

Beginning in May 2020, PMI supported an IRS campaign in four districts that included Kedougou, Makacolibatang, Koumpentoum, and Koungheul (Figure A-12), selected based on their high burden of malaria.

The IDB provided funds to support IRS in the areas of pre-elimination, mostly northern Senegal for 2020 and 2021. With these funds the NMCP is using a "hot spots" approach targeting health zones with malaria incidence greater than 5 per 1,000. To date it is unclear whether IRS will continue past the IDB project that will end in December 2021.

Supporting Data

Figure A-12. PMI VectorLink Senegal Project IRS Districts and Non-PMI supported IRS Districts for 2021

PMI Supported IRS Districts

Non-PMI Supported IRS Districts

Key Question 2

In PMI-supported areas, what spray coverage rates have been achieved in the past three years and what are the plans for 2021?

Supporting Data

Table A-6. IRS Coverage

Calendar Year	Districts Sprayed (#)	Districts	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)
2020	4	Kedougou, Makacolibatang, Koungheul, Koumentoum	136,417	98.9%^	571,649
2021*	4	Kedougou, Makacolibatang, Koungheul, Koumentoum	156,461	NA	587,084

*Denotes targets for current year

^ During the spray campaign, spray operators found a total of 137,932 structures and sprayed 136,417, for a spray coverage of 98.9%. In terms of targets; VectorLink Senegal sprayed 136,417 out of 134,883 structures targeted (101%). This was due to a greater number of structures found across all four districts than targeted. Specifically, in two districts—Koumpentoum and Koungheul—the number of structures found greatly exceeded the target (124% and 119%, respectively). While structures were underestimated in these two districts, the number of structures were incorrectly estimated in Kedougou—only 34% of structures targeted were found. This was due to an inadequate estimation of the target based on the population from the last universal ITN distribution campaign.

Key Question 3

What is the residual efficacy of the insecticides used for IRS in PMI-supported areas?

Supporting Data

The residual efficacy of IRS was evaluated in Kédougou and Makacolibatang for six months (July–December 2020), five months in Koumpentoum (August–December 2020), and four months in Koungheul (September–

December 2020). With an average mortality rate of laboratory reared susceptible *An. coluzzi* of > 99 percent, the results indicate that the residual efficacy of both SumiShield 50WG and Fludora Fusion remain for at least seven months for all wall types tested (mud and cement walls). Additional data can be obtained from the PMI VectorLink Senegal Annual Entomology Report (January 2020–December 2020) and Senegal End of Spray Report: Spray Campaign May 28–August 16, 2020.

Table A-7. IRS insecticide residual efficacy based on cone bioassays using susceptible laboratory reared *An. coluzzi*

Site/District	Year	Insecticide	Residual Efficacy (months)*
Kedougou	2020	SumiShield®	8
Makacolibatang	2020	Fludora® Fusion	8
Koumpentoum	2020	Fludora® Fusion	7
Koungheul	2020	Fludora® Fusion	7

*Monitoring only occurred up to four months in Koungheul and five months in Koumpentoum, but 100% mortality was detected at these time points.

Key Question 4

What is the insecticide rotation plan in PMI-supported areas?

Supporting Data

In Senegal, there is susceptibility to both clothianidin (a neonicotinoid) and organophosphates, and two neonicotinoid formulations (SumiShield and Fludora Fusion) were used for IRS in 2020. For 2021 Senegal will continue using the clothianidin products given their residual efficacy of about seven months. The insecticides formulations will be rotated in 2022 and an organophosphate formulation (Actellic) will be included.

Table A-8. Insecticide Rotation Plan

Target Spray Area	2020	2021	2022*
Kedougou	SumiShield® (NN)	Fludora® Fusion (NN)	Actellic (OP)
Makacolibatang	Fludora® Fusion (NN)	SumiShield® (NN)	Actellic (OP)
Koumpentoum	Fludora® Fusion (NN)	SumiShield®/Fludora® Fusion (NN)	Actellic (OP)
Koungheul	Fludora® Fusion (NN)	SumiShield®/Fludora® Fusion (NN)	SumiShield®/Fludora® Fusion (NN)

*Denotes planned insecticide classes OP = Organophosphates; NN = Neonicotinoid; P = Pyrethroid

Conclusions for IRS Investments

- Following the third year of spray (2022), IRS will be withdrawn and replaced with PBO and dual AI ITNs and SBC activities, which PMI will support in the 2022 mass campaign and in continuous distribution channels in 2022 and 2023.
- During the 2020 IRS campaign, there were challenges in spray coverage in Kedougou, with only 34 percent of structures sprayed due to a large difference between the theoretical room per structure ratio (1.67 rooms per structure) used for targeting and the actual ratio (4 rooms per structure) found in the field. To address this challenge, PMI supported a census activity of rooms and structures in 2020 in Kedougou, specifically in the eight health posts where the proportion of rooms sprayed was less than 85 percent of rooms targeted. This census activity revealed that the number of eligible structures found in the eight health posts surveyed was more than four times higher than the number of structures sprayed during the IRS 2020 campaign. Detecting these additional structures was attributed to improved ability of data collectors to identify structures and the establishment of new structures since the IRS campaign. These data were used to revise quantification of insecticides using the revised estimated number of structures for the 2021 IRS campaign and operational planning to accommodate adjustments needed.
- Of the structures found and not sprayed in Kedougou, 51 percent were due to refusals either because household members were absent from the house or if present, chose not to accept spraying or move personal items. Addressing these issues will be important for future spray campaigns during sensitization to achieve high spray coverage
- Coverage in Koumpentoum, Koungheul, and Makacolibatang were all above 85 percent in 2020, with only Kedougou having low spray coverage. Following the 2021 IRS campaign PMI is supporting an assessment in the four districts IRS was sprayed to determine impact, in particular following the adjustments made in Kedougou
- Spray quality results showed 100 percent mortality of exposed susceptible laboratory reared *An. coluzzi* to the two insecticide formulations used during the 2020 spray campaign, suggesting high spray quality.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2. HUMAN HEALTH

2.1. CASE MANAGEMENT

NMCP Objective

The objectives outlined in the 2021–2025 National Strategic Plan are:

- Introduce molecular biology for case investigations in pre-elimination zones
- Diagnose 100 percent of suspected cases of malaria by RDT and/or microscopy in accordance with the national case management guidelines by 2025
- Treat 100 percent of confirmed malaria cases with safe and effective medications for malaria in accordance with the national case management guidelines at the facility level by 2025

- Treat 100 percent of confirmed malaria cases with safe and effective medications for malaria in accordance with the national case management guidelines at the community level by 2025

NMCP Approach

NMCP adopted ACTs as first-line treatment in 2006 and introduced RDTs in 2007. Senegal considers artesunate-amodiaquine (ASAQ), artemether-lumefantrine (AL), and dihydroartemisinin-piperaquine as co-first-line ACTs. ASAQ is only used in zones in which SMC is not implemented. In pre-elimination zones where incidence is <5/1,000, any confirmed case of malaria is given a single low-dose of primaquine along with an ACT (dihydroartemisinin-piperaquine is preferred).

Universal testing for fevers became policy in 2017. RDTs are used at the health post and community level, and microscopy at higher levels. Recently, the NMCP introduced the use of molecular biology (Loop Mediated Isothermal Amplification or LAMP) in the diagnosis of malaria in low-incidence settings.

- Senegal monitors antimalarial efficacy by implementing therapeutic efficacy studies in two sentinel sites each year
- Injectable artesunate has been adopted as the first-line treatment for severe malaria at health centers, hospitals, and some rural health posts that are inaccessible during the high- transmission season. Injectable artemether and quinine are also used as second-line treatment for severe malaria cases. Rectal artesunate suppositories as pre-referral treatment have been adopted at health posts and at the community level for children up to five years of age
- Primaquine (Single Low Dose) is used as a gametocytocidal in pre-elimination zones in the treatment of confirmed malaria cases
- Healthcare 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 and this has been extended to the community level

There are two types of services available for malaria case management at the community level:

- **Health huts:** Health huts, staffed by CHWs (*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.
- **Home-based management of malaria (PECADOM):** PECADOM *(prise en charge à domicile)* was piloted in 2008, and has now been scaled up to the 14 medical regions nationwide. Under this model, selected communities with remote or difficult access to healthcare choose a home-based care provider (*dispensateur de soins à domicile* or DSDOM), who is trained in management of malaria with RDTs and ACTs. Malaria diagnosis and treatment are provided to patients of all ages. The PECADOM program is offered for both passive and active case detection and treatment.
    - PECADOM: An integrated home-based package (integrated PECADOM), including treatment of malaria, diarrhea, and acute respiratory illness for children under five years of age was piloted in 2012 and subsequently expanded to 14 regions of Senegal with currently over 3,700 villages benefiting from this program.
    - PECADOM+: 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+ was piloted by Peace Corps volunteers in 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 identify 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+ 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, and has now expanded to 35 districts with PMI support. The package has been further extended and now includes deworming, vitamin A supplementation, and identification of children who are late for immunizations. Currently PECADOM+ is being implemented by 2,226 DSDOMs monitored by 699 community supervisors. With the success and expansion of the PECADOM program, variations of the program have been created to target specific populations:

- PECA *daara*: A situational analysis identified that students of Koranic residential schools, or *daaras*, suffered disproportionately from severe malaria cases. In 2016, DSDOMs were trained to offer malaria case management at 73 *daaras* in the district of Diourbel. To date there are 350 DS *daaras* trained in the districts of Vélingara, Saint-Louis, Diourbel, Kaolack, Darou Mousty, Kaffrine, Fatick, and Touba.
- PECA *École*: A strategy to reach students who are in school while weekly sweeps are being carried out in the communities under the PECADOM+ program is still ongoing in 34 schools in the region of Kédougou.

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 detected passively at any service delivery point triggers an investigation of the patient's residential compound and a reactive focal test and treat (FTAT) or focal mass drug administration (FDA) approach is implemented. All eligible members in the index case's residential compound are treated with dihydroartemisinin-piperaquine and low-dose primaquine and messaging about malaria preventive measures is provided in the five neighboring households.

PMI Objective in Support of NMCP

PMI contributes to the NMCP's case management strategy nationwide, with more support going to the higher-transmission areas in the south-eastern regions. Other financial partners including IDB and BMGF are supporting molecular surveillance, case investigation, and reactive case detection in the pre-elimination zones. PMI provides partial funding for operational cost of case investigations in the pre-elimination zones.

PMI-Supported Recent Progress (CY 2020 implementation)

- Number of ACTs procured: 935,581
- Number of RDTs procured: 3,063,622

Facility level in 2020:

- Healthcare workers trained:
  - Annual implementation of External Competency Assessment of Malaria Microscopists course, implemented by UCAD in partnership with the NMCP, WHO, WHO AFRO, and AMREF Health Africa — in early 2021, 24/24 microscopists achieved accreditation (course held March–April 2021)

    - 6,182 healthcare workers trained on prevention and case management guidelines
    - 50 medical officers were trained on a national malariology course, including malaria case management
    - 491 health post chief nurses were trained on a local malariology course organized by medical region staff in collaboration with NMCP
- Supervision and case investigation
    - NMCP and UCAD ensured the supervision of 151 different health structures (public and military hospitals) for quality control of their microscopy diagnostic capacities — in these laboratories they assessed the quality of slide reading of lab technicians
    - 7,110/7,121 (99,8 percent) of eligible index cases in the northern regions had an investigation performed

Community level in 2020:

- 431 CHWs from health huts and 35 traditional healers trained in malaria case management and referral guidelines
- PECADOM+ was implemented in 35 districts with 1,937 DSDOM completing 48,712 of 49,208 (99 percent) targeted weekly sweeps, performing 151,192 RDTs, diagnosing 55,527 cases of malaria (test positivity rate 36.7 percent), and referring 296 cases of severe malaria
- In 2020, the COVID-19 context disrupted the healthcare continuum with some delays in care-seeking behavior and the NMCP developed a contingency plan to mitigate the risk of severe malaria and deaths due to COVID-19 pandemic

PMI-Supported Planned Activities (CY 2021–2022 implementation)

- Support for the decentralization of malaria activities by the development and implementation of regional and district level malaria action plans. These plans will be used by partners along with the NMCP to direct their funding. Malaria control and elimination activities will then be included in an integrated annual work plan both at the regional and district level
- Continued support for implementation of quality control programs for both microscopy and RDTs at all levels of the health system, including the private sector
- Continued support in 2021 for training of laboratory technicians from health facilities at the district level, Military Medical Center and hospitals for microscopy diagnosis and annual supportive supervision of laboratories from health facilities at the district level, and Military Medical Center and hospitals for microscopy
- Continued implementation of the PECADOM+ strategy, including an expansion of DSDOMs in targeted areas and expansion of active sweeps over time, aiming for annualization of sweeps in high-burden areas
- Therapeutic efficacy study to be conducted in two sentinel sites in 2021 — funding for this activity was increased to be able to use next-generation sequencing for the molecular analysis of the samples

Key Goal

Improve access to and use of timely, quality, and well-documented malaria testing and treatment by providing facility- and community-based health workers with training, supervision, and malaria commodities to provide quality, effective care.

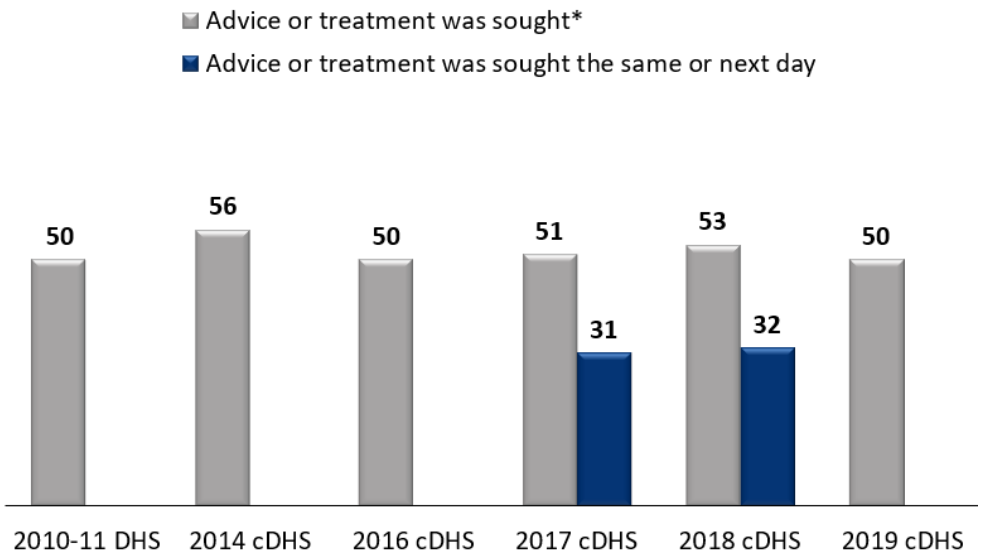
Key Question 1a

What is the status of care-seeking and/or access to care for children under five years of age with fever?

Supporting Data

Figure A-13. Trends in care-seeking for fever

Among children under five years of age with fever in the two weeks before the survey, percentage for whom advice or treatment was sought



**Note that this indicator has been recalculated according to the newest definition, care or treatment from any source, excluding traditional practitioners.*

While Senegal has evolved very positively in terms of availability of commodities, and the routine data indicates that once a patient reaches a point of care within the public sector they generally received appropriate diagnosis and treatment, the cDHS data presented in Figure A-13 indicate that there are still major barriers to prompt care-seeking for febrile illness.

The NMCP SBC communication strategy targets heads of households and other family decision makers. A formative research survey was implemented in 2019–2020 with funding from Global Fund to further assess various determinants of care-seeking behaviors. Additionally, a PMI- funded operational research study that focuses on care-seeking for febrile illness and provider behavior related to fever management will be implemented in 2021 (see OR section below).

Key Question 1b

What significant structural and/or behavioral challenges affect prompt care-seeking?

Supporting Data

Formative research conducted in 2019 found that mothers are well aware of the fever as a presenting symptom of malaria, and the need for early care-seeking, but often do not go to a health facility until the symptoms persist or get worse. Additionally, they often are not empowered to make decisions regarding care-seeking. Additionally, low risk perception of fever was reported for the head of household, who usually manages the financial resources at home, and could affect care-seeking. Lack of financial resources is a common reason cited for not seeking care promptly.

Access to care continues to be a challenge due to distance or difficult access to a health facility, and the country is trying to resolve this issue by expanding its community health platform.

Most previous studies on care-seeking focused on vulnerable populations such as young children and pregnant women and head of household (to explore financial barriers), but did not explore barriers to early care-seeking for all ages. Additionally, because the cDHS survey collects care-seeking information only for children under five years of age, we do not have visibility on care-seeking for other age groups. Although Senegal has a comparative wealth of information around children under five years of age, as the country shifts from a control phase to a context of malaria elimination, a better understanding of care-seeking and case management is needed for the entire population. There is very limited data on care-seeking for and management of febrile illness in all age groups and how this may impact malaria case management.

Please refer to Section 3.4. for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 2a

What proportion of patients are being tested and appropriately treated for malaria?

Figure A-14. Trends in diagnosis and treatment of children with fever

Among children under five years of age with fever in the two weeks before the survey and with fever in the two weeks before the survey who received any antimalarial

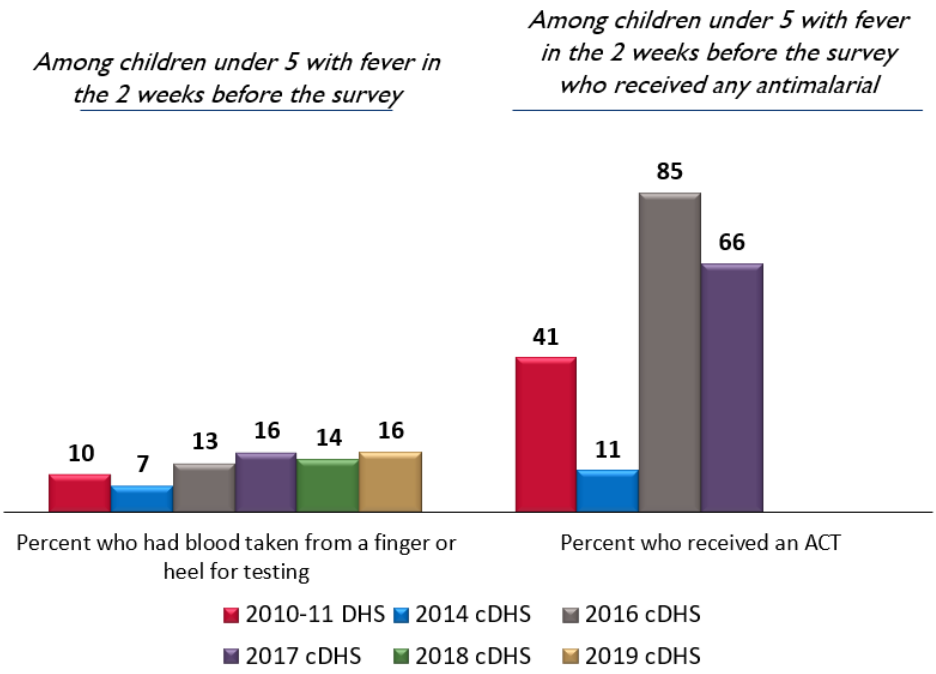
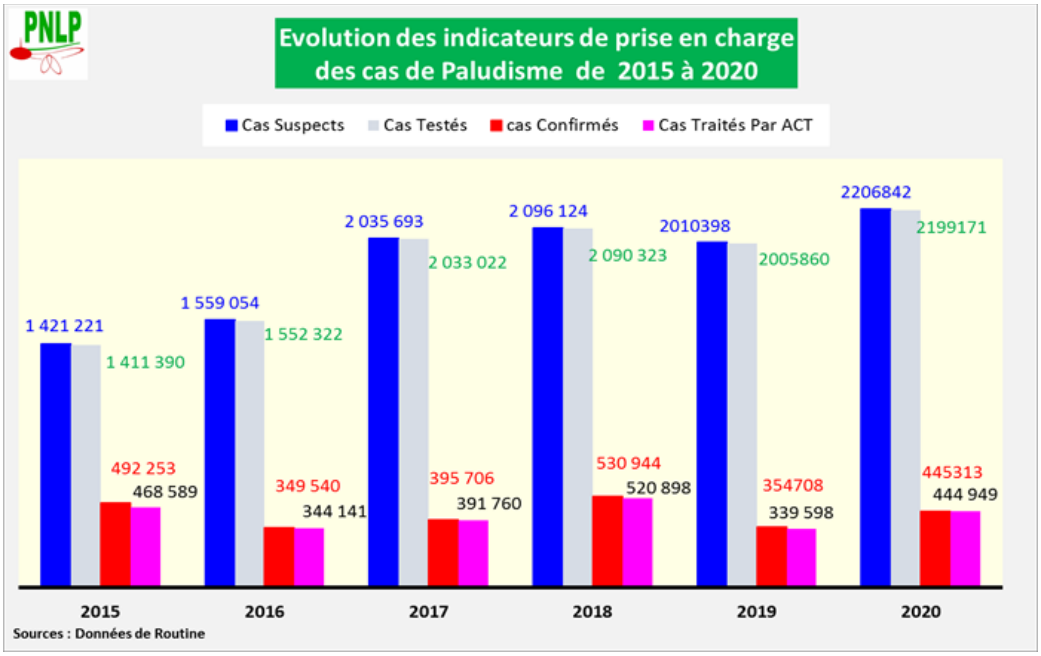


Figure A-15. Evolution over time of malaria case management indicators indicating the proportion of suspected malaria cases being tested and the proportion of confirmed malaria cases being treated by ACT



Routine data reported in the DHIS2 and in the annual epidemiological bulletin (Figure A-15) indicates appropriate implementation of diagnosis and treatment guidelines with a high level of testing of suspected malaria cases (99.7 percent in 2020) and treatment of 99.9 percent of confirmed cases with ACT. Due to the COVID-19 pandemic, the annual Service Provision Assessment (SPA) survey was not undertaken in 2020 in Senegal, so these findings could not be triangulated with this facility-based survey for facility-based case management. In 2020, 1,937 CHWs undertook 48,712 weekly household sweeps and consulted a total of 280,450 patients, 152,353 of whom presented with febrile illness. All of them were tested with an RDT (100 percent testing rate) and 55,527 were confirmed for malaria. Among these malaria cases, 296 were referred to a health facility as the presented signs of severity and 55,293 were treated with ACT, thus 99.6 percent of the confirmed malaria cases were appropriately diagnosed and treated with ACT at the community level.

The case management data presented above indicates appropriate diagnosis and treatment once a patient reached a provider, either a health facility or a CHW.

Key Question 2b

What significant structural and behavioral challenges affect testing and treatment practices among providers?

Supporting Data

Stockout of commodities at health facilities and community level; most CHWs reported frequent stockouts of malaria diagnosis and treatment tools (limiting their ability to follow case management guidelines), patient neglect, provider backlog, lack of performance, inadequate monitoring of health activities. (**Source**: *Recherche sur les déterminants de comportement par rapport à l'utilisation des services liés à la lutte contre le paludisme 2019–2020)*

A PMI-funded operational research study that focuses on care-seeking for febrile illness and provider behavior related to fever management will be implemented in 2021 (see OR section below). Data generated from these studies will allow for more targeted and informed interventions to increase care-seeking in all epidemiologic zones in Senegal.

Please refer to Section 3.4. for information on how SBC interventions will be directed to address the challenges identified above.

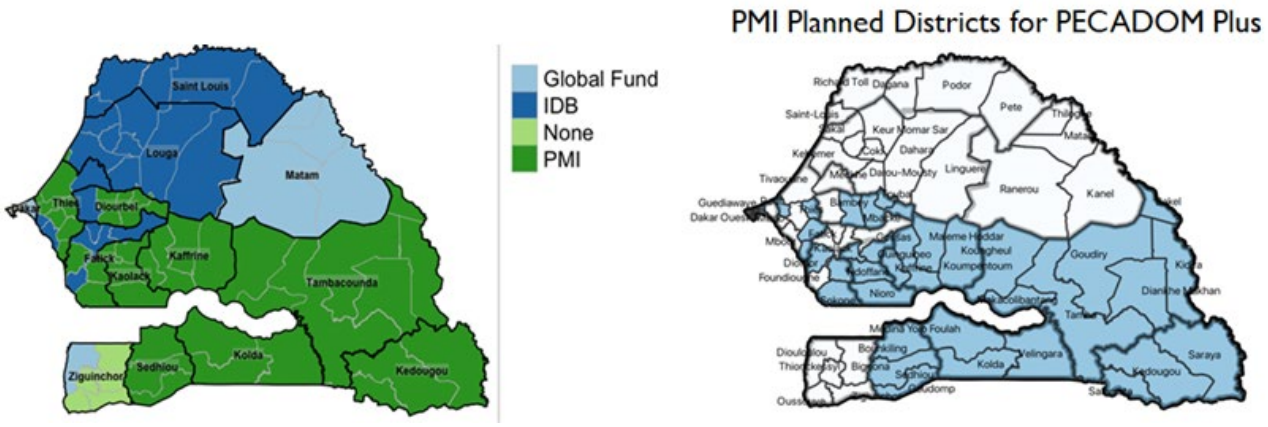
Key Question 3

What is the current and planned support for case management at health facilities and in the communities by CHWs?

Table A-9. Donor Support of Case Management Interventions

	GF	PMI	IDB
Training on Case Management (Public and Private Sector)	X	X	
Diagnostic training	X	X	
Provision of commodities for molecular biology			X
Provision of commodities for case management		RDT ACT ASAQ Rectal Artesunate Inj. Artesunate	Primaquine DHA-PQ (for pre-elimination zones)
QA of case management (Formative supervision)	X	X	
TES		X	
QA of diagnostic capacity		X	
Death audits	X		
Pharmacovigilance	X		

Figure A-16. Donor support of the PECADOM-Community Case Management Program in Senegal as of October 2019 and planned PMI-supported districts with FY 2022 funds



Senegal benefits from the support of several partners to strengthen its case management both at the health facility and community level. PMI and Global Fund provide most of the support for training and supervision, as well as quality assurance activities. There is wide coverage of DSDOMs providing passive and active case management in Senegal, contributing to increased access to care for malaria across the country in addition to stronger surveillance of malaria at the community level.

Key Question 4

What is the estimated need for RDTs during CY 2021–2023? Are there any projected RDT gaps based on anticipated partner contributions compared to estimated needs?

Table A-10. RDT Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	17,223,497	17,738,795	18,275,743
Population at risk for malaria	17,223,497	17,738,795	18,275,743
PMI-targeted at-risk population	17,223,497	17,738,795	18,275,743
RDT Needs			
Total number of projected cases	3,125,000	3,150,000	3,175,000
Percent of fever cases tested with an RDT	100%	100%	100%
RDT Needs (tests)	3,125,000	3,150,000	3,175,000
Needs Estimated based on Other (specify in comments)			
Partner Contributions (tests)			
RDTs from Government	*0*	*0*	*0*
RDTs from Global Fund	*0*	*0*	*0*
RDTs from other donors	*0*	*0*	*0*
RDTs planned with PMI funding	2,750,000	3,200,000	3,250,000
Total RDT Contributions per Calendar Year	***2,750,000***	***3,200,000***	***3,250,000***
Stock Balance (tests)			
Beginning Balance	1,236,750	861,750	911,750
- Product Need	3,125,000	3,150,000	3,175,000
+ Total Contributions (received/expected)	2,750,000	3,200,000	3,250,000
Ending Balance	861,750	911,750	986,750
Desired End of Year Stock (months of stock)	3	3	3
Desired End of Year Stock (quantities)	781,250	787,500	793,750
Total Surplus (Gap)	***80,500***	***124,250***	***193,000***

In 2020, the NMCP recorded 11,693,409 all-cause consultations provided by service providers at health facilities and at the community level (Source: DHIS2) and 2,206,842 suspected malaria cases, which represents 19 percent of consultations. For planning purposes, with the continued reinforcement of case detection strategies, the program estimates that 25 percent of all cause consultations will present with febrile illness and therefore be categorized as suspected malaria cases and require an RDT.

PMI is the sole partner procuring RDTs for 2021–2023. There is no projected gap in RDTs. In fact, recent orders of RDT were canceled due to available country stock.

Key Question 5

What is the estimated need for ACTs during calendar years 2021–2023? Are there any projected ACT gaps?

Supporting Data

Table A-11. ACT Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	17,223,497	17,738,795	18,275,743
Population at risk for malaria	17,223,497	17,738,795	18,275,743
PMI-targeted at-risk population	17,223,497	17,738,795	18,275,743
ACT Needs			
Total projected number of malaria cases	625,000	630,000	635,000
Total ACT Needs (treatments)	625,000	630,000	635,000
Needs Estimated based on Other (specify in comments)			
Partner Contributions (treatments)			
ACTs from Government	*0*	*0*	*0*
ACTs from Global Fund	*0*	*0*	*0*
ACTs from other donors *[specify donor]*	*0*	*0*	*0*
ACTs planned with PMI funding	800,030	500,000	500,000
Total ACTs Contributions per Calendar Year	***800,030***	***500,000***	***500,000***
Stock Balance (treatments)			
Beginning Balance	510,000	685,030	555,030
- Product Need	625,000	630,000	635,000
+ Total Contributions (received/expected)	800,030	500,000	500,000
Ending Balance	685,030	555,030	420,030
Desired End of Year Stock (months of stock)	3	3	3
Desired End of Year Stock (quantities)	156,250	157,500	158,750
Total Surplus (Gap)	***528,780***	***397,530***	***261,280***

In 2020, the nationwide test positivity rate was 20 percent. Every year, the NMCP estimates an average 20 percent test positivity rate, which is applied to the quantification of the ACT needs from 2021 to 2023. AL is procured for the districts in which SMC is implemented and which cover about 80 percent of malaria cases in the country. For the remaining 20 percent, ASAQ is used. PMI plans to procure all AL and ASAQ needs for 2021–2023 in Senegal. There is no projected ACT gap for CY 2021–2023.

Key Question 6

What is the estimated need for definitive treatment and pre-referral treatment for severe malaria during calendar years 2021–2023? Are there any anticipated gaps?

Table A-12. Inj. Artesunate Gap Analysis Table

Calendar Year	2021	2022	2023
Injectable Artesunate Needs			
Projected number of severe cases	9,000	8,900	8,800
Projected number of severe cases among children	1,568	1,518	1,468
Average number of vials required for severe cases among children	6,272	6,072	5,872
Projected number of severe cases among adults	7,432	7,382	7,332
Average number of vials required for severe cases among adults	89,184	88,584	87,984
Total Injectable Artesunate Needs (vials)	***95,456***	***94,656***	***93,856***
Needs Estimated based on Other (specify in comments)			
Partner Contributions (vials)			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	0	0	0
Injectable artesunate from other donors [specify donor]	0	0	0
Injectable artesunate planned with PMI funding	150,000	75,000	75,000
Total Injectable Artesunate Contributions per Calendar Year	***150,000***	***75,000***	***75,000***
Stock Balance (vials)			
Beginning Balance	89,000	143,544	123,888
- Product Need	95,456	94,656	93,856
+ Total Contributions (received/expected)	150,000	75,000	75,000
Ending Balance	143,544	123,888	105,032
Desired End of Year Stock (months of stock)	3	3	3
Desired End of Year Stock (quantities)	23,864	23,664	23,464
Total Surplus (Gap)	***119,680***	***100,224***	***81,568***

Table A-13. RAS Gap Analysis Table

Calendar Year	2021	2022	2023
Artesunate Suppository Needs			
Number of structures to receive artesunate suppositories	7,800	8,100	8,400
Total Artesunate Suppository Needs (suppositories)	***39,000***	***40,500***	***42,000***
Needs Estimated based on Other (please specify in comment section)			
Partner Contributions (suppositories)			
Artesunate suppositories from Government	0	0	0
Artesunate suppositories from Global Fund	0	0	0
Artesunate suppositories from other donors	0	0	0
Artesunate suppositories planned with PMI funding	42,720	30,000	36,000
Total Artesunate Suppositories Available	***42,720***	***30,000***	***36,000***
Stock Balance (suppositories)			
Beginning Balance	23,768	27,488	16,988
- Product Need	39,000	40,500	42,000
+ Total Contributions (received/expected)	42,720	30,000	36,000
Ending Balance	27,488	16,988	10,988
Desired End of Year Stock (months of stock)	3	3	3
Desired End of Year Stock (quantities)	9,750	10,125	10,500
Total Surplus (Gap)	***17,738***	***6,863***	***488***

Injectable artesunate: In 2020, a total of 9,179 severe cases were recorded for all ages and the program expected to register a decrease of 100 cases every year if the implementation of interventions is accelerated. In 2020, 1,458 severe cases were recorded for children under five years of age, and the program expected to register a decrease of 50 cases every year if the implementation of interventions was accelerated. In 2020, 7,482 severe cases were recorded for adults and the program expected to register a decrease of 50 cases every year if the implementation of interventions was accelerated. The total needs for injectable artesunate for 2021–2023 are 95,456, 94,656, and 93,856 vials, respectively. This includes a buffer stock estimated at six months, which represents 50 percent of annual needs, and a loss rate of 10 percent.

Rectal Artesunate: The treatment presentation used is artesunate 100 mg suppository, B/2 suppositories. The assumption used for the commodity forecast is to provide at least five boxes of two suppositories of 100 mg every year for each peripheral structure. A buffer stock estimated at six months, which represents that 50 percent of annual needs was taken into account and a loss rate of 10 percent was factored in. The total needs for rectal artesunate suppositories for 2021–2023 are 39,000, 40,500, and 42,000 suppositories respectively.

There are no anticipated gaps for injectable artesunate or rectal artesunate for years 2021–2023

Key Question 7

What is the estimated need for any other standard antimalarial drug used in the country (e.g., primaquine for *P. vivax*) during calendar years 2021–2023? Are there any anticipated gaps?

Supporting Data

In the pre-elimination districts (annual incidence <5/1,000), DHA-PQ is used along with single low-dose primaquine in case investigations and reactive case detection, and both drugs are currently procured by the IDB. Additionally primaquine is provided to every confirmed malaria case detected in the pre-elimination districts. As the IDB project is coming to an end in late 2021, it is not yet clear how the dihydroartemisinin-piperaquine gap will be filled. PMI will support procurement of primaquine (using available FY 2021 funds) and will advocate for it to be purchased by national authorities moving forward.

Key Question 8

Are first-line ACTs effective and monitored regularly?

Supporting Data

Table A-14. Recently completed and ongoing antimalarial therapeutic efficacy studies

Most Recent Study Year	Sites	PMI Funded Y/N	Treatment Arms	PCR-Corrected Efficacy>90%
2020[1]	Kolda	Y	AL, ASAQ	Y
2020[1]	Kaolack	Y	AL, ASAQ	Y

Ongoing TES: None **Next Planned TES:** 2021

ACPR: adequate clinical and parasitological response. AL: artemether-lumefantrine; ASAQ: amodiaquine-artesunate; DP: dihydroartemisinin-piperaquine. PARMA: PMI-supported Antimalarial Resistance Monitoring in Africa.

[1]Ndiaye, D., Sene, D. Rapport Sur La: Surveillance de l'efficacité et de la tolérance des combinaisons Artemether Lumefantrine et Artesunate-Amodiaquine dans la prise en charge du paludisme non compliqué à Plasmodium falciparum au Sénégal. 2020.

Therapeutic efficacy studies are performed every year in Senegal with recruitment in two different sites, which are updated yearly. There is evidence that the first-line ACTs used in Senegal continue to be effective as of 2020. Additionally, there is advanced in-country capacity to perform the laboratory testing for antimalarial resistance markers.

Key Question 9

Are there other areas (e.g., lab strengthening, private sector support, etc.) that should be considered for PMI-support?

Supporting Data

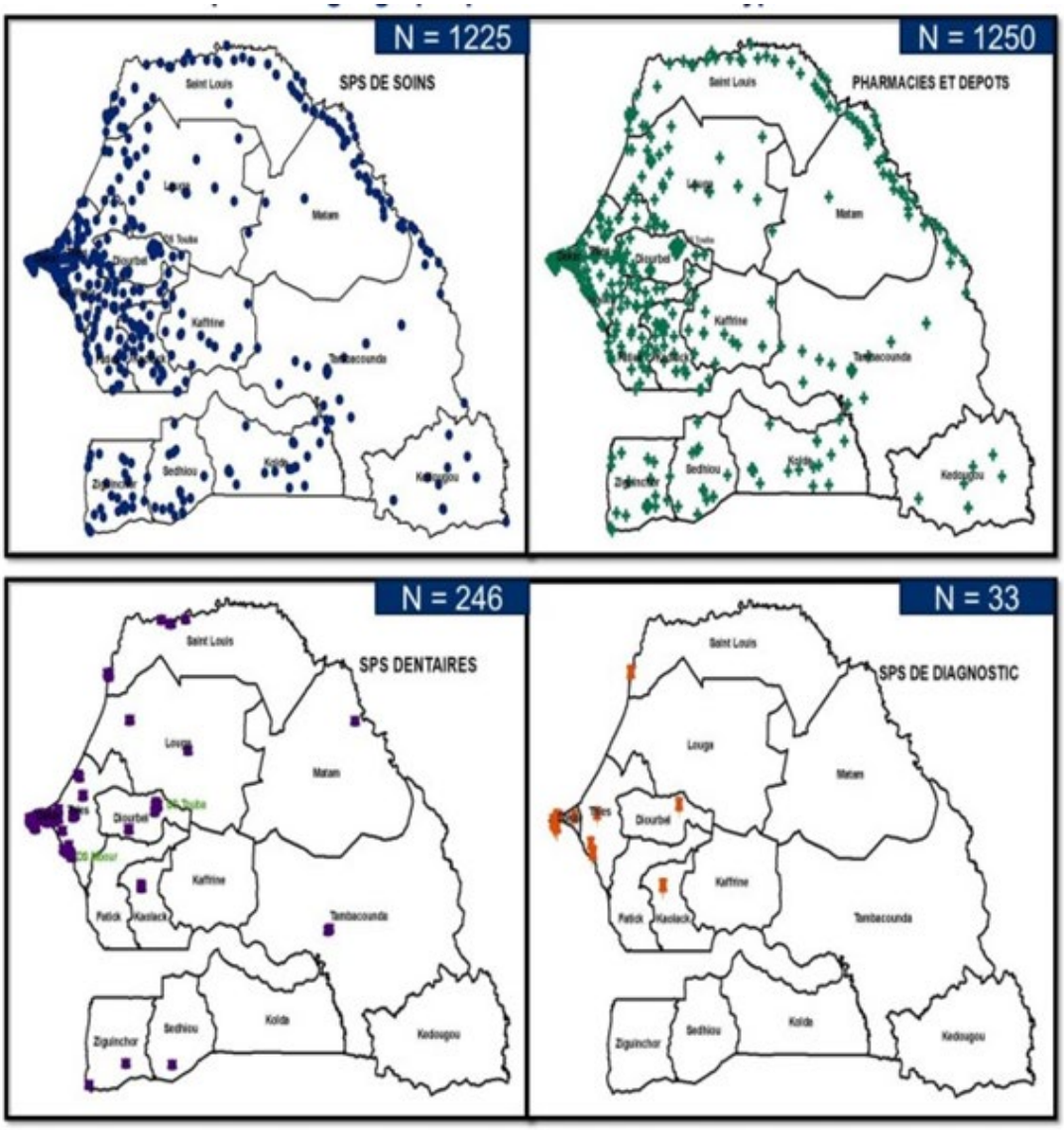
Laboratory Strengthening

Laboratory capacity strengthening to ensure quality diagnostic capacity remains a priority. Maintaining microscopy diagnosis capacity in low-transmission areas where few positive slides are processed by health facilities is a significant operational challenge. In 2020 the introduction of molecular biology diagnostics (LAMP assays) at health facilities in 2021 with support from IDB may change the diagnostic capacity of these facilities, but the operational implications of introducing this new technology remains to be seen. PMI will continue to support training, supervision, certification, and quality control activities for RDTs and microscopy.

Private Sector Support

The mapping of private health structures was performed in 2017 by the MSAS and ASPS with technical support from Sustaining Health Outcomes through the Private Sector (SHOPS) Plus and USAID funding. There were 2,754 private health structures identified within the country. The majority are located in urban areas (86.8 percent) with more than half in Dakar region (51.8 percent). Almost half (45.4 percent) are pharmacies, while 36.6 percent are medical or paramedical facilities.

Figure A-17. Geographical distribution of private health structures, by type of structure



Private Sector engagement in 2020 – NMCP-implemented activities:

- Updated private sector mapping to identify private health structures providing malaria services
- Included private sector health workers in NMCP training plan
- Provided case management tools for selected private sector structures

- Planned regular review on quality case management with private health structures
- Established a partnership between the case management office and several private structures; working on harmonization of malaria services with national guidelines
- Organized training of obstetricians and pediatricians on national case management guidelines for pregnant women (funded by the Global Fund)
- Initial brainstorming with pharmacies on how to effectively engage them in malaria prevention activities and discuss the possibility and implications of providing malaria diagnosis (RDTs) in their structures.

There have been key activities related to private sector engagement that the NMCP has undertaken in 2020; however, there are still many needed activities to fully engage the private sector:

- Increase the number of private health workers benefiting from training on national guidelines
- Update the private sector mapping
- Provide commodities and case management tools to health facilities in the private sector

FY 2020 funding allocated $95,571 for the acceleration of the improvement of case management in the private sector and this activity will be implemented by the NMCP. PMI will provide $100,000 in FY 2020 and in FY 2021 MOPs (for implementation in 2021 and 2022, respectively) for development and testing of innovative approaches to improving malaria service provision in the private sector. Successful approaches will be replicated in other urban settings beyond the three target districts in Dakar region.

Conclusions for Case Management Investments

To reach our case management objectives and contribute to the reduction of malaria mortality, the NMCP aims to scale up PECADOM+ at community level in time and space to better cover the malaria transmission period. The budget for this activity of a target of "one DSDOM, one village" in the Southeastern region of the country will help to accelerate malaria control at community level.

There is also a need to better engage the private sector and reduce case management gaps in private health structures.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2. DRUG-BASED PREVENTION

NMCP Objective

Malaria in Pregnancy (MIP)

- Protect at least 80 percent of pregnant women with IPTp with three doses of SP in accordance with the national guidelines by 2025

Seasonal Malaria Chemoprevention (SMC)

- Ensure 95 percent yearly coverage of children 3-120 months old in areas targeted for SMC by 2025

Mass Drug Administration

- Ensure 95 percent MDA coverage of targeted population in eligible districts

NMCP Approach

MIP

The protection of pregnant women remains a major intervention in the NMCP strategy because malaria infection during pregnancy continues to be a public health problem in Senegal, with substantial risks for the mother, her fetus, and the newborn. The NMCP recommends that all pregnant women receive at least three doses of sulfadoxine-pyrimethamine (SP) as intermittent preventive treatment during pregnancy, beginning as early as 13 weeks gestational age and administered one month apart until delivery. Additional doses can be given up to childbirth respecting the interval of at least one month between two doses. Despite the progress made over the past five years, disparate levels of IPT2 and IPT3 coverage are still observed in some districts of Senegal as reflected in routine health data. To fill these gaps in coverage, the NMCP and the health system have been piloting a district-driven initiative of IPTp delivery at the community level. The approach consists of distribution of SP by CHWs to pregnant women starting in the second trimester of pregnancy after a census of this target population. The initial results indicate an improvement of coverage as well as an increase in completion of prenatal consultations.

SMC

The Senegal NMCP began SMC implementation in 2013, since its recommendation by WHO in 2012, including children up to ten years of age. Much of the existing research on SMC was conducted in Senegal, first in children under five years of age and subsequently in children under ten years of age.

In 2018, SMC was interrupted due to a strike in the healthcare sector. In 2019, the SMC campaign strategy was readjusted based on the evolving malaria epidemiology in Senegal to cover a total of 19 districts, adding the Kaolack, Touba and Diourbel districts in the central zone. Additionally, a directly observed therapy (DOT) strategy for all three days was implemented to ensure compliance with the SMC guidelines for drug administration. Monthly sweeps for three months are implemented in the Diourbel, Kolda, and Tambacounda regions, and four months in Kédougou, based on the respective length of the malaria transmission season in these regions.

In 2020, the region of Sédiou was phased out of the SMC campaign, as it had seen a significant reduction in incidence over the years. Due to the COVID-19 pandemic a contingency plan was developed to mitigate the COVID-19 context at community level and ensure the safe implementation of the door-to-door SMC campaign.

PMI Objective in Support of NMCP

PMI supports the national strategy for MIP and SMC. The support for MIP includes the provision of ITNs at first ANC visit and monthly IPTp administration starting at the fourth month of pregnancy. To date, SP remains the primary malaria commodity the country has committed to procuring through its national pharmacy. PMI remains aligned with this commitment and will focus its MIP support on implementing service delivery and SBC activities. PMI has also supported SMC in Senegal since 2013 in all targeted areas which includes three or four rounds depending on the length of the raining season, for children 3 to 120 months of age.

PMI-Supported Recent Progress (CY 2020 implementation)

SMC

- PMI supported the implementation of 2020 SMC campaigns in five medical regions and 16 districts from June to October with four rounds in Kedougou region and three rounds in all other selected regions and districts
- 711,551 children 3 to 120 months of age were treated with a coverage of 95 percent
- 13,292 CHWs were involved in the SMC campaign
- A DOTS 3 approach was used to ensure compliance with the SMC guidelines for drug administration. All procedures were adapted to the COVID-19 pandemic context, to ensure safe implementation of the campaign

MIP

- PMI supported the implementation of IPTp at health facility level and the pilot of community IPTp in five regions (Diourbel, Kolda, Kedougou, Sedhiou, and Tambacounda)
- PMI supported the orientation of 431 providers in nine health districts on IPTp at community level
- PMI also supported the training of 827 CHWs (Bajenu Gokh, DSDOM) on the importance of IPTp and malaria prevention and promoted the early ANC attendance and uptake of SP to prevent malaria in pregnancy

PMI-Supported Planned Activities (CY 2021–2022 implementation)

SMC

PMI is the only financial partner that supports SMC in Senegal.

- Planning and coordination of the yearly campaign
- Training/refresher training of nurses and CHWs
- Procurement of SBCC tools and implementation of communication activities (national launch, community mobilization, media coverage)
- Door-to-door drug distribution with DOTS approach on all days
- Supervision of field activities
- National evaluation of the 2021 SMC campaign and planning for the 2022 campaign
- Implementation of SMC campaign in 2021 in 16 target districts, targeting 870,923 children 3 to 120 months of age with four rounds in Kedougou region and three rounds in all other selected regions and districts
- PMI support covers both commodity cost and operational costs for the SMC campaign (including SBCC activities)

MIP

- Continued training and supportive supervision for ANC providers nationwide
- Continued support of SBC interventions focused on promoting early and regular ANC attendance and IPTp uptake in regions with low level of performance

- Support the implementation of an innovative approach of community-level delivery of IPTp in 20 districts, complementing Global Fund investments to fill nationwide needs

Please see FY 2022 MOP budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.1. MALARIA IN PREGNANCY (MIP)

Key Goal

Support the national strategy for MIP, which includes provision of ITNs at the first antenatal care (ANC) visit, a minimum of three doses of intermittent preventive treatment for pregnant women (IPTp) in malaria endemic areas starting at 13 weeks gestational age, and effective case management of malaria per WHO and NMCP guidelines.

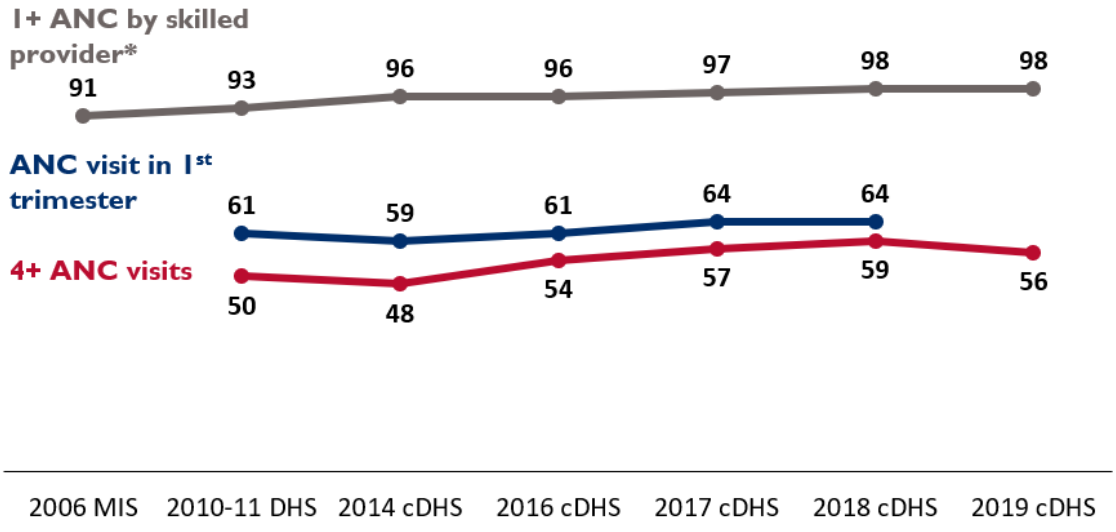
Key Question 1a

What proportion of pregnant women are accessing ANC early and frequently (as recommended by national and/or WHO strategies) during their pregnancy?

Supporting Data

Figure A-18. Trends in ANC coverage

Women 15 to 49 years of age with a live birth in the five years before the survey (most recent birth)



**Skilled provider includes doctor, nurse, or midwife.*

Key Question 1b

Are there important health systems and/or behavioral barriers to ANC attendance at health facilities?

Supporting Data

In 2003, Senegal adopted intermittent preventive treatment in pregnant women with SP given free of charge as directly observed therapy during focused ANC visits in all ANC sites nationwide. In 2014, the NMCP updated its policy and training materials to reflect WHO recommendations. One key recommendation supported by the NMCP is that SP be given as early as possible in the second trimester with a one-month interval between two doses of SP.

The NMCP's Strategic Plan highlights four key IPTp interventions:

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 IPTp implementation
4. Engaging the private sector

The most recent data show that a high proportion of pregnant women attend ANC at least once (98 percent), though the gap between this proportion and the proportion of women with at least four ANC visits remains wide. Only 56 percent of women attended four or more ANC visits, which has also decreased 3 percent since the last data point in 2018. Because there is a substantial gap between the proportion of women attending one or more ANC visits and the proportion who have an ANC visit in their first trimester, this points to late initiation of ANC, in addition to a lack of return visits (either due to late initiation or deprioritization of repeat visits.) Structurally, lack of access to services is a fundamental challenge, particularly in remote areas. In KKT regions in particular, behavioral barriers such as keeping pregnancy secret or requiring spousal permission before an ANC visit (in addition to economic barriers such as costs of transportation and ANC services) pose challenges. These barriers to access are often exacerbated during the rainy season.

Please refer to Section 3.4. for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 2

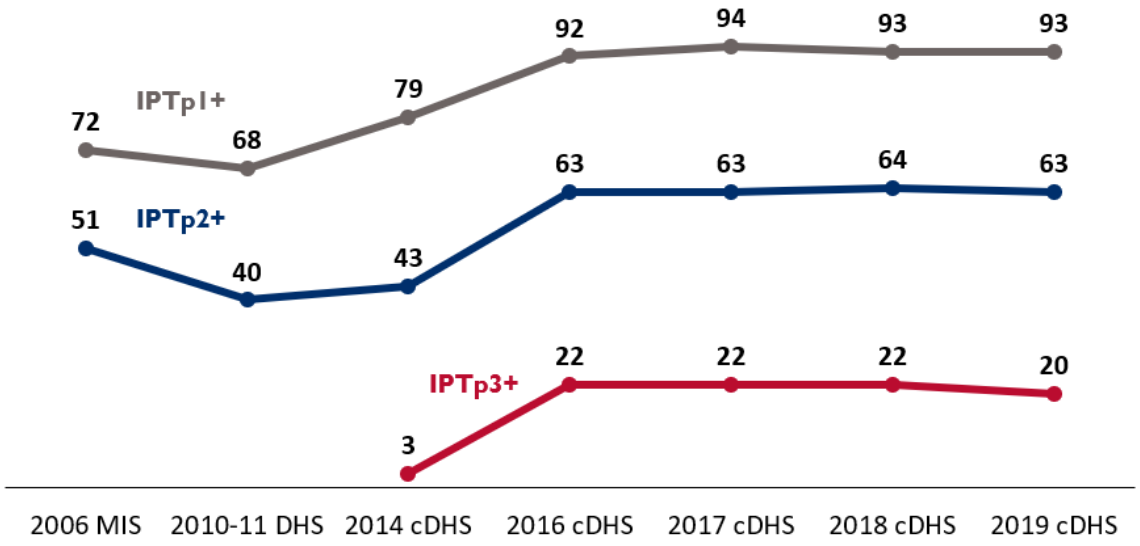
What proportion of pregnant women are receiving the recommended doses of IPTp?

According to Senegal's Demographic and Health Surveys, the proportion of women who had at least one dose of SP as intermittent preventive treatment has hovered between 92 and 94 percent since 2016. The proportion of pregnant women receiving two rounds of IPTp has also remained fairly stagnant throughout the same period, although there is more room for improvement; in 2019, the percentage of pregnant women receiving two rounds of IPTp was 63 percent. We observe the same trend for pregnant women receiving three rounds of IPTP, where very little has changed since 2016, and the proportion remains very low, even decreasing from 22 percent in 2018 to 20 percent in 2019. Senegal's routine data shows a more positive picture of IPTp coverage over time. In 2017 and 2018, Senegal experienced dips in coverage of both IPT 2 and IPT 3 due to shortages of SP. However, since then, coverage has steadily improved with record highs for both IPT 2 and IPT 3 in 2020 at 75 percent and 62.9 percent respectively.

Figure A-19. Trends in IPTp

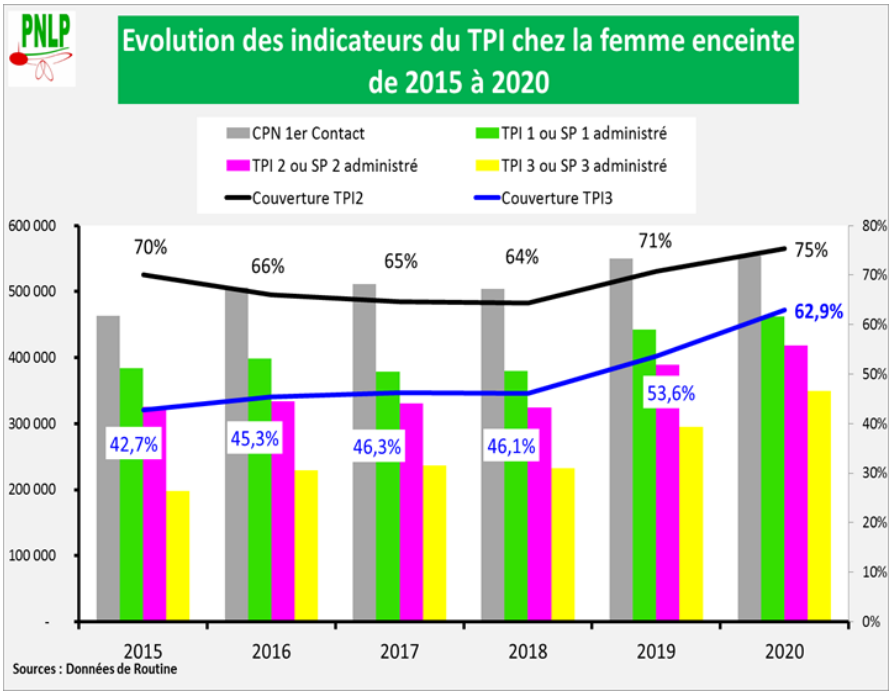
Women 15 to 49 years of age with a live birth in the two years before the survey who received the specified number of doses of SP/Fansidar during their last pregnancy

Note: IPTp3 baseline uses the first survey available after the recommendation was updated to three or more doses



Note that this indicator has been recalculated according to the newest definition, the specified number of doses of SP/Fansidar from any source.

Figure A-20. Trends in IPTp coverage among pregnant women as reported in routine data, 2015–2020



Key Question 3a

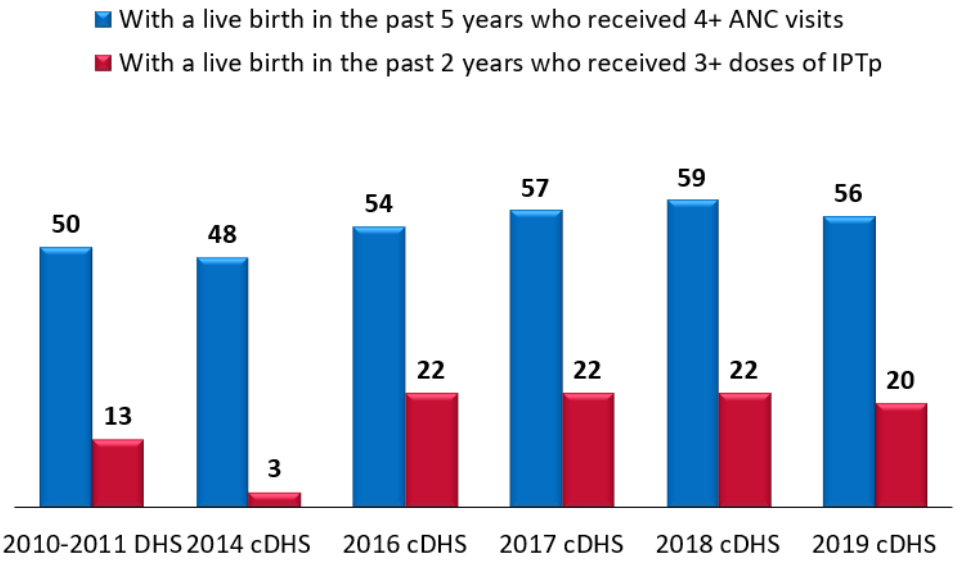
What is the gap between ANC attendance and IPTp uptake (i.e., missed opportunities for giving IPTp at ANC)?

Among women 15 to 49 years of age who reported being pregnant within the past five years, there has been a steady increase in the proportion of women who reported attending four or more ANC visits, aside from a dip from 59 percent in 2018 to 56 percent in 2019. Only 20 percent of women who were pregnant within the past two years reported receiving three or more doses of IPTp in 2019, a 2 percent drop from 2018. This figure highlights that although a larger proportion of women are attending the recommended number of ANC visits, they are still not receiving the recommended number of doses of SP as IPTp.

Supporting Data

Figure A-21. Trends in missed opportunities for IPTp

ANC visits and IPTp among recently pregnant women 15 to 49 years of age



Key Question 3b

What significant health system and/or behavioral challenges affect provider delivery of MIP services (e.g., IPTp and ITN distribution at ANC)?

Supporting Data

The household survey data included above highlight a clear gap between ANC attendance and uptake (or provision) of IPTp. In short, these data points indicate that missed opportunities for ANC providers to administer IPTp to eligible pregnant women are a contributor to low IPTp uptake in Senegal. While the gap narrows slightly between the two household survey data points, it is still a substantial service delivery problem. The 2019 SPA highlighted that the availability of SP at health facilities has improved from 38 percent in 2017 to 81 percent in 2019, but lack of availability of SP is still an issue impacting provision of IPTp, as reported during the quarterly malaria routine data reviews performed in the country. Another relevant issue is training. According to the SPA, among health facilities offering malaria services, in 2019 only 63 percent of facilities had staff trained in IPTp, and this number has been steadily decreasing from 71 percent in 2017. Aside from access to SP and training on when/how to correctly administer it, there may be other important social or individual factors influencing ANC provider behavior related to administration of IPTp.

Please refer to Section 3.4. for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 4

Does the national ANC program or health information system collect data and track the proportion of pregnant women with fever, those tested for malaria, those found to have malaria infection, and those who are treated? If yes, provide available information here.

Supporting Data

Senegal's HMIS does collect malaria-specific data on pregnant women, such as a cascade of the annual proportion of suspected malaria cases in pregnant women, the annual proportion of pregnant women tested for malaria among the suspected, the annual proportion of positive malaria tests among pregnant women tested, and the annual proportion of pregnant women given ACTs among those who tested positive for malaria.

According to DHIS2 and the NMCP's annual epidemiologic bulletin for malaria, since 2015, the percentage of pregnant women who were suspected to have malaria that were provided a malaria test has remained solidly at 99 percent. The rate of malaria positivity in pregnant women has decreased from 35 percent in 2015 to 20 percent in 2020. Among those pregnant women who tested positive for malaria, the proportion who were provided with an ACT has increased steadily from 95 percent in 2015 to 99 percent in 2020.

Key Question 5

What is the estimated need for SP during 2021–2023? Are there any anticipated SP gaps? Are there gaps in other IPTp commodities?

Table A-15. SP Gap Analysis Table

Calendar Year	2021	2022	2023
Total Country Population	17,223,497	17,738,795	18,275,743
Total Population at Risk for Malaria	17,223,497	17,738,795	18,275,743
PMI Targeted at Risk Population	17,223,497	17,738,795	18,275,743
SP Needs			
Total Number of Pregnant Women	628,658	647,466	667,065
Proportion of women expected to attend ANC1 at 13 weeks or greater	70%	75%	80%
Proportion of women expected to attend ANC2	78%	79%	80%
Proportion of women expected to attend ANC3	72%	74%	75%
Proportion of women expected to attend ANC4	60%	62%	65%
Total SP Needs (treatments)	***1,760,241***	***1,877,651***	***2,001,194***
Needs Estimated based on Other (specify in comments)			
Partner Contributions (treatments)			
SP from Government	0	0	0
SP from Global Fund	0	914,100	1,540,950
SP from Other Donors	0	0	0
SP planned with PMI funding	0	0	0
Total SP Contributions per Calendar Year	***0***	***914,100***	***1,540,950***
Stock Balance (treatments)			
Beginning balance	1,645,600	0	0
- Product Need	1,760,241	1,877,651	2,001,194
+ Total Contributions (Received/expected)	0	914,100	1,540,950
Ending Balance	-114,641	-963,551	-460,244
Desired End of Year Stock (months of stock)	3	3	3
Desired End of Year Stock (quantities)	440,060	469,413	500,298
Total Surplus (Gap)	***-554,702***	***-1,432,964***	***-960,542***

Quantification Assumptions for Sulfadoxine-Pyrimethamine

- The starting point for sulfadoxine-pyrimethamine quantification is the number of pregnant women in PMI intervention provinces, estimated at 3.65 percent of population
- ANC attendance (1, 2, 3, and 4) is taken from the DHIS2 for 2020. In 2020, the proportion of women attending ANC 1 was 54 percent. For ANC 1, Senegal has targeted 87 percent for 2021, 88 percent in 2022, and 90 percent in 2023. In 2020, the proportion of women attending ANC 2 was 76 percent; targets for ANC 2 are 78 percent in 2021, 79 percent in 2022, and 80 percent in 2023. For ANC 3, this figure in 2020 was 70 percent; it is estimated that this figure will be 72 percent in 2021, 74 percent in 2022, and 75 percent in 2023. Lastly, the proportion of pregnant women who attended ANC 4 was 58

percent in 2020; the expected proportions are 60 percent in 2021, 62 percent in 2022, and 65 percent in 2023

- SP needs are for the calendar year (12 months)
- Using these assumptions there is a gap for 2021, 2022, and 2023. However, some of these gaps will be covered by the remaining SP stock from 2020, 2021, and 2022
- In an effort to encourage domestic investments in the fight against malaria, PMI has advocated for the country to purchase one malaria commodity and Senegal has committed to purchasing SP through its country's National Pharmacy. Despite some of the challenges in covering the SP needs, PMI believes it is important to support this strategic decision made several years back and continue to support Senegal with its advocacy for domestic investment in malaria commodities

Conclusions for MIP Investments

PMI will continue to support MIP activities with a similar package of interventions supported in previous years. These activities include training and supportive supervision for ANC providers. PMI will continue to support SBC interventions focused on promoting early and regular ANC, as well as ANC provider behaviors to address missed opportunities to provide IPTp for eligible pregnant women at ANC. Starting in 2022, PMI will support the implementation of an innovative approach of community-level delivery of IPTp in 20 districts, complementing Global Fund investments to fill nationwide needs. PMI proposes to continue this support with FY 2022 resources. Please see FY 2022 MOP budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.2. SEASONAL MALARIA CHEMOPREVENTION (SMC)

Key Goal

Support the national strategy for SMC, targeting relevant geographic areas and age groups, which includes three to five rounds (depending on the region and district, – see Figure A-22), for children 3 to 120 months of age.

Key Question 1

What is the estimated need for SMC drug (SPAQ) during calendar years 2021–2023? Are there any projected SPAQ gaps?

Supporting Data

The estimated need for SMC commodities during CY 2021 is as follows: 4,392,063 doses of co-blister SPAQ to cover a target population of 870,923 children 3 to 120 months of age.

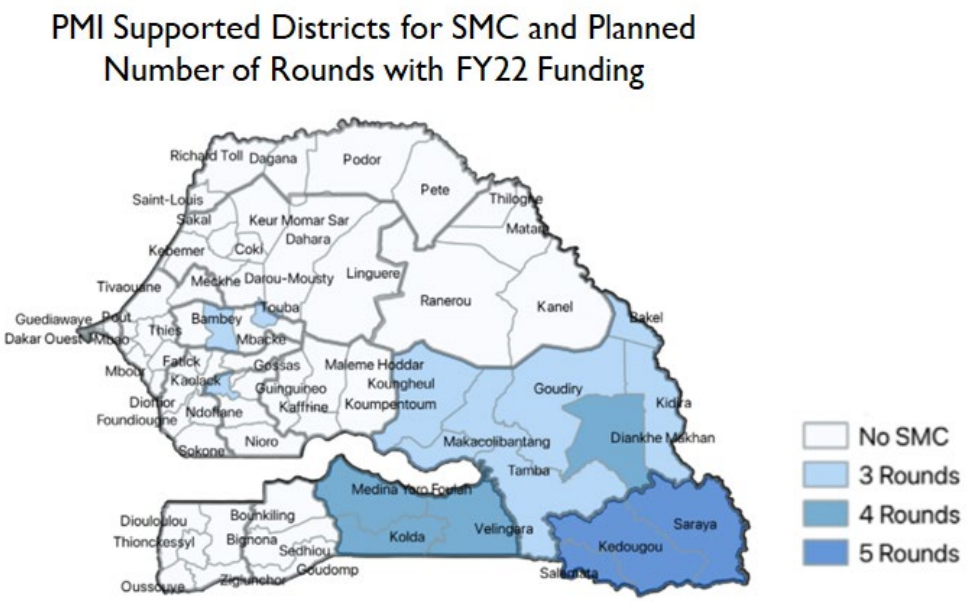
The NMCP has estimated its needs for 2022 and 2023 calendar year campaigns respectively as 4,534,281 and 6,769,464 doses of co-blister SPAQ to cover a target population of 894,438 and 918,588 children 3 to 120 months of age.

See gap analysis tables for commodity gap details. There are no projected SPAQ gaps.

Table A-16. SMC Gap Analysis Table

Calendar Year	2021	2022	2023
Total population in the SMC targeted age range	870,923	894,438	918,588
SMC Drug (SP+AQ) Needs			
National population 3-11 months targeted for SMC	82,462	84,689	86,975
National population 12-59 months targeted for SMC	433,941	445,657	457,690
National population 60-120 months targeted for SMC	354,520	364,092	373,923
Total national population targeted for SMC	*870,923*	*894,438*	*918,588*
PMI population 3-11 months targeted for SMC	82,462	84,689	86,975
PMI population 12-59 months targeted for SMC	433,941	445,657	457,690
National population 60-120 months targeted for SMC	354,520	364,092	373,923
Total PMI population targeted for SMC	*870,923*	*894,438*	*918,588*
Total SP+AQ Needs (co-blisters)	***4,392,063***	***4,534,281***	***6,769,464***
Partner Contributions (co-blisters, national)			
SP+AQ carried over from previous year	474,453	18,890	0
SP+AQ from Government	0	0	0
SP+AQ from Global Fund	0	0	0
SP+AQ from other donors	0	0	0
SP+AQ planned with PMI funding	3,936,500	4,515,391	6,769,464
Total SP+AQ Contributions per Calendar Year	*4,410,953*	*4,534,281*	*6,769,464*
Total SP+AQ Surplus (Gap)	*18,890*	*0*	*0*

Figure A-22. Target areas for SMC in 2021–2023 and planned number of rounds with FY 2022 funding



Note: In addition to Diankhe Makhan district, there will be two additional districts in Tambacounda region that will receive 4 rounds of SMC

Sixteen districts in the five highest burden regions (Kédougou, Kolda, Tambacounda, Kaolack, and Diourbel) will be targeted for the upcoming SMC campaigns. All districts in the KKT regions as well as Touba, Diourbel, and Kaolack districts will benefit from the intervention. In 2021, there will be monthly sweeps for four months in Kédougou and three months in all the other target regions. However, based on the observed length of malaria transmission season in these regions, starting in 2022 an additional monthly sweep will be added to districts to cover a larger portion of the malaria transmission season. The map in Figure A-22 indicates the target areas for SMC during the 2021–2023 campaigns and the number of planned rounds starting in 2023.

Key Question 2

What are the estimated non-commodity resources needed to properly deliver SMC over the next three years (e.g., staffing, SBC, etc.)?

Supporting Data

PMI is the only donor that supports SMC in Senegal and that includes both commodity and non-commodity costs. The non-commodity cost refers to operational costs and includes a range of activities such as planning, training, implementation, communication, supervision, monitoring, transportation, materials, equipment, and campaign evaluation. In addition, the DOT approach on all treatment days that has been used since 2019 will continue. The operational cost for SMC for the next three campaigns (2021–2023) is estimated at $8,150,000, which also includes the additional resources required to include COVID-19 protective measures and materials. Starting in 2020, the implementation of the SMC campaign benefits from the support of a bilateral implementing partner while maintaining the coordination and planning role of the NMCP. Feedback gathered during the national evaluation of the 2020 SMC campaign indicates that the support of the implementing partners ensured the timely availability of resources (financial, commodities and tools) at the operational level. Thus the same mechanism and model of implementation will be maintained for 2021–2023.

Key Question 3

If refusal or adherence to full dosing of SMC is a challenge, what behavioral challenges affect SMC acceptance and adherence?

Supporting Data

Data about refusals are mostly gathered from the supervision activities during the administration phase, as well as from specific surveys (MBS, end of campaign evaluations). Data have shown that districts that have benefited from SMC since the beginning are less likely to present high refusal rates and coverage is higher than in other districts.

- *The side effects of drugs dispensed during the SMC campaign are poorly explained and little understood by the population: In a recent malaria behavior survey, 67.2 percent of caretakers interviewed* whose children had received SPAQ reported adverse effects (diarrhea, vomiting, etc.) right after the administration of the drug and expressed concerns that the drug was making their children sick. Additionally, 59.0 percent of them felt that these consequences reduced the effectiveness of the drugs. Some caretakers believe the medication is "too powerful" due to these side effects. (2019–2020 MBS in Kolda district)
- *Caretakers' reluctance to administer the SMC drugs:* Caretakers have been reluctant to directly administer the SMC drugs because they fear the side effects and the possible financial implications of needing medical care to address these side effects. However, caretakers do not dare to refuse the tablets in front of the healthcare provider or CHW. From 2019, all SPAQ tablets are provided directly under the direct observation of the CHW (DOT3 approach). Recent campaign data shows high coverage levels with this new strategy, but this can be perceived as an authoritarian intervention that caretakers cannot avoid or risk being stigmatized by health professionals. Severe adverse events (such as the death of a child during the 2019 campaign in Tambacounda) associated by the populations to the intake of SMC drugs may affect acceptance of SMC in future campaigns. Some caretakers hold the belief that the SMC campaign targets children to reduce their fertility later in life. This is mainly seen in areas where heads of household are abroad and give clear instructions not to accept the intervention. (Data source: 2019–2020 MBS in target SMC districts; 2019 and 2020 SMC campaign national evaluations)

  Despite these challenges, it should be noted that due to the absence of the 2018 SMC campaign (caused by a health workers' strike), the population witnessed an increase in severe malaria cases in children, which was seen as proof of the effectiveness of SMC and improved adherence to SMC during the subsequent campaigns. (Data source: 2019–2020 MBS in target SMC districts)
- *Insufficient communication about SMC prior and during the campaign*: Refusals can often be linked to insufficient communication targeted to the general population in SMC districts or to authority figures (head of household, and village and religious leaders). Some people interviewed reported they were not aware of the activity. Additionally, lack of buy-in from community or religious leaders is associated with higher refusal rates within the community. During the 2020 SMC campaign, a lack of sensitization prior to the campaign of village and religious leaders was noted. The reported refusal rate was 2 percent for the district of Tambacounda on day 1 of the first monthly sweep there, which is quite high. The same trend has been noted during the 2020 campaign in all three "new" districts where SMC was recently introduced (Touba, Diourbel, and Kaolack), which each had refusal rates of 5.7 percent, 6.4 percent, and

6.5 percent, respectively, at the end of the first monthly sweep. Insufficient SBC and information, education, and communication (IEC) messaging before the launch of the campaign was cited as a reason for higher than usual refusals. For the 2020 campaign, the national and regional launches were not implemented due to concerns related to the COVID-19 and this limited the visibility of the campaign both in the country and within the Senegalese diaspora (often heads of households working abroad). The operational level reported that the budget allocated to communication activities was insufficient and often transferred late from the central level. This negatively affects implementation of SBC and IEC activities. (Data source: 2019–2020 MBS in target SMC districts, 2019 and 2020 evaluations of the national SMC campaign, and SMC campaign daily bulletins)

- The SMC campaign was not spared the context of COVID-19 and the pandemic was a barrier to the implementation of SMC, particularly in the Diourbel region. The 2020 campaign evaluation data showed that COVID-19 has conditioned the perception of communities in the area. This is because the SMC drugs were perceived as an experimental treatment of COVID-19. This is due to the many rumors circulating about the management of COVID-19 in social media. The most dominant rumor is that Africa will be the laboratory for testing the treatment and a possible vaccine against COVID-19 and consequently has led to the refusal of some communities.

Conclusions for SMC Investments

PMI will continue to support SMC interventions among children 3 to 120 months of age in 16 target districts located in five high-burden regions of Senegal, as in the previous year (Figure A-22). However, the campaign will be extended for an additional monthly sweep in priority districts based on an updated analysis of the epidemiological profile. The malaria transmission season extends for at least six months and detailed analysis of the 2020 epidemiological data indicates that over 50 percent of annual cases of simple malaria, severe malaria and deaths among children under five years of age were reported after the last SMC sweep in these priority districts. Accordingly, a fourth monthly sweep will be implemented in the district of Dianke Makha starting with FY 2021 support, to ensure better coverage of vulnerable children during the 2022 transmission season. For the 2023 campaign supported with FY 2022 funding, PMI proposes to further support an additional monthly sweep in the districts of Kolda, Kedougou and one to three priority districts in Tambacounda (Figures A-22 and A-24). There will be five rounds in the Kedougou region, four rounds in the Kolda region, and up to three districts in Tambacounda region, with the remaining districts in Tambacounda region receiving three rounds with selected districts in Diourbel and Kaolack also with three rounds. The target population for the 2023 campaign is 918,588 children 3 to 120 months of age.

Reaching children 3 to 11 months of age is a challenge in some districts such as Diourbel, Touba, Kaolack, and Kédougou. Necessary efforts should be done to identify any barriers that could limit the coverage of that specific target. The annual evaluation meeting that will identify lessons learned from the campaign could be an opportunity to start reflecting and proposing approaches to address the issue.

The DOT approach on all days of the SMC campaign has helped reach a high level of coverage (Figure A-23) and circumvent key challenges with adherence. This approach will be maintained, incorporating COVID-19 modifications as needed (direct observation of SPAQ at a safe distance and use of protective equipment).

Emphasis should be put on advocacy to ensure support from community leaders, and extensive and varied communication for a wide reach of target communities (sensitization of local and religious authorities, community mobilization, and interpersonal communication). Resources for SMC communication activities were increased starting with FY 2021 support.

The estimated SMC cost is based on the current epidemiological profile that may change over time. We expect that interventions will have a substantial impact on malaria morbidity as long as they are being scaled up. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

Figure A-23. DOTS administrative DOTS coverage by district and age group, SMC campaign 2019

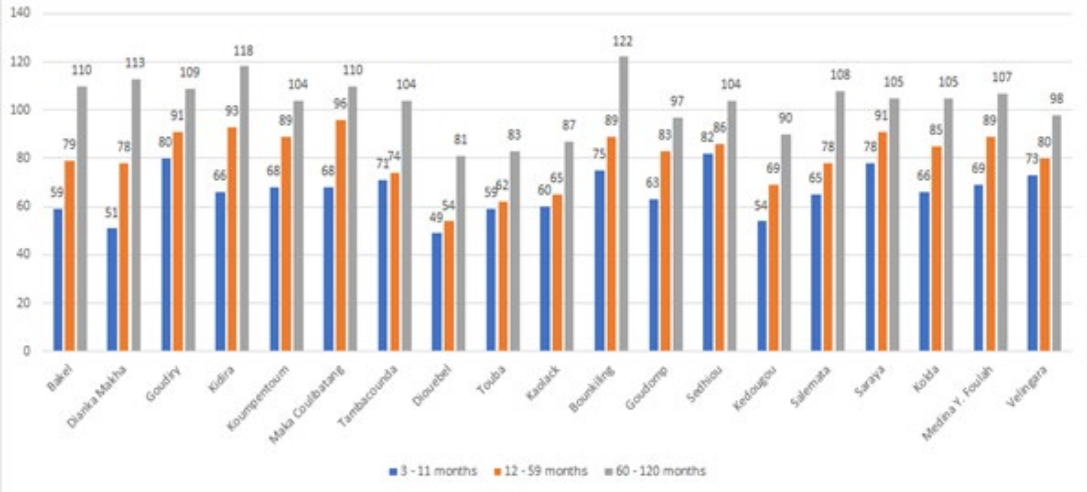
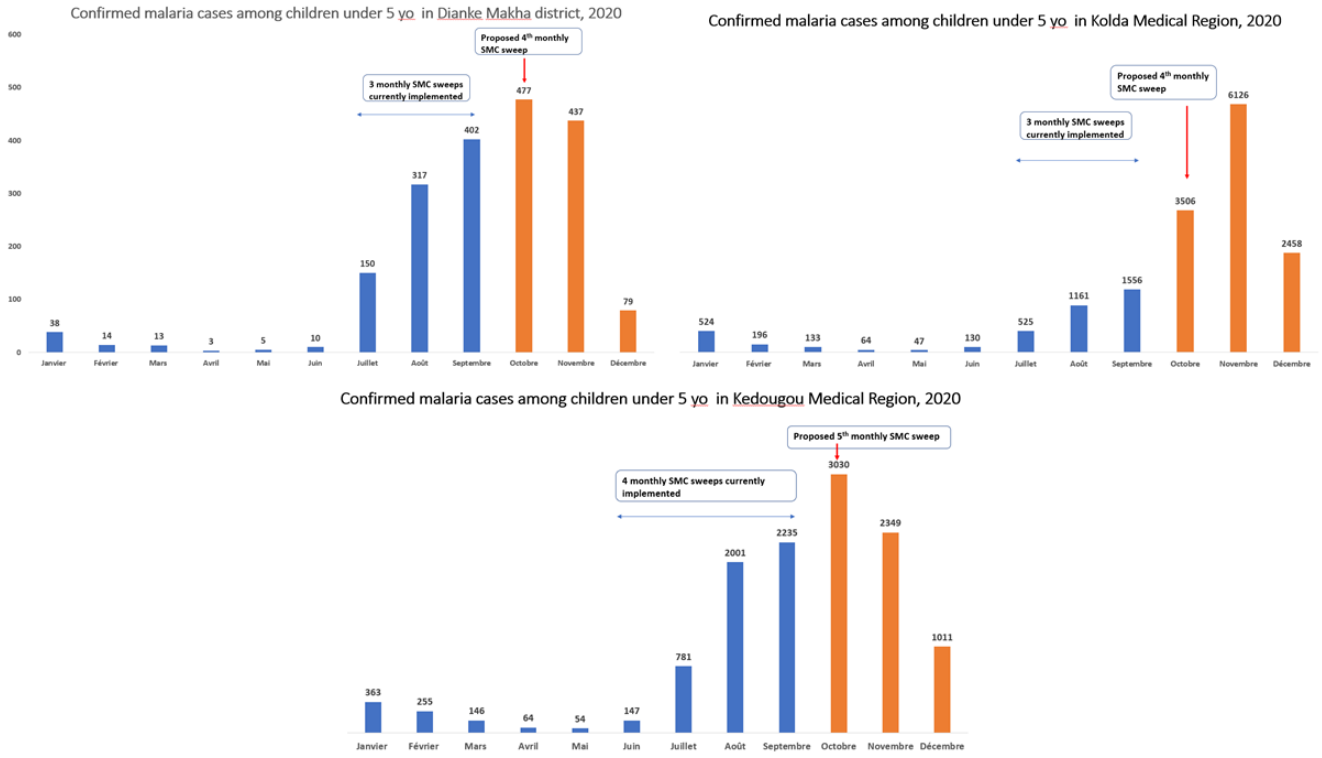


Figure A-24. Temporal distribution of 2020 confirmed malaria cases among children under five years of age in the district of Dianke Makha, Kolda region, and Kedougou region, and proposed timing of additional monthly SMC sweep



2.2.3. ADDITIONAL DRUG-BASED PREVENTIVE STRATEGIES

Country Goal

As stated in the country's National Malaria Strategic Plan 2021–2025 (NSP 2021–2025), Senegal's goal is to reach elimination by 2030. There one general objective related to elimination in the updated NSP 2021–2025 is to interrupt local transmission in at least 80 percent of eligible districts in 2019.

With this objective in mind, several specific objectives related to drug-based prevention have been included in the NSP 2021–2025:

- Ensure MDA coverage of 95 percent of the target population in the areas concerned
- Have at least 80 percent of embassy, airport, hotel, and port officials share aspects of traveler malaria chemoprophylaxis according to NMCP guidelines
- Control 100 percent of epidemics and emergencies within one week of detection

Figure 6 summarizes the geographical scope of malaria interventions within Senegal. In brief, case investigations are to be implemented in the north-western low-burden regions (annual incidence <5 cases/1,000 population), pending OR results MDA is to be implemented in the south-eastern high- burden regions (annual incidence >25 cases/1,000 population), while the promotion of malaria chemoprophylaxis in travelers is implemented nationwide.

Case investigations and outbreak response in pre-elimination districts

In pre-elimination districts (annual incidence <5 cases/1,000 population), the NMCP has implemented case investigations. All malaria cases will be documented and investigated within 72 hours. The investigation of the index case will trigger a response, which may include an FTAT or FDA approach using dihydroartemisinin-piperaquine (DHA-PQ) and single low-dose primaquine as the drugs of choice in the index case's household and neighboring concession. In the event of a malaria outbreak (defined as the detection of 5 malaria cases within a 100 m radius within 15 days), an FDA approach is used to treat all eligible contacts within a 100 m radius. In 2020, case investigations were implemented in 10 northern districts. The NMCP plans to extend these case investigations to a total of 35 eligible districts in 2021 with financial support from PMI, IDB, and BMGF and technical support from PATH/ Malaria Control and Elimination Partnership in Africa (MACEPA).

MDA intervention in higher burden districts (annual incidence >25 cases/1,000 population)

With the support from PMI, Senegal NMCP is testing an MDA intervention as an OR study (see OR section for further details). This is a cluster randomized controlled trial and the purpose of this study is to determine whether time-limited MDA with DHA-PQ and primaquine will be able to rapidly reduce malaria incidence in areas of moderate-to-low malaria transmission settings of Senegal where control activities are ongoing so that the program can reorient their malaria strategy to implement elimination interventions in these settings. The study was initiated in 2020, with implementation of the MDA intervention in 2021 and preliminary data being available in 2022. If the intervention proves effective, the NMCP proposes to scale up the intervention to all eligible districts starting in 2022–2023.

Malaria chemoprophylaxis in travelers

Training sessions will be organized to educate employees from embassies, airports, hotels, and ports about the national directives related to Malaria chemoprophylaxis in travelers. Information materials (posters and flyers) will be distributed. Special focus will be placed on tourist areas with a high malaria burden. Supportive supervision will be performed on a biannual basis to monitor implementation of directives and to identify challenges and bottlenecks. A problem resolution plan will be made after each site supervision.

PMI Goal

Support the national strategy for pre-elimination or elimination addressing relevant geographic areas in accordance with WHO recommendations.

PMI-Supported Recent Progress (CY 2020 implementation)

- Support for case investigations implemented in the districts of Saint-Louis, Dagana, Pete, Podor, and Richard Toll (5 districts). In 2020, there were 1004 documented malaria cases within the Saint-Louis region. Of those, 904 were considered eligible for case investigation and 757 were investigated within 72 hours (84 percent). During the investigations, 12,928 contacts were identified, of which 11,249 were eligible for FDA and 11,242 were treated (2 eligible patients were referred and 5 refused treatment for a refusal rate of 0.4 percent). Additionally, 108 pregnant women and 21 children less than 2 months of age were ineligible for FDA and were referred to health facilities for further care. Please note that procurement of the drugs for the FDA response is supported by IDB, not PMI.

- Implementation of the preparatory phase for the MDA randomized control trial in the district of Tambacounda (see OR section for further details).

PMI-Supported Planned Activities (CY 2021–2022 implementation)

- Support case investigations in the districts of Saint-Louis, Dagana, Pete, Podor, Richard Toll, Matam, Thilogne, and Linguere (8 districts)
- Implementation of the MDA randomized control trial in the district of Tambacounda (see OR section for further details)

Key Question 1

What specific drug-based preventive or proactive strategies are directed toward pre-elimination and/or elimination in the near-term? Which of these merit PMI support for FY 2022 funding with consideration of existing or planned national or other partner funding?

Supporting Data

The NMCP has included the implementation of MDA as a strategy to accelerate its progress toward pre-elimination and elimination in its NSP 2021–2025. The NMCP proposes to expand the MDA intervention to eligible districts with an annual incidence of >25 cases/1,000 population by 2022–2023. As the OR study is currently ongoing, PMI did not include any specific activities to support scaling up of MDA using FY 2022 funding. However, based on the results from the MDA trial, expected in 2022, this decision can be revisited later if warranted by a positive outcome of the MDA RCT study. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

Conclusions for Other Preventive Drug-Use Investments

PMI will continue its support for case investigation activities. Based on the findings from the MDA RCT expected in 2022, PMI will assess the possibility to support an MDA intervention in eligible districts with moderate to low malaria transmission.

With the IDB funding coming to a close at the end of 2021, PMI has discussed plans with the NMCP to fill the need for case investigation in districts previously supported by IDB. PMI proposes to expand the support for case investigations in a phased approach. With FY 2021 funding, PMI proposes to support case investigation activities in 17 districts. With FY 2022 funding, PMI proposed to further expand its support for case investigations in up to 18 additional prioritized districts (see SME section, Figure A-27). However, it remains to be defined which partner will support Senegal with the procurement of DHA-PQ and primaquine for the FTAT/FDA responses triggered by the case investigations, as historically this has been supported by other partners considering the current guidance from PMI regarding the use of FDA. This remains an ongoing topic of conversation between PMI and the NMCP.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.1. SUPPLY CHAIN

NMCP Objective

Under the NMCP's National Strategic Plan 2021–2025, the program aims to ensure permanent availability (0 percent stockouts) of medicines (ACTs, SP, primaquine, injectable artesunate, and rectocaps) and antimalarial products (long-lasting insecticidal nets (LLINs) and RDTs) for at least 99 percent of structures.

NMCP Approach

According to the Senegal 2021–2025 National Strategic Plan, continuous improvement of supply chain management and quality of medicines will be made possible through implementation of the following interventions:

1. Capacity-building
2. Logistics Management Information System (LMIS) monitoring
3. Commodity quantification
4. Commodity procurement
5. Coordinating with the central medical stores (*Pharmacie Nationale d'Approvisionnement*) and other partners
6. Improving the capacity to store and transport commodities
7. Monitoring the quality, efficacy, and safety of antimalarial drugs and products
8. Developing supply chain management policies and documentation

PMI Objective in Support of NMCP

PMI fully aligns with the NMCP supply chain strategy to ensure continual availability of quality products needed for malaria control and elimination at health facilities and at the community level.

PMI-Supported Recent Progress (CY 2020 implementation)

- In collaboration with the Ministry of Health (MOH), PMI is contributing to the improvement of warehouse operations at three regional warehouses (Diourbel, Fatick, and Saint-Louis). Completion of renovations has increased the overall storage capacity of these warehouses from 402 to 757 pallets. It has also improved the quality of product storage with the use of racks and compartmentalization of temperature-sensitive products.
- PMI improved coordination among the different actors in the supply chain by helping to organize supply committees with the Direction of Pharmacy and Medicines (*Direction de la Pharmacie et du Médicament, DPM*), the Central Medical Stores (*Pharmacie National d'Approvisionnement, PNA*), the NMCP, and private wholesalers.
- PMI supported the rollout of the ERPX3 logistics management information system to district depots, including the purchase of 77 computers and software licenses. This will contribute significantly to

improved availability of timely data for decision-making at the operational, regional, and central levels for optimal health commodities management.

- PMI trained the NMCP procurement and supply management team and PNA staff on the use of PipeLine® 5.4 and Supply Planning Automation tool. These tools are used respectively for health commodity supply planning and to review the plans. Follow-up training was also held to support stakeholders to use the tool on their own to encourage sustainability. Trainees expressed that these tools would be very useful to improve their supply plan monitoring and create standardized supply plans.
- Following an assessment of the PNA's 2014–2018 strategic plan, PMI contributed to the steps to prepare a new plan covering 2021–2025 (delayed due to COVID-19). The analysis of strengths, weaknesses, opportunities, and threats was validated by the MOH steering committee and key stakeholders developed the first draft of the new plan. Next steps include technical validation and budgeting.
- PMI assisted the NMCP staff to conduct the quantification and malaria commodity forecast for the 2021–2025 strategic plan, as well as assisting with supply planning. Support was also provided for the quarterly data analysis process with the PNA. These meetings ensure data quality, their consistency with respect to previous data, and also allow the committee to appreciate the accuracy of the forecasts.
- PMI supported the establishment of a national, multi-sectoral post-marketing surveillance unit for drug quality. The terms of reference for the unit were validated, guidelines were developed, and members were trained on the risk-based post-marketing surveillance methodology and the risk assessment tool (MedRS).
- PMI continued to support the National Laboratory for Druq Quality Control (*Laboratoire National de Control des Medicaments*, LNCM) in its quest for ISO 17025 accreditation. This included institutionalization of a new tool (SATTA – Stepwise Assessment Tool Toward Accreditation) that can be used to conduct internal audits and monitor LNCM performance. The LNCM also conducted a field mission in December 2020, collecting 288 antimalarial samples in six regions of Senegal (Dakar, Kolda, Diourbel, Kaolack, Kédougou, and Tambacounda).

PMI-Supported Planned Activities (CY 2021–2022 funded activities)

- PMI will contribute to the installation of ERPX3 at the district level in the regions of Dakar and Thies and will build capacity of the dedicated staff on its use. PMI will also contribute to an assessment visit for the functionality of ERPX3 in one district.
- Continue supporting coordination among supply chain stakeholders through the various committees, with a focus on ensuring quality data
- Sampling and testing of antimalarials at nine sites across the country
- Continue supporting the LNCM to build its capacities toward ISO 17025 accreditation, including training on risk management and the calculation of measurement uncertainties. Strengthen their capacity to manage their equipment, including training on calibration and equipment maintenance and developing equipment preventive maintenance protocols and a list of recommended spare parts.

Key Goal

Ensure continual availability of quality products needed for malaria control and elimination (ACTs, RDTs, SP, Art. Inj., and ITNs) at health facilities and at the community level.

Key Question 1

Has the central level, (or subcentral level, if appropriate) been stocked according to plan for ACTs, RDTs, SP, and Art. Inj. over the last year (2020)? If not, have they been under, over, or stocked out?

Stock levels for AL were low at the central medical store but not at the operational level at the end of FY 2019 through most of FY 2020. Low central-level trends show that products have been pushed out to the peripheral level to prevent stockouts at the last mile. The NMCP did not report critical stockouts at the health district level. For ASAQ, stock levels have varied based on the timing of deliveries, but for the most part have stayed above minimum recommended levels. While the supply of SP was very low through all of FY 2020, it rebounded in early FY 2021. The stock of injectable artesunate and RDTs has consistently remained above the minimum level at both central and regional warehouses and no shortages are anticipated. Work continues with the PNA to improve data quality and regularly review quantification and supply plans.

Key Question 2

What are the trends in service delivery point stockout rates for ACTs (including ability to treat), RDTs, Art. Inj., and SP over the last year (if tracked)? Is there a seasonal or geographic difference in stockout rates?

Supporting Data

In the past PMI has obtained data on facility- and community-level stockouts from the SPA annual survey, but this was not done in 2020 due to COVID-19.

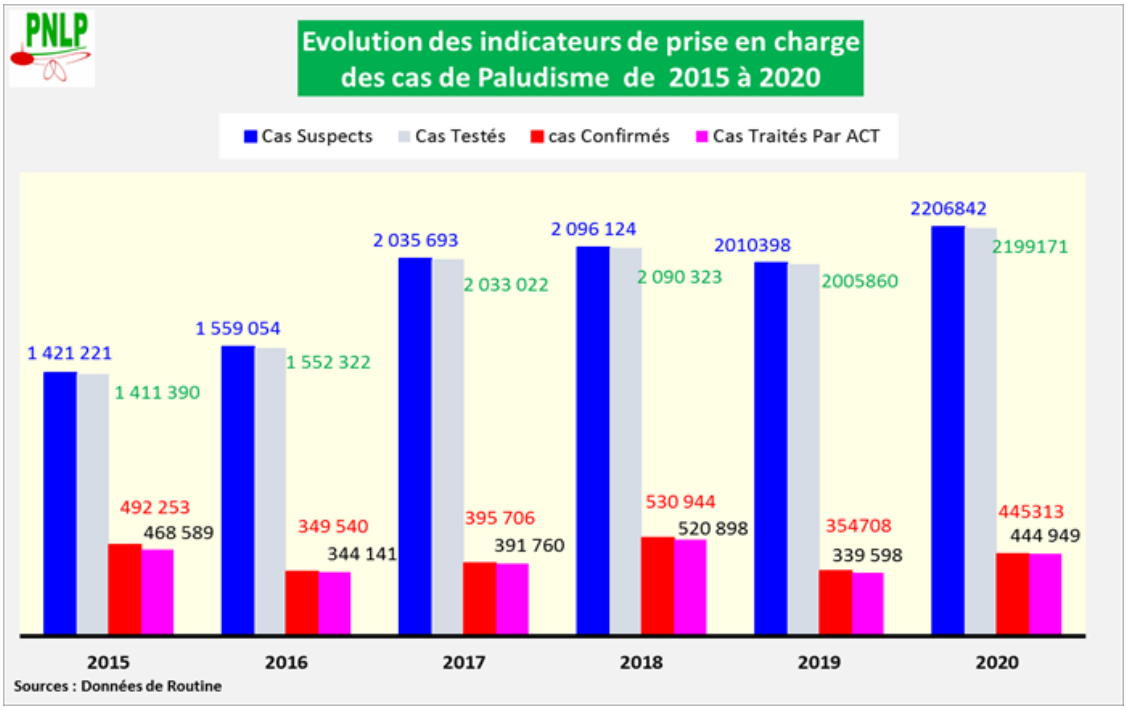
Key Question 3

What is the difference between quantities for ACTs consumed and malaria cases, and RDTs consumed and numbers tested? What is driving any differences seen?

Supporting Data

The figure below shows that there is a high level of concordance between the numbers of suspected and tested cases, and the number of confirmed and treated cases. The trend has been consistent for several years.

Figure A-25. Progress in malaria case management indicators from 2015–2020



Key Question 4

To what extent does a functional LMIS provide visibility into timely and quality logistics data from various levels of the system? To what extent is commodity data visibility dependent on surveys or supervisory data rather than routine data reported by an LMIS?

Supporting Data

The Senegal supply chain system faces several challenges that impede the realization of its key health strategic objectives. To address the challenges of the last mile distribution in the public sector, the PNA consolidated the implementation of the Informed Push Model (*Yeksi naa)* that allowed it to obtain logistical data at service delivery points in real time using CommCare, which is an electronic data collection tool. Despite these achievements, the data collection that is still performed manually hampers the system to automatically generate logistics data from the health district level to facilitate decision-making.

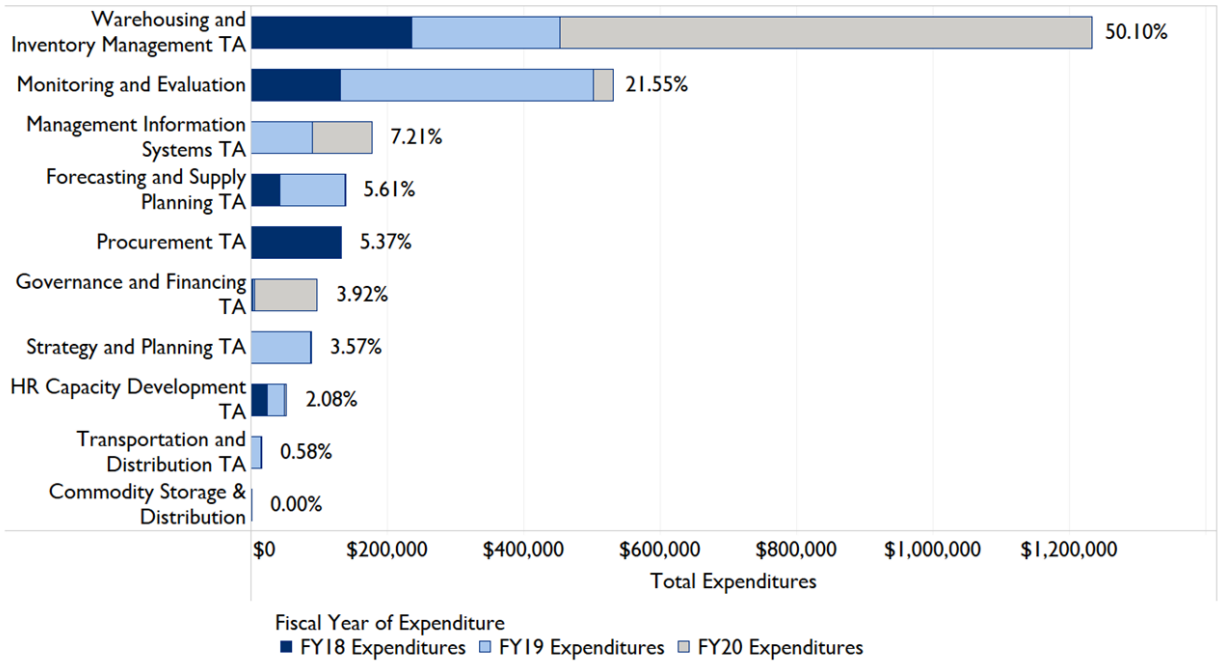
The supply chain system faces a major challenge related to the lack of consumption data to forecast, procure and distribute commodities. The rollout of the ERPX3 logistics management information system to district depots over the coming year should improve this situation significantly by creating the much-needed data visibility into peripheral logistic data. The ERPX3 provides the core functions necessary for accurate quality assurance, including serial and batch numbers management, stock status management, expiration data management, and upstream and downstream traceability. The system will also integrate inventory management, including stock data, inquiries, consumption analysis, and ultimately automated data collection at the district level.

Key Question 5

What are the main supply chain technical assistance functions supported by PMI? Are there additional investments that PMI should make (e.g., increasing visibility of demand at health facilities) to ensure continual availability of quality products needed for malaria control and elimination at health facilities and the community level? In areas performing well, is it dependent on PMI/donor funding (e.g., PMI and Global Fund pay for warehousing and distribution)? Should more be done to foster self-reliance in domestic systems and, if so, what approaches should be considered?

Supporting Data

Figure A-26. PMI supply chain investment by technical area



The supply chain intervention that takes the largest share of PMI's support is warehousing and inventory management, followed by technical assistance for monitoring and evaluation. PMI technical assistance also supports the Central Medical Store to improve stock management and an annual inventory.

Conclusions for Supply Chain Investments

PMI's technical assistance investments will continue to be directed toward improving visibility and use of logistics data. This will include regular quantification and supply planning exercises, collection of consumption data at the peripheral level, and reinforcing malaria commodity distribution through the national system.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.2. SURVEILLANCE, MONITORING, AND EVALUATION (SM&E)

NMCP Objective

The NMCP objective for SM&E is to ensure 100 percent prompt and complete routine reporting at all levels and use of data for SM&E of the 2021–2025 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, facility, and community. The NMCP has successfully worked 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 worked with the MOH to improve the quality of the malaria data. As Senegal pushes toward elimination, the stated objectives of the NMCP in surveillance are to detect 100 percent of epidemics and emergencies within one week with an early warning system, control 100 percent of epidemics and emergencies within one week of detection, and monitor vector resistance to insecticides.

NMCP Approach

Senegal's approach to achieving their objectives is continuing to strengthen their surveillance system as they work toward elimination. Their strategy is to support the following:

- Epidemic surveillance sites report all data weekly and data are analyzed to identify hotspots
- Introduction of mobile health (mHealth) system to facilitate reporting of data at community level and reporting of weekly case counts
- Health facility and CHW supervision using tablet computers to streamline analysis and feedback
- Strengthening of epidemic prediction and detection and community-based surveillance
- Strengthening the documentation of index cases and the investigation of cases and epidemic situations
- Strengthening of entomological surveillance and monitoring the effectiveness of insecticides

Support from PMI will continue to contribute to key data collection and analysis activities including continued collaboration with the DSISS and the NMCP in increased use of the HMIS in DHIS2 and use of the malaria module in the system. 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. PMI will continue to support technical assistance to the cDHS for data analysis and dissemination as the ANSD is now fully able to manage and implement the survey on their own. PMI also provided some technical assistance to an MIS in October 2020 that was funded by the Global Fund and focused in the Southeast, higher-burden regions with the aim to collect more granular data; results are still pending. PMI will also continue to support capacity strengthening at the central, regional, and district levels through the malariology and SM&E courses.

PMI-Supported Recent Progress (CY 2020 implementation)

- Technical, planning, and data analysis assistance to a subnational MIS in 2020, sampled to provide district level coverage estimates in KKT

- Support for case investigations and training health staff in investigated procedures in pre-elimination zones with incidence <5/1,000 (more information provided on page 66–67)
- Continued support for weekly reporting from sentinel sites and routine HMIS data collection with the production of the annual bulletin
- Support for weekly reporting from sentinel sites and dissemination of progress reports
- Support for DHIS2 implementation with a specific emphasis on data quality
- Implement health information system readiness assessment to assess if systems are ready for elimination activities and identify areas of need and priorities

PMI-Supported Planned Activities (CY 2021–2022 implementation)

- Malaria specific supportive supervision at all levels of the health pyramid (community, district and regional) – these regular supervisions take into account case management, prevention, and promotion of protective behaviors as well as on-site data verification
- Continued support for case investigations in pre-elimination zones with incidence <5/1,000
- Pilot use of PECADOM+ platform as community-based surveillance in the context of an OR study and pilot the use of digital data collection tools for CHW
- Implementing recommendations from SM&E systems assessment after prioritization by the NMCP which is currently in process as of the development of this MOP

Key Goal

To support the NMCP to build their capacity to conduct surveillance as a core malaria intervention using high-quality data from both surveys and routine health information systems.

Key Question 1

Which data sources are available to inform estimates of intervention coverage, service availability and readiness, and morbidity and mortality?

Supporting Data

Table A-17. Available malaria surveillance sources

Source	Data Collection Activity	2019	2020	2021	2022	2023	2024
Household Surveys	Demographic and Health Survey (DHS)	X		P	P	P	P
Household Surveys	Malaria Indicator Survey (MIS)		X				
Health Facility Surveys	Service Provision Assessment (SPA)	X		P	P	P	P
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies (TES)	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System	X					
Malaria Surveillance and Routine System Support	Support to HMIS	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response (IDSR)						
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System (eLMIS)						
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System						
Other	End Use Verification Survey (EUV)	X	X	X	P	P	P
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey						
Other	Malaria Impact Evaluation						
Other	Entomologic Monitoring Surveys						

*Asterisk denotes non-PMI funded activities, X denotes completed activities, and P denotes planned activities.

Key Question 2

What HMIS activities have been supported? What current priorities will be supported with FY 2022 MOP funding?

Supporting Data

PMI supports supervision visits from the central level to lower level regions, districts and facilities for continued monitoring of programs. PMI also supports training central NMCP staff and health workers in the use of DHIS-2 to enter, view, and analyze HMIS data along with data quality assessments and data review meetings.

Available data support maintaining SM&E funding levels with an increase in funds to the DSISS for HMIS support and encouraged collaboration with the NMCP for more regular access to the malaria data in the HMIS now that the malaria routine information has been fully transitioned to the HMIS. With strengthened use of routine information at the central level, there is now a concerted effort to strengthen the use and quality of data at regional level with increased supervision support at the district level in Senegal.

Key Question 3

Are there specific outcomes of past/current HMIS strengthening efforts that can be identified?

Supporting Data

Table A-18. Outcomes of HMIS strengthening efforts

	Indicator	2019	2020
Timeliness	% of reports received on time	96.5%	89%
Completeness	"Confirmed malaria cases for children under five years of age" was reported in	99.1	95.7
Accuracy	Populate with most recent Data Quality Assessment data:	>95%	>95%

There is a decrease in timeliness in reporting due to the complete transition that was made from an Excel-based system managed by the NMCP to the DHIS-2 based HMIS managed by DSISS. As part of this transition there was a concerted effort to include many private health facilities across districts, increasing the number of reporting facilities into the system. The calculation of timeliness is typically completed on the 15th of every month through the system, but as reporting weeks move past the 15th of any given month, the timeliness calculation will change. The NMCP is working with the DSISS in understanding how to interpret the timeliness now that it is in one system and PMI is providing funds for the continued collaboration and monitoring as more private facilities begin to report into the system.

Key Question 4

Are there any other considerations that impact your funding allocation in this category (e.g., strategic information or capacity-building in-country)?

Funding from the Islamic Development Bank (IDB) will end at the end of 2021. The IDB funds have been used to support case investigations and training of health workers and CHWs to perform these investigations in northern, lower-burden regions as PMI focused funding and support for interventions in the southern, higher-burden regions with some support to case investigations in 17 districts across three regions in the north, Louga, Matam,

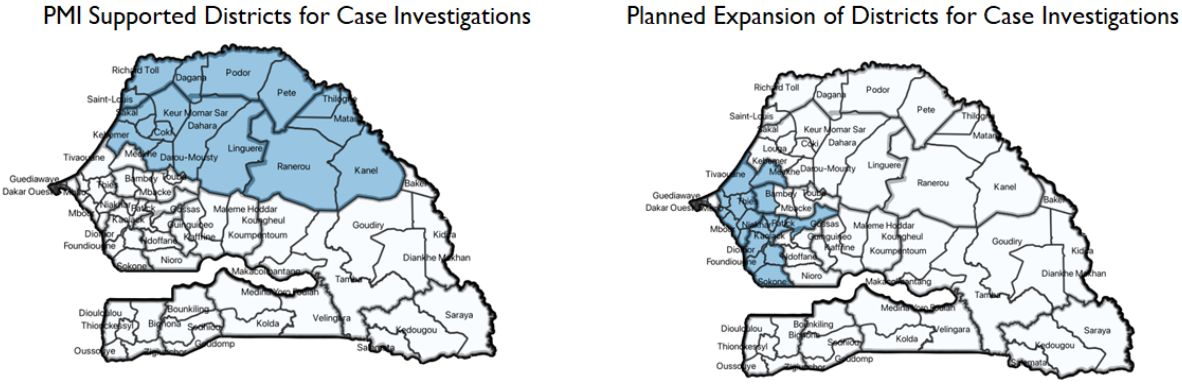
and Saint-Louis. With the end of IDB funding, PMI proposes to increase funding for elimination surveillance activities in additional districts and add up to an additional 18 districts in the regions of Diourbel, Fatick, and Thies (Figure A-27).

We are also proposing one evaluation activity to be supported with FY 2022 funding: the evaluation of training courses in malariology and malaria SM&E. Since 2008, in collaboration with the *Institut de Santé et Développement* (National Institute of Public Health), the NMCP implemented training courses in malariology and in malaria SM&E at the central level. These courses are open to senior and mid-level health officers and managers such as regional and district-level medical officers. To date, 838 senior and mid-level health officers have participated in these training courses (36 sessions total). Since 2018, using a training-of-trainers approach, the NMCP has adapted and decentralized the malariology training courses to make these available to primary care level health managers (health post nurses and midwives) across the nation, at a regional level. With support from PMI, Global Fund, GIZ, and IDB, a total of 34 sessions have been held and 824 health post managers have been trained.

Although the impression is that these training courses have made a difference in the quality of management of malaria prevention and control activities across the nation, there is to date no concrete evidence about its impact. The NMCP is interested in formally evaluating these courses. As other nations and partners look toward Senegal as an example of a country making great progress in malaria control and pivoting toward elimination, a recurrent question is, "What are the reasons for its success?" Many partners in the country believe that these malaria-specific training courses are an important part of its success, but in an effort to assess this and to share lessons learned with other nations, a formal evaluation has been prioritized.

Supporting Data

Figure A-27. PMI-supported districts for case investigations and proposed districts for expansion



See Table 2 for proposed funding for increased surveillance activities.

Conclusions for Surveillance, Monitoring, and Evaluation Investments

PMI will continue to support SM&E activities to achieve the NMCP's goal of improved and sustained data timeliness, quality, completeness, and use. As the NMCP strengthens its central data management and use, there

is an increased focus on strengthening regional, district, facility, and community information systems to improve quality and use.

There is an increase in investments to support supervision and training at the regional and district levels, focused in higher-burden regions along with an increase in investments in elimination surveillance activities to cover additional northern districts with the end of IDB funding.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.3. OPERATIONAL RESEARCH

NMCP Objective

There is one OR-related specific objective in the updated Senegal National Malaria Strategic Plan 2021–2025: Increase the promotion and implementation of operational research activities from 26 percent to 60 percent (gross execution of planned activities).

The NSP indicates that the objective of operational research is to guide the strategic plan implementation and provide evidence for innovative initiatives. Three interventions are related to this specific objective:

- Intervention 1: Promotion of Operations Research
- Intervention 2: Development of operational research topics of national interest
- Intervention 3: Implementation of operational research topics of national interest

NMCP Approach

As described in the NSP, to promote operational research at all levels—in collaboration with the committee for research and training within the framework of the *Cadre de Concertation de Partenaires de Lutte Contre le Paludisme* (Malaria Partners Coordination Committee – CCPLP)—the NMCP will identify operational research needs on an annual basis. These various operational research projects will be submitted to the CCPLP committee for Research and Training for validation. These priorities will form the basis for resource mobilization. The implementation of these projects will ensure efficiency in the implementation of decisions. For better coordination, a framework for sharing malaria research results will be implemented. This will involve organizing annual workshops to share research results on malaria. Both Global Fund and PMI were approached to support these efforts (operational costs for the CCPLP and annual scientific workshops).

The NMCP actively engages as a research partner in malaria-related OR/PE activities that have direct implication on programmatic activities, or which are implemented through the public health system.

The standard procedures of engagement in OR by the NMCP is described briefly below:

- The NMCP has an office/unit that manages PE/OR activities
- The NMCP regularly facilitates Institutional Review Board (IRB) approval for studies undertaken in collaboration with international research partners
- A national Steering Committee is nominated by the NMCP for advising and monitoring the study implementation—the steering committee will include NMCP staff, the local study coordinator, partners, and other researchers; it will review and approve the proposed research protocol; it will meet regularly

for the duration of the study, will review draft study progress reports, and will validate them; and in case of challenges with study implementation, it may be called upon for ad hoc meetings
- The NMCP is responsible for the introduction of the research team to the actors at the operational level of the health system (regional medical officer, district medical officer, health facility nurses, etc.) and facilitates and accompanies the research team in its engagement with the health sector at the operational level

PMI Objective in Support of NMCP

- In Senegal, PMI financially supports program- and policy-relevant PE/OR activities proposed by the NMCP
- In-country or headquarters-based PMI staff participate as co-investigators in specific PE/OR activities (usually the ones funded by PMI)
- The PMI in-country team participates actively in the CCPLP
- PMI in-country team members are regularly requested to participate as members of PE/OR Steering Committees, based on their technical expertise
- The PMI CDC Resident Advisor chairs the CCPLP committee for research and training (October 2019–October 2022)
- Through the Peace Corps' Small Program Award, innovative approaches are developed and piloted at a small scale. Several of these innovative approaches have been then brought to scale by the NMCP (such as PECADOM+)
- The PMI Resident Advisors and malaria specialist participate as lecturers in training modules on operational research, as part of the malariology training course organized by the NMCP and as guest lecturers at national universities when requested

PMI-Supported Recent Progress (CY 2020 implementation)

Study: Mass drug administration with DHA-PQ and primaquine to reduce malaria in a moderate- to low-transmission setting in Senegal – a cluster randomized controlled trial (Core-funded)

Objective: To determine the effect of three rounds of MDA with DHA-PQP and low-dose primaquine on village-level confirmed malaria case incidence compared to standard of care SMC when provided in the context of optimized control (proactive community case management + PBO nets)

Actual start date: October 2020

Progress in past six months (since initiation)

- Subcontract awarded by Impact Malaria to local research partner (Universite de Thies)
- PBO ITN distribution completed in November 2020: VectorLink registered 1,617 households and 20,430 people and distributed 10,015 PBO ITNs. The population coverage[2] was 98 percent and the sleeping places coverage was 94 percent across the seven health posts

[2] Proportion of every two persons owning an ITN

- IRB review of protocol completed in November 2020 (UCSF) and December 2020 (Senegal National IRB)
- Community outreach and sensitization activities started in December 2020
- Baseline survey completed in December 2020 among the 60 study villages
- Census of all 60 selected study villages completed (February 2021)
- Standard operating procedures and data collection forms finalized in French (will be translated in English)
- Qualitative survey methodology and tools drafted
- Study preparation underway to conduct three MDA rounds from June to September 2021
- All study timelines developed
- First meeting of the monitoring committee held (February 2021)
- Setting up of the Data and Safety Monitoring Board and first meeting held (February 2021)
- Retrospective malaria morbidity data collection (for 2020) in the study area completed
- Reinforcement of the community case management platform in the study villages with recruitment of additional CHWs and training of all 102 CHWs

PMI-Supported Planned Activities (CY 2021 implementation)

In 2021, two PMI-funded studies will be implemented in Senegal:

- Mass drug administration with DHA-PQ and primaquine to reduce malaria in a moderate- to low-transmission setting in Senegal (cluster randomized controlled trial, described in previous paragraph)
- Framework to assess and remediate barriers to care-seeking for febrile illness in Senegal (formative research)

Study: Framework to assess and remediate barriers to care-seeking for febrile illness in Senegal (FY 2018 MOP funded)

Objective: To assess the care-seeking behavior and management of febrile illness as it pertains to malaria case management in three prioritized districts in the Central and Southeastern regions of Senegal.

Planned start date: Fall 2021. The decision was made last year to delay because of the COVID-19 pandemic. We plan to implement this study during the 2021 malaria season, with field data collection in the fall 2021.

Current status: Study has secured PMI OR committee approval. NMCP is in the process of selecting a research institution, using a competitive process (tender) and will award a contract to the select local research partner.

Additionally, another PMI-funded study was proposed in FY 2021 MOP. The concept note will be developed in Q3 2021 and submitted for approval to the OR committee. There is a need to develop and implement novel vector control strategies better adapted to urban settings. VectorLink undertook in 2019 a landscape analysis to identify the ecological and vectorial determinants of malaria transmission in urban areas of Diourbel, Touba, and Kaolack districts. These determinants were identified and characterized, and were found to have some distinctive differences per urban site. The objective of the study is to implement and evaluate pilot packages of vector control interventions derived from the recommendations of the entomological urban landscape assessment in urban settings of the central regions of Senegal. Although the packages of specific interventions has not yet been finalized and will be tailored to the specificities of each urban setting, some areas of interest include a package of

innovative interventions combining larval site management and household improvement, distribution of next-generation ITNs to counter existing pyrethroid resistance, reinforcement of home-based care in residential koranic schools, and transforming ITNs to "mega-nets" to encourage use of nets in this setting where residential students share sleeping spaces.

PMI Goal

PMI will conduct PE/OR that helps to evaluate coverage of population at-risk, intervention quality, or delivery efficiency; study reducing malaria transmission and disease burden; test effectiveness of new or evolved priority interventions and strategies; or explore new metrics and mechanisms to assess intervention impact.

Key Question 1

In consultation with the NMCP, have technical challenges or operational bottlenecks in program interventions been identified that require PE/OR? How have they been prioritized?

Supporting Data

In summer 2020, the NMCP went through a performance review (MPR) of its past national strategic plan (2016–2020) and the development of its new NSP. This was the opportunity to review the program performance and identify specific areas that could benefit from research projects. Research topics will be implemented to obtain evidence related to parasitological, epidemiological, entomological, anthropological, environmental, genomic, and climatic aspects.

The following list of illustrative activities was developed at the start of this new NSP:

- Evaluation of SMC
    - Impact evaluation of SMC
    - Cost-effectiveness of SMC implementation with a DOTS3 approach
    - Evaluation of the SMC withdrawal from Sedhiou region
- Evaluation of community level IPTp implementation
- Pilot study on MDA in the health district of Tambacounda will evaluate the relevance of this strategy in reducing malaria transmission—NMCP is very interested in scaling up this intervention as soon as possible

Table A-19. Ongoing program evaluation and operational research

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
BMGF	• UCAD • Harvard University • Broad Institute MSAS/PNLP	Integrating genomic data into real-world malaria surveillance and decision-making strategy	Launched in February 2020, three-year project so will continue until early 2023
BMGF	• PATH/MACEPA • UCSF • MSAS/PNLP • UCAD	Identification of high- risk population for malaria and characterization of their movement and exposure profiles to develop specific intervention strategies (formative research); interventions to be tested in pilot phase among gold miners and residents of residential Koranic school	Initiated in winter 2019 pilot intervention to be tested in 2021
BMGF	• MSAS/PNLP • PATH (MACEPA)	Impact evaluation of cross-border interventions (Senegal/Gambia)	Start in 2021
FIND	• MSAS/PNLP • PATH	Demonstrate the added value of using highly sensitive RDTs in case detection in the Northern pre-elimination zone (four health posts total in the districts of Dagana and Kanel)	Completed in 2020
BMGF	• Universite de Thies • MSAS/PNLP • LSHTM	Impact assessment of non-SMC administration in Southern Senegal in 2018	Initiated in 2020
Trésor Français	• MSAS/PNLP • Research for Development Institute, Dakar • QISTA	Evaluation of anti-mosquito outdoor insect traps in Kaolack (urban setting) and its impact on malaria	Initiated in late 2020
WHO/TDR	• Universite de Thies • MSAS/PNLP	Monitoring Seasonal Malaria Chemoprevention and Intermittent Prevention Treatment in pregnant women efficacy through Antenatal Clinics in South-east Senegal	Initiated in 2019
UKRI	• Universite de Thies • MSAS/PNLP • MSAS/MTN • LSHTM	Investigating the feasibility and effectiveness of integrating helminth control with Seasonal Malaria Chemoprevention in Senegalese children (Kedougou)	Initiated in January 2021

Key Question 2

Are there specific challenges in any intervention areas that merit further exploration or research with the potential of establishing strategies or interventions applicable in the near future?

Supporting Data

The collection of routine malaria data with the current population stratification (<5, >5 years old, pregnant women) may be appropriate for an approach of malaria control with a focus on vulnerable populations, but as Senegal is pivoting toward elimination, this data stratification may not be optimal for the needs of an elimination objective, where it is critical to refine our interventions to very specific challenges and specific segments of the population. An illustrative example of this challenge is presented below.

Within the northern region of Saint-Louis (1,092,742 inhabitants), where case investigations have been implemented, there is the opportunity to have more visibility on the age distribution of recorded index malaria cases. The table below summarizes the age distribution of passively detected malaria cases within the five health districts of the region of Saint-Louis in 2020.

Table A-20. Distribution of reported malaria cases in the five districts of the region of Saint- Louis, by age group (2020)

Districts	0-5	5-10 years	10-15 years	15-30 years	30-60 years	60 years and over
Dagana	1	8	10	23	18	3
Pete	9	20	32	77	51	16
Podor	5	14	13	53	32	4
Richard-Toll	4	8	7	72	53	5
Saint-Louis	27	42	65	212	99	20
Total	**46**	**92**	**127**	**437**	**253**	**48**

The age group most affected in the Saint-Louis region is between 15 and 30 years old, or 43.5 percent of the total cases. This young population, even if they do sleep under a long-lasting insecticidal nets, do so somewhat late in the night. On the other hand, the children under five years of age and those over 60 years of age seem to be the groups least affected. Children under five years of age and the elderly most often sleep early and under LLINs.

As PMI is shifting its core vector control intervention on the distribution of next-generation nets, it becomes critical to better understand behavioral issues around use of ITNs. However, the need is to understand these behaviors across all age groups and not only focused on children under five years of age or pregnant women, so as to be supportive of the elimination objective of Senegal. Two specific topics for future research related to the use of ITNs are listed below:

- Characterization of indoor/outdoor sleeping behavior (all age groups) and net use in the south-eastern regions and in the *daaras*
- Net preferences (texture, shape, color): acceptability of next-generation nets

Other aspects related to specific age groups could be relevant to other intervention areas such as:

- Care-seeking behavior which will impact case management interventions

- Appropriateness of school-based interventions, which can impact prevention and case management interventions

Other additional areas that merit further exploration

- Evaluation of community-level IPTp implementation (PE)

Key Question 3

Are there any other considerations that impact your funding allocation in this category?

Supporting Data

N/A

Conclusions for Program Evaluation and Operational Research Investments

No new OR topics are being proposed.

Between the three PMI-funded projects (MOP and core-funded) and the eight PE/OR activities listed above that are currently being conducted, the NMCP and its partners are addressing several of the highest priority topics in the coming 12 to 36 months. The country approach will be followed to prioritize further research topics, as described above in the NMCP approach section.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.4. SOCIAL AND BEHAVIOR CHANGE (SBC)

NMCP Objective

The overarching goal of Senegal's current national malaria communication strategy as described in its NSP 2021–2025 has two specific objectives:

- To bring 80 percent of the population to adopt healthy behaviors with regards to malaria prevention measures and case management by 2025.
- Increase from 33 percent to 80 percent (gross execution of planned activities) the institutional communication, for a better visibility of the NMCP

It should be noted that these objectives are aligned with the problems identified in the use of prevention and care services, related to behavioral problems (individual and collective). More specifically, the communication strategy is designed to:

- Increase the proportion of the population sleeping under ITNs to > 80 percent
- Increase the proportion of pregnant women who take at least three doses of SP under directly observed treatment at ANC to > 80 percent
- Increase the proportion of people who seek care at health facilities within 24 hours of the onset of fever to > 80 percent
- Increase compliance in the treatment of uncomplicated malaria

- Protect at least 98 percent of the population with IRS in targeted areas
- Ensure 95 percent coverage with seasonal malaria chemoprevention of children 3 to 120 months of age in the target areas per transmission season
- Have 100 percent of suspected malaria cases diagnosed with RDTs or blood smear according to national guidelines
- Treat 100 percent of confirmed cases according to national guidelines and with effective drugs at both the health facility and community levels
- Ensure that 100 percent of complicated malaria cases among children under 10 years of age have access to pre-referral treatment
- Ensure MDA coverage of 95 percent of the target population in target zones
- Have at least 80 percent of embassy, airport, hotel and port officials share aspects of traveler malaria chemoprophylaxis according to NMCP guidelines
- Strengthen partnerships with the private sector, media, local government, Parliament, and other government departments

NMCP Approach

The NMCP's 2021–2025 National Malaria Strategic Plan (NSP) emphasizes that IEC/BCC 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. The NSP maintains the need to capitalize on the gains made in the 2016–2020 malaria communication strategy plan and scale up intervention in identified areas of underperformance.

Communications about malaria are expected to take into account local specificities such as differences in net use culture. The NMCP implements various malaria control interventions depending on the malaria burden of specific areas, in the context of health promotion in pre-elimination zones and strengthening control in others.

The current communication strategy has two specific objectives (listed above) and identifies key strategic approaches: advocacy, social mobilization, and capacity-building for behavior change communication implementation.

Advocacy: Using a multi-sectoral approach, advocacy efforts particularly target the private sector, national leadership, and other actors associated with the malaria pre-elimination objective in Senegal. The NMCP plans to reinforce advocacy for resource mobilization to scale up interventions proven 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 toward increasing resources to achieve specific objectives. The national strategic plan aims at broadening the partnerships between the NMCP and the private sector as the country works toward pre-elimination.

Planning and implementation of advocacy will be piloted by steering committees at all levels with leadership from high-level institutions such as the Parliament to gain commitment of political authorities. The NMCP is to raise awareness of deputies on the importance of increasing budgetary support to the health sector and specifically for malaria as the country moves toward pre-elimination.

Social mobilization: This communication approach aims to reinforce community participation in malaria control through enhanced collaboration with local NGOs and community-based organizations. The strategies of *Malaria Jambars* (Malaria Champions) increase commitment from communities for malaria control activities through local events covered by the media. Social mobilization activities involve individual citizens as well as specific groups such as artists, local leaders, local elected officials, etc.).

Capacity-building for Social Behavior Change Communication: The NMCP strengthens the IEC/SBCC capacities of civil society's groups to contribute to malaria prevention and control. Use of data and evaluation is pertinent to strengthening capacity for effective implementation of SBC activities. In order to increase utilization of malaria services by different segments of the population, SBC efforts focus on targeted communication using interpersonal communication, mass media (TV channels, radios shows at national and community levels, nontraditional media, billboards, etc.).

PMI Objective in Support of NMCP

PMI contributes to the NMCP's SBC strategy by supporting efforts on the acceptance and correct and consistent use of proven interventions such as SMC, ITNs, and IRS as well as reinforcing early care-seeking behavior. The NMCP is keen to ensure that approaches are grounded in formative research that identifies key determinants of behavior, are evidence-based and tailored to specific populations and geographic areas.

In addition to PMI support, the IDB supports district level communication plans for advocacy activities including contracting of media broadcasting in 27 pre-elimination districts. The Global Fund (through Plan International) provides SBCC support through advocacy targeting government officials and communication activities for MIP and ITN usage through community-based organizations (CBOs). Focus is on the KKT region for the promotion of increased first ANC visits as well as increased use of bed nets by children under five years of age and pregnant women. GIZ provides financial assistance for the procurement of protective equipment, routine follow-up with CBOs, and other community activities (social mobilization, sensitization talks, and home visits) in the KKT regions. The Global Fund also funds the operational cost of SBC activities in the KKT regions including the contracting of regional radio stations to broadcast programs and spots on malaria. Finally, PATH/MACEPA supports the NMCP with the implementation of case investigations in pre-elimination districts with annual incidence less than 5/1,000 inhabitants. Part of the response during the investigation includes sensitization and interpersonal communication related to the proper use of ITNs and early care-seeking for febrile illness. PMI coordinates closely with other partners and the NMCP to ensure complementarity of SBC activities and avoid duplications, particularly in the high-burden KKT region and the pre-elimination districts.

PMI-Supported Recent Progress (CY 2020 implementation)

PMI has supported various community mobilization and SBC activities in Senegal. These include both ongoing SBC activities through mass media and interpersonal communications, and targeted activities promoting specific interventions, such as ITN distribution or SMC 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, banners and T-shirts with messages, etc.). Topics of ongoing SBC at the community level include the importance of owning and using ITNs, prompt care-seeking in 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 civil society organizations, PMI has supported malaria education and prevention throughout the country.

- PMI supported broadcasting of 86 TV spots and 258 radio spots at the central level for social support for the use of LLINs and early access to care.
- PMI also supported the broadcasting of 3,164 radio public service announcements in the seven regions on bed net use, IPTp, and early care-seeking; additionally, 870 messages were inserted in the largest broadcasts.
- Through the integrated outreach activities, PMI supported the training of 524 mutuelle members and 2,114 CVACI members, more than 70 percent of whom were women.
- PMI supported 332 action plans of CVACIs, mainly focusing on social and behavior change communication (SBCC).
- Integrated Maternal health promotion activities developed and implemented by mutuelles and CVACIs reached 27,055 pregnant women with prevention and care messages including malaria in pregnancy.
- 110 community actors (CVACIs and mutuelles) were trained in the health districts of Louga, Kebemer and Darou Mousty on malaria to help increase the population sensitization of malaria symptoms and early care-seeking behavior.
- SMC communication: PMI supported community mobilization activities in all SMC districts, interpersonal communication to promote acceptability and adherence to SMC regimen in targeted communities, the reproduction of all communication tools (T-shirts, caps, bibs, banners, A2 posters, and bags), the reproduction of all management tools, and the acquisition of hydroalcoholic solutions for the 2020 SMC campaign. Additionally PMI provided resources to support launch events and media communication (TV spots, media coverage) both at the central and regional level. Due to the COVID-19 context, several events with large audiences had to be scaled down and adapted with preventive measures.
- IRS communication: PMI supported SBC activities for the 2020 IRS campaign in the four spray districts including organizing awareness caravans in each district, conducting advocacy sessions with opinion leaders, contracting community radio to broadcast a package of activities (over 600 spots, 15 interactive radio broadcasts, and 30 interviews), and organizing over 200 radio talks.
- PMI also supported IRS SBC training workshops for 1,425 *relais* and 119 supervisors, mobilization of 322,535 community actors including traditional leaders, and the purchase of sensitization activities such as T-shirts, caps, banners, surgical masks, and hydroalcoholic gels.
- PMI supported a sustained communication campaign to promote the use of LLINs in the regions selected on the basis of cDHS data, with a focus on regions with low long-lasting insecticidal net use, large cities, and *daaras*. Activities were implemented in the regions of Dakar, Kaffrine, Kédougou, Tambacounda, Kaolack, and Diourbel. The campaign included activities of interpersonal communication activities implemented by CBOs in rural areas and communication through billboards and media (TV and radio for cities, community radios in rural areas).
- **COVID-19 Impact: Data from the 2020 Annual Epidemiology Bulletin reveals a decline in early care-seeking, which had a negative impact on health status linked to malaria.** Nationally, there was a decrease in the number of visits to health facilities and slight increase in the number of malaria-related deaths since the beginning of the COVID-19 pandemic in March. The high-burden malaria regions (Tambacounda, Kédougou, and Kolda) reported an increase in late referral of cases and sharp increase in malaria deaths at the onset of COVID-19. Additionally, four regions (Dakar, Diourbel, Thiès, and

Ziguinchor) observed a pronounced decline in the use of health facilities and slight increase in malaria-related deaths between February and March.

PMI-Supported Planned Activities (CY 2021–2022 implementation)

With the reduction in malaria burden observed in Senegal and the rollout of interventions specific to the epidemiologic profile of different parts of the country, SBC activities are tailored to local contexts as well to reflect the interventions being implemented.

- PMI's focus intervention areas are the high-incidence south-eastern KKT regions as well as high-burden hotspots in the central regions of Diourbel and Kaolack. However, support for SBC activities is two-pronged with a nationwide focus through mass media implemented by the National Health Communication Office, and target regional communication activities through the integrated bilateral health project. PMI funding supports both the national and regional communication activities.
- PMI will provide technical assistance and resources for the acquisition of communication tools for PECADOM+ in 35 target districts, tools for IPT in pregnant women, in 4 districts for IRS campaigns, and in 16 target districts for the SMC campaign.
- PMI will support social mobilization at the community level for IRS and messaging for the proposed 2021 and 2022 IRS campaigns and the 2023 phasing out of IRS in the four target districts (Kedougou, Koumpentoum, Koungheul, and Maka Colibantang).
- PMI will support SBC messaging around ITN use at the operational level, targeting the whole community but with an emphasis on pregnant women and children under five years of age. Channels of communication will include interpersonal communication (IPC) using CHWs, as well as local radios, drama, etc. Special focus will be on high malaria burden regions in Southeast Senegal as well as regions with low long-lasting insecticidal net use, large cities and *daaras*.
- PMI will support SBC messaging for the SMC campaign through various channels (event launch, media coverage, community sensitization, social mobilization, and IPC). Activities will also include outreach and sensitization of local religious and governmental authorities in areas were low acceptability of the SMC campaign has been noted in previous years (Kaolack, Diourbel, Touba, Kedougou, and Tambacounda districts)

Key Goal

Through the use of SBC interventions and in alignment with a country's national malaria control communication strategy, PMI supports the uptake and correct and consistent use of malaria interventions, thereby improving the overall quality of malaria control efforts that will contribute to reductions in malaria.

Key Question 1

What behaviors is PMI proposing to prioritize through its SBC programming? What data support this prioritization? Will support be geographically targeted or national?

Table A-21. Prioritized behaviors with FY 2022 funds

Behavior	Target Population	Geographic Focus	Justification
Uptake of IPTp3	Pregnant women and heads of households	Kolda, Diourbel, Kédougou, Tambacounda, Sédhiou	Strategic decision to target high-burden regions with SBC combined with mobile outreach at the community level to increase coverage with SP3. While IPT 3 coverage (number of women seen in prenatal consultation who received directly observed treatment of three doses of SP) increased from 53.6% in 2019 to 62.9% in 2020, the strategic objective for 2020 of 80% coverage has not been reached. The same coverage level (80%) remains in place for the NSP 2021–2025. A Global Fund study found that pregnant women are skeptical of the efficacy of IPTp and say that they are not receiving enough information from healthcare providers about side effects.
Proper use of nets	All population with a particular focus on pregnant women and children under five years of age	All regions	PMI support for vector control is shifting from use of IRS to a broad introduction of next-generation nets (PBO and dual AI), prioritizing high-burden areas and neighboring regions. Specific communication will have to include information about phasing out of IRS and novel aspects of these next-generation nets. Additionally, the proportion of the population sleeping under an ITN remains below the proposed target of 80% coverage in the NSP. To ensure optimal impact of our investment in next-generation nets, communication activities around use of nets will be reinforced. The recent behavior study shows seasonal net use, so communication campaigns need to continue to encourage populations to sleep under nets all year.
Early care-seeking	All population	All regions	PMI plans to intensify support for pre-elimination and control, the need to promote early care-seeking behavior to avert severe cases. A Global Fund study indicated that individuals don't think ACT is effective enough and thus choose traditional medication as first-line treatment instead.

Malaria in Senegal is unequally distributed among the regions, with three out of the four PMI focus regions (KKT) carrying the bulk of the malaria burden. While the three regions account for only 11 percent of the Senegalese population, they recorded 83.3 percent of confirmed malaria cases in 2020, 89.6 percent of cases among children under five years of age, 90.2 percent of cases in pregnant women, 51 percent of reported malaria-related death among the general population, and 73 percent of malaria-related deaths among children under 5 years of age. Thus, PMI support for SBC will continue to focus mainly on these high-burden regions with an integrated package of activities aiming at increasing uptake and utilization of core malaria prevention (ITN, SMC, and MIP) and

treatment services (early care-seeking and access to RDTs and ACTs). Channels of communication will include mass media through radio and TV, and IPC through CBOs working with CHWs. At the national level, PMI will support the NMCP for SBC messaging and advocacy during special events such as SMC campaigns, ITN distribution campaigns, World Malaria Day, etc. Findings from the formative research carried out in 2020 will be used to inform the design of activities as necessary.

Key Question 2

Given the priority behaviors identified, what data are available to better understand the factors influencing low uptake? What are the behavioral determinants of the prioritized behaviors? Are there gaps in understanding the barriers to uptake?

Supporting Data

Table A-22. Prioritized Behaviors with FY 2022 Funds

Behavior	Key Facilitators	Key Barriers	Knowledge Gaps
Uptake of IPTp3	Early disclosure of pregnancy and access to ANC services, knowledge of health effects, administration methods	Distance to health facilities, SP stockouts, provider behavior, and lack of information or misinformation on side effects	The impact of various known barriers to optimal IPTp coverage, including access to SP, late disclosure of pregnancy, and provider behaviors
Proper use of nets	Knowledge of benefits of proper usage and adequate amount for number of household members and sleeping spaces	Increased heat during hot season, discomfort due to shape, color, rigidity, allergic reactions and unsuitability with communal sleeping spaces/arrangements	Net use data are not stratified by age group
Early care-seeking	Access to health facilities, particularly in rural areas, address issues of indirect cost, adequate supply of medication with DSDOMs, and motivation to conduct SBCC activities	Cost of services; cultural practices to treating illness (self-treatment, traditional healers); perception of malaria case as less urgent and service providers behavior; non-respect of national testing and treatment guidelines by service providers in all sectors; low risk perception of heads of household; mothers feeling disempowered to bring children for care	Perception of cost and effectiveness of medication such as ACT and SP; characterization of the care-seeking behavior for febrile illness in all age groups as there is limited data beyond children under five years of age; service provider behavior in terms of adherence to national malaria testing and treatment guidelines; lack of data from private and informal sectors

While several studies have been conducted on the determinants of behaviors, the NMCP assessment is that they are not comprehensive enough, because of either their scope or design. The 2020 Global Fund-funded research on the determinants of behavior in relation to the use of malaria services conducted in 21 high-burden districts across Senegal, reveals barriers and knowledge gaps that significantly impact behavior change particularly around the use of nets, early ANC visits, and early care-seeking overall. While there was predominantly positive feedback (94 percent) on the dissemination of broad SBCC messaging, for uptake of IPT3, a significant number of respondents reported fear of side effects because health workers do not take enough time to inform them of the importance of IPT3 and misconceptions around the risks of side effects. The respondents also call for an improvement in the administrative approach of IPT3. The study shows that key barriers to the use of nets relate mostly to the discomfort of heat during the high temperature months, the incompatibility with sleeping spaces (shape, color and sleeping arrangements). Additionally, for early care-seeking, only 46.8 percent perceive early recourse to healthcare within 24 hours in case of fever. Caretakers are seeking traditional medicine as a first line of treatment before going to the clinic. Another notable barrier is the cost associated with seeking care, such as transportation and consultation fees, particularly for people in rural areas. Other notable deterrents to care include distance to health facilities and shortage of medications at the community level.

While Senegal has evolved very positively in terms of availability of commodities and communication of messages, and data show that both caregivers of children and healthcare providers have the requisite knowledge, the proportion of children with fever for whom care was sought has remained constant at approximately 50 percent since the 2008–2009 MIS, and a surprisingly low proportion of children under five years of age with fever receive a diagnostic test (cDHS data). Although Senegal has a comparative wealth of information around children under five years of age, as the country shifts from a control phase to a context of malaria elimination, a better understanding of care-seeking and case management is needed for the entire population. There is very limited data on care-seeking for and management of febrile illness in all age groups and how this may impact malaria case management.

Current routine data from health facilities provide us with good visibility of testing and treatment within the public sector, but there is minimal visibility in other sectors (private, traditional medicine, pharmacies, etc.). Even though the proportion of suspected cases tested is routinely reported to be 99 percent to 100 percent in the public sector, it is unclear why only a third of children under five years of age seeking care for fever report receiving a diagnostic test (cDHS data).

Key Question 2a

For uptake of IPTp3, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Supporting Data

Limited research studies on the effectiveness of the approach to administering IPTp3 and barriers that may be associated with distance to facilities. Knowledge gaps around misconceptions and fear of potential risks to side effects of IPTp3.

Key Question 2b

For proper use of nets, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Supporting Data

Limited understanding in households sleeping arrangements/spaces, cultural and social sentiment around the shape, texture and color of the nets, incompatibility with sleeping spaces. For example, the NMCP study of the determinants of behavior reported the white color of the nets is associated with the covering of the dead. Limited understanding of indoor/outdoor sleeping behavior in all age groups, which is a common occurrence in many parts of the country due to the climate conditions.

Key Question 2c

For early care-seeking, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Supporting Data

As routine data and survey data focuses on vulnerable populations (children under five years of age and pregnant women), there is very limited data on care-seeking for and management of febrile illness in all age groups and how this may impact malaria case management. This is a major gap in understanding, as the country shifts from a control phase to a context of malaria elimination, where the country seeks to interrupt malaria transmission. The most recent behavior determinants study designed in 2019 and conducted in 2020 fall short in its questionnaire to address these knowledge gaps. PMI will promote future monitoring and evaluation tools to capture data that provide deeper understanding of care-seeking behavior and bed net usage among all age groups. Seasonal behavioral change based on activities and the constraints of indirect cost associated with receiving care (cost of transportation, provider consultation fees, and time away from income-generating activities) remain to be explored. Because provider actions affect clients' care-seeking decisions, a better understanding of service provider behavior and quality of overall experience at health facilities (private and public) is also needed, as well as an understanding of services sought and provided within the informal health sector.

An evaluation of malariology training courses implemented by the NMCP with the *Institut de Santé et Développement* (National Institute of Public Health) is planned. This evaluation will include reviewing the training module on SBC. Additionally, in 2021 an OR study will be undertaken to identify barriers to appropriate case management of febrile illness that influence care-seeking that would be amenable to intervention at the community and health facility levels (see Section 3.3).

Key Question 3

What is the country's capacity to design, implement, and monitor SBC interventions at the national and subnational level?

Supporting Data

In addition to the assessment of the current SBC capacity provided on the Program Inventory, the following strengths and weaknesses were identified:

Strengths

- Existence of a National Communication Strategy in support of the NSP
- Existence of guidance documents for community actors on different interventions (training guides and briefs)
- Production of communication media for all interventions
- Sustained mass media activities
- Implementation of SBC (IPC) at community level through civil society organizations

Weaknesses

- Insufficient communication plans at the operational level
- Lack of monitoring of community level SBC activities by the districts
- Insufficient action-oriented social/citizen mobilization
- Insufficient support for the implementation of community plans
- Significant financial gaps and heavy dependence on donors for funding activities
- Advocacy plan for domestic resource mobilization not well implemented

Conclusions for SBC Investments

- PMI will support various SBC channels including broadcasting, 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, banners and T-shirts with messages, etc.)
- PMI will support SBC activities with a nationwide focus through mass media implemented by the National Health Communication Office, and target regional communication activities through the integrated bilateral health project and regional direct financing (regional G2G). PMI will also provide funding for both the national and regional communication activities including the procurement of communication tools and technical support for the design of SBC materials.
- The NMCP conducted formative research in 2020 to identify key drivers and determinants to uptake of malaria services. These recent findings are taken into account in the new NSP strategy and planned SBC activities, funded by all partners. As with other interventions, PMI's specific focus will be in supporting SBC activities in the high-burden South-Eastern region of the country. Additionally with the proposed implementation of PBO and dual AI nets, the SBC activities strengthening the use of ITNs and highlighting the added value of PBO/dual AI nets will be reinforced in the districts where these new ITNs will be distributed.

Senegal has a relatively strong SBC and long-standing communication strategy that combines both IPC and mass media and involves CBOs in the implementation of activities. The weaknesses outlined by the head of the SBC/communication office are due to a combination of budget constraints, poor local resource mobilization, and low prioritization of SBC by decision-makers who tend to favor other intervention areas during budget planning, which is not unique to Senegal. There is also a need to prioritize social mobilization for increased citizen commitment to behavior change promotion

PMI recommended an increase of the SBC budget and will provide technical assistance for monitoring and evaluation of activity implementation as well as the use of data to better understand determinants of social

behavior. The NMCP is committed to taking lessons learned from the 2016–2020 Communication Strategy Plan and emphasizes focus on health promotion in pre-elimination zones and stronger control activities in others. Efforts to increase commitment to SBC activities from the national level are well presented in the 2021–2025 National Strategic Plan.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.5. OTHER HEALTH SYSTEMS STRENGTHENING

NMCP Objective

The 2021–2025 National Strategic Plan describes program management challenges that need to be met in order to improve performance in the implementation of interventions. It defines one specific objective: increase from 41 percent to 80 percent (gross execution of planned activities) governance, managerial, and operational capacities at all levels.

NMCP Approach

The NMCP will focus on concrete actions particularly in the areas of governance, decentralization of coordination, human resource strengthening at the operational level, functionalitý of partnership and coordination bodies, capacity-building for the NMCP coordination unit́, and advocacy for domestic resource mobilization. Specific interventions include the following:

- Improving the program's management framework
- Strengthening program coordination
- Strengthening management capacity at all levels
- Deconcentration/decentralization of malaria control activities
- Strengthening the partnership
- Program management in cross-border areas
- Improving domestic funding for malaria control
- Organizational learning
- Operation of the central coordination unit

PMI Objective in Support of NMCP

PMI supports many of the priority areas presented in the National Strategic Plan, with a particular focus on capacity-building for the NMCP and operational-level actors, promoting stronger coordination among partners, and decentralization. PMI traditionally provides a small amount of funding to support malaria-related Peace Corps small project assistance grants, but these have not been implemented because all Peace Corps Volunteers were evacuated at the onset of the COVID-19 pandemic.

PMI-Supported Recent Progress (CY 2020 implementation)

- Provided technical assistance to NMCP for the implementation of G2G activities. This assistance was also extended to the three G2G regions (Kaffrine, Kaolack, Ziguinchor) and four concentration regions

(Diourbel, Tambacounda, Kédougou, and Kolda). Key elements of the support included verification of milestones by regional committees, and a focus on the quality and use of health system and logistics data.
- Supported local governments to include malaria and other health priorities in their development plans and increase participation of communities in decision-making regarding health issues. This included participatory budgeting, training of local elected officials of the Health Technical Commissions, and promoting synergy and multisectoriality of interventions by actors in the fight against malaria at the institutional and territorial levels.
- Five departmental training workshops were held in Kolda and Sedhiou regions on the role of women's associations and elected women in improving the provision of malaria control services; 120 women, 50 percent of whom were local elected officials, were trained to strengthen their roles in the fight against malaria.

PMI-Supported Planned Activities (CY 2021–2022 implementation)

- Support NMCP staff for their participation in international scientific and professional meetings such as ASTMH to learn best practices, share experiences, and develop networks.
- Support for monitoring of the G2G agreement between PMI and the NMCP and assistance for management and data reporting. Support for at least two data quality audit missions to assess the performance level of key malaria indicators versus the target levels.
- Support to the CCPLP to bring together NMCP staff and all its in-country partners as well as the Global Fund, PMI, and other partners to provide guidance to the NMCP, facilitate information sharing, and ensure better coordination of malaria-related activities across the country.
- Continue support for local authorities to include malaria and other health priorities in their Community Development Plans, and for an increased participation of communities in decision-making regarding health issues. Facilitate local governments' access to data for proper analysis and consideration of malaria in local planning and budgeting. Support peer-to-peer approaches on good malaria control practices between territorial collectives, and within collectivities between communities and community-based organizations.
- Support local civil society organizations to advocate for a malaria line item in the national budget and for increased Government of Senegal funding of malaria, including advocacy for timely procurement of SP to prevent stockouts and increase procurement of malaria commodities.
- Implement a malariology course for health staff at various levels using a training-of-trainers model, whereby regional level health officers (graduates from the central level course) will train peripheral staff. This course will target health post chief nurses and nurse-midwives.

Key Goal

The goal of PMI for health system strengthening is the ability of a country to possess appropriately skilled human resources and the necessary infrastructure to plan, implement, and monitor the progress of their malaria control activities.

Key Question 1

N/A

Supporting Data

N/A

Conclusions for Additional Health Systems Strengthening Investments

PMI supports a broad array of health system strengthening activities that cut across intervention areas. The combined interventions have strengthened the health system in general, and greatly contributed to the progress made in reducing the malaria burden in Senegal.

With FY 2022 funds, PMI will:

- Support quarterly malaria partners coordination meetings to review planned activities, facilitate information sharing and ensure better coordination of malaria-related activities across the country.
- Continue the successful malariology course to increase the cadre of trained staff at the district level capable of leading program implementation of malaria control and elimination activities.
- Provide technical assistance for the management of Fixed Amount Reimbursement Agreement under the G2G mechanism to support the preparation and monitoring of the G2G agreement between PMI and the NMCP.
- Support Peace Corps Small Project Assistance grants. Specific projects that require funding will be submitted to the Small Project Assistance committee for approval. Projects that have been funded in the past include net care and repair activities, piloting the active detection of fever cases, training women's groups/community care groups, and organizing malaria fairs.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.