

PMI

U.S. PRESIDENT'S MALARIA INITIATIVE

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This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The funding available to support the plan outlined here is pending finalization of the FY 2020 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.

U.S. PRESIDENT’S MALARIA INITIATIVE

BENIN

Malaria Operational Plan FY 2020

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ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AI	Active ingredient
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
BMGF	Bill and Melinda Gates Foundation
CDC	Centers for Disease Control and Prevention
CREC	<i>Centre de Recherche Entomologique de Cotonou</i> (Entomological Research Center of Cotonou)
CNLS-TP	<i>Conseil National de Lutte contre le SIDA, les infections sexuellement transmissibles, la Tuberculose, le Paludisme, les hépatites et les épidémies</i> (National AIDS Council on Sexually Transmitted Infections, Tuberculosis, Malaria, Hepatitis and Epidemics)
CY	Calendar year
DDS	Departmental Health Service, Ministry of Health
DHS	Demographic and Health Survey
DPMED	<i>Direction des Pharmacies, des Médicaments et Explorations Diagnostiques</i> (National Directorate of Pharmacies, Medicines, and Diagnostics)
DSME	<i>Direction de la Santé de la Mère et de l'Enfant</i> (National Directorate for Maternal and Child Health)
EPI	Expanded Program on Immunization
ETAT	Emergency triage assessment and treatment
FY	Fiscal year
GHI	Global Health Initiative
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOB	Government of Benin
HMIS	Health management information system
IEC	Information, education, communication
IPTp	Intermittent preventive treatment for pregnant women
IR	Insecticide resistance
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LSM	Larval Source Management
MIP	Malaria in pregnancy
MICS	Malaria indicator cluster survey
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program

PBO	Piperonyl butoxide
PMI	U.S. President's Malaria Initiative
PSN	National Malaria Strategic Plan
PSNIE	<i>Plan Stratégique National Intégré orienté vers l'Élimination du VIH/SIDA, la tuberculose, le paludisme, les hépatites virales, les IST et les maladies à potentiel épidémique</i> (Integrated National Strategic Plan Orientated towards Elimination of HIV/AIDS, Tuberculosis, Malaria, Viral Hepatitis, STIs and Epidemic Potential Diseases)
PSSP	<i>Plateforme du Secteur sanitaire Privé du Bénin</i> (Private Sector Health Platform)
RDT	Rapid diagnostic test
RMIS	Routine malaria information system
SBC	Social and behavior change
SM&E	Surveillance, monitoring, and evaluation
SOPs	Spray operations
SP	Sulfadoxine/pyrimethamine
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization

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 Benin to end malaria. PMI has been a proud partner of Benin since 2008, helping to decrease child death rates by 23.2 percent and increased ownership and utilization of insecticide treated nets (ITNs) from 25% to 92% and from 15% to 71%, respectively over the last decade (DHS 2006 and DHS 2017) through investments totaling almost \$205,023,000.

The proposed PMI fiscal year (FY) 2020 budget for Benin is \$16 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Benin for FY 2020. Developed in consultation with the National Malaria Control Program (NMCP) and key 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 Benin as well as other donors and partners.

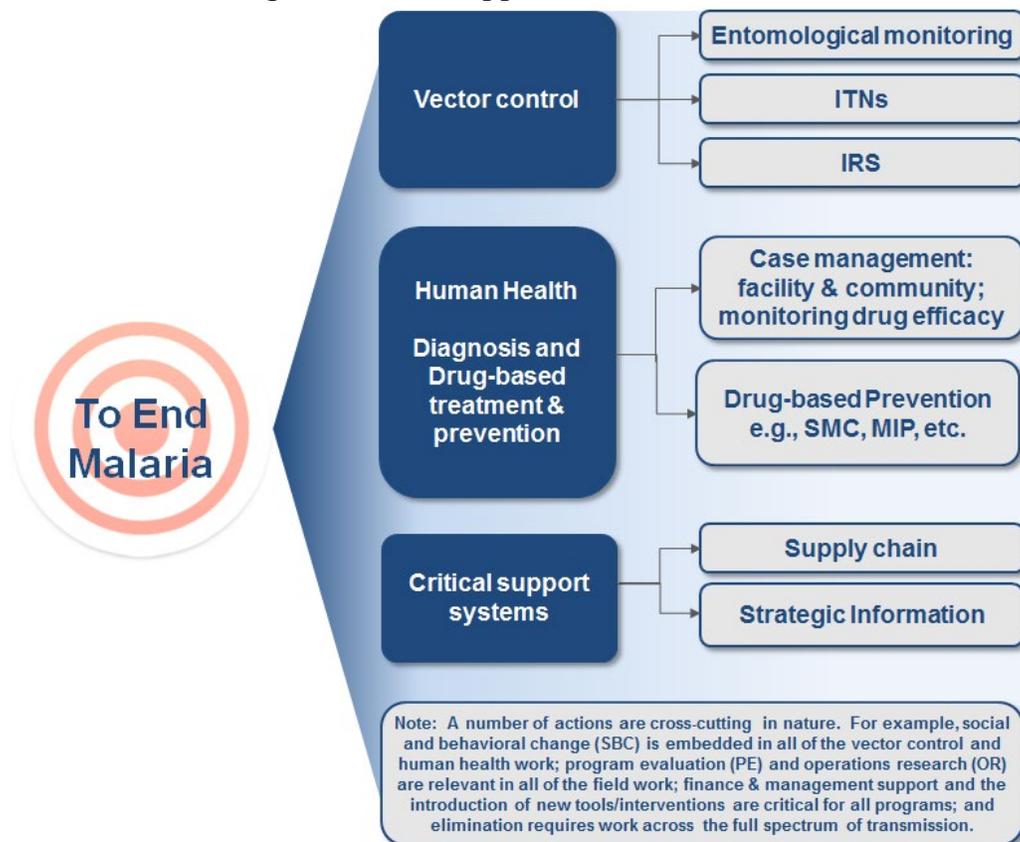
Benin at a Glance

- **Geography:** The Republic of Benin is located in West Africa and covers an area of 114,763 km². The country is divided into 12 administrative departments, 77 communes, 546 arrondissements (districts) and 5,295 villages. The villages are the base administrative subdivisions.
- **Climate:** The country is characterized by three climate zones – the south exhibits a sub equatorial climate with two rainy seasons (April - July and October - November) and two dry seasons (August-September and December-March); the center has a Sudano-Guinean climate zone characterized by a semi-humid tropical climate with a long rainy season; the north has a humid tropical climate with one rainy season (May - October) and one dry season (November - April).
- **Population in 2019:** 11,527,412 (INSAE projections)
- **Population at risk of malaria:** 100% (PSN)
- **Malaria incidence per 1000 population:** 150 (*annuaire des statistiques sanitaires* 2017)
- **Under-five mortality rate:** 96 (DHS 2017-2018)
- **World Bank Income Classification & GDP:** GDP per capita is \$2,069, annual GDP growth is 6.5 per cent, Human capital index is 0.41, <https://data.worldbank.org/country/benin>)
- **Political system:** presidential system
- **Trafficking in Persons designations, 2016-2018:** Tier 2 (Trafficking in Persons Report June 2018, 2019)

- **Malaria funding and program support partners include (but are not limited to):**
 - Global Fund to Fight AIDS, Tuberculosis and Malaria (GF)
 - U.S. President’s Malaria Initiative (PMI)
 - World Health Organization (WHO)
 - United Nations Children’s Fund (UNICEF)
 - Bill and Melinda Gates Foundation (BMGF)
- **PMI Support of National Malaria Control Strategy:** Approximately \$16 million per year. (See III. Overview of PMI’s support of Benin Malaria Control Strategy for additional details)
- **PMI Investments:** Benin began implementation as a PMI focus country in FY 2008. The proposed FY 2020 PMI budget for Benin is \$16 million; that brings the total PMI investment to nearly \$221 million.

PMI organizes its activities and planning levels around the activities in Figure 1, in line with the national malaria strategy.

Figure 1. PMI’s Approach to End Malaria



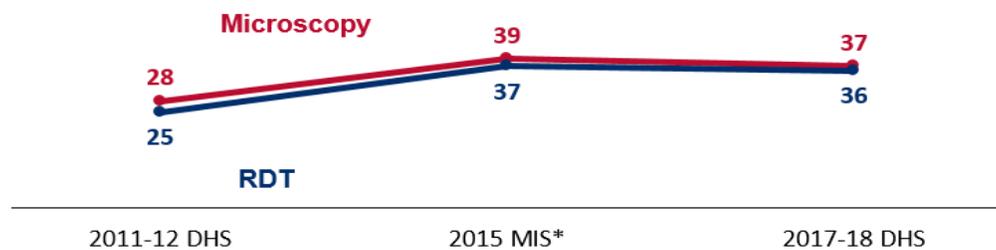
PMI’s approach is both consistent with and contributes to USAID’s Journey to Self-Reliance framework. Building and strengthening the capacity of Benin’s people and institutions – from the central level to communities – to effectively lead and implement evidence-based malaria control and elimination activities, remains paramount to PMI. As denoted in Table 2 (the budget table), nearly all of PMI’s planned support for FY 2020 in the areas of vector control, human health, supply chain and strategic information contains elements of capacity building and system strengthening. PMI/Benin will continue to rely on and engage with local partners such as NMCP, the National AIDS Council on Sexually Transmitted Infections, Tuberculosis, Malaria, Hepatitis and Epidemics (CNLS-TP), the Entomological Research Center of Cotonou (CREC), and is expanding its local partner base to reach local non-governmental organizations such as BUPDOS, SIANSON, and DEDRAS. Finally, PMI/Benin will continue to rely on private sector partnerships such as the Private Sector Health Platform (PSSP).

To accelerate the journey to self-reliance, PMI developed a programmatic inventory to assess the strengths and persistent challenges of Benin’s program (see Annex B). The activities proposed in this MOP are tailored to draw on these strengths and address the weaknesses, which will be monitored to evaluate the effectiveness of capacity building efforts. In addition, while PMI is cognizant that it will take time before Benin is capable of fully financing its development priorities, PMI will work with other partners (e.g., the Global Fund and the BMGF) to jointly track Benin’s funding commitments across the malaria portfolio.

II. MALARIA SITUATION AND MALARIA CONTROL PROGRESS IN BENIN

Malaria prevalence remains stubbornly high in Benin despite a decade of PMI support to the country. As the major donor for malaria control, PMI's support has been essential to the improvement of malaria control and infant mortality indicators. ITN ownership improved from 25% in 2006 (DHS) to 92% in 2017 (DHS). In addition, the mortality rate for children under five years of age dropped from 125 in 2006 (DHS) to 96 in 2017 (DHS). However, the IPTp 2 rate is still low at 50% (DHS 2017) and the early care-seeking rate in case of fever in children under five years of age is 53% (DHS 2017).

Figure 2. Trends in Malaria Prevalence, Percent of Children Age 6-59 Months who Tested Positive for Malaria by Microscopy and RDT



*The 2015 MIS sampled all children under five for these indicators

Figure 3. Trends in Prevalence of Low Hemoglobin, Percent of Children Age 6-59 Months with Moderate-to-Severe Anemia (Hemoglobin < 8.0 g/dl)

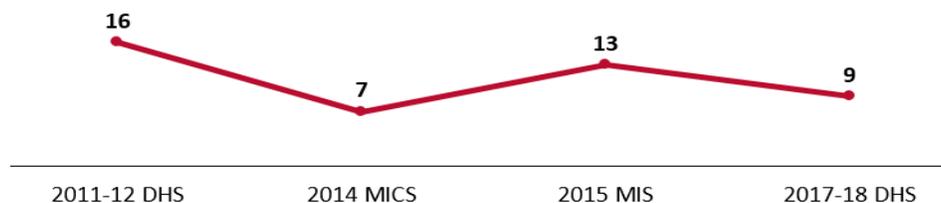


Figure 4. Malaria Parasite Prevalence Children Age 6-59 Months who Tested Positive for Malaria by Microscopy (2017 – 2018 DHS)

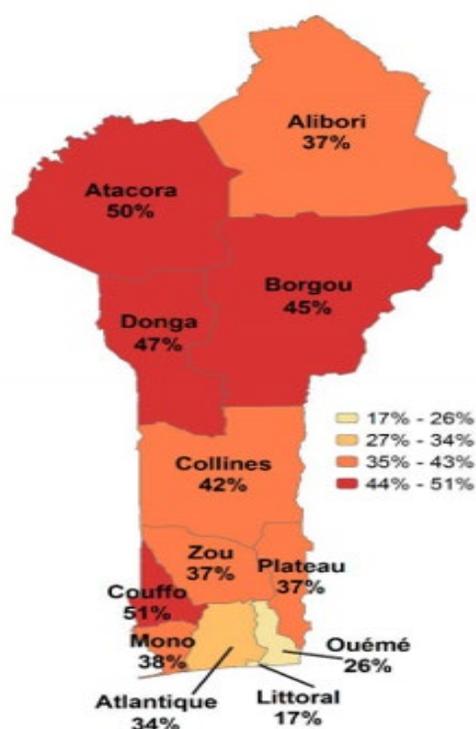


Figure 5. Key Indicators for Malaria Prevention and Treatment Coverage and Impact Indicators from Demographic Health Surveys (DHS) and Malaria Indicator Surveys (MIS) from 2006-2018.

Indicator	2006 DHS	2011-12 DHS	2014 MICS	2015 MIS	2017-18 DHS
% Households with at least one ITN	25	80	75	88	92
% Households with at least one ITN for every two people	7	45	35	29	61
% Population with access to an ITN	15	64	55	n/a	77
% Population that slept under an ITN the previous night*	15	63	60	68	71
% Children under five years of age who slept under an ITN the previous night*	20	70	73	81	78

Indicator	2006 DHS	2011-12 DHS	2014 MICS	2015 MIS	2017-18 DHS
% Pregnant women who slept under an ITN the previous night*	20	75	47	80	80
% Children under five years of age with fever in the last two weeks for whom advice or treatment was sought	64	58	44	n/a	53
% Children under five years of age with fever in the last two weeks who had a finger or heel stick ¹	n/a	17	19	26	18
% Children receiving an ACT among children under five years of age with fever in the last two weeks who received any antimalarial drugs ¹	1	32	13	n/a	37
% Women who received two or more doses of IPTp during their last pregnancy in the last two years ²	5	42	65	48	50
% Women who received three or more doses of IPTp during their last pregnancy in the last two years ²	n/a	9	13	12	14
Under-five mortality rate per 1,000 live births	125	70	115	n/a	96
% Children under five years of age with parasitemia (by microscopy , if done)*	n/a	28	n/a	39	37
% Children under five years of age with parasitemia (by RDT , if done)*	n/a	25	n/a	37	36
% Children under five years of age with severe anemia (Hb<8gm/dl)	n/a	16	7	13	9

*DHS/MICS surveys are generally fielded during the dry season, whereas MIS surveys are deliberately fielded during the high transmission season, which should be taken into consideration when interpreting these indicators

¹Note that this indicator has been recalculated according to the newest definition, care or treatment from any source excluding traditional practitioners wherever possible

²Note that this indicator has been recalculated according to the newest definition (at least two doses of SP/Fansidar from any source) wherever possible

Figure 6. Evolution of Key Malaria Indicators Reported through DHIS2

Indicator	2014	2015	2016	2017	2018
# Suspect malaria cases ¹	1,887,269	2,035,869	1,967,239	2,474,052	2,772,052
# Patients receiving diagnostic test for malaria ²	1,595,744	1,783,083	1,799,300	2,284,259	2,365,936
Total # malaria cases ³ (confirmed and presumed)	1,413,879	1,527,346	1,536,600	1,765,182	2,142,391
# Confirmed cases ⁴	1,113,839	1,274,560	1,368,575	1,575,389	1,755,597
# Presumed cases ⁵	300,040	252,786	168,025	189,793	386,794
% Malaria cases confirmed ⁶	79%	83%	89%	89%	82%
Test positivity rate (TPR) ⁷	71%	70%	75%	81%	74.2%
Total # <5 malaria cases ⁸	615,412	635,785	632,264	713,665	819,022
% Cases under 5 ⁹	44%	42%	41%	40%	38%
Total # severe cases	190,185	173,532	162,441	165,441	171,990
Total # malaria deaths ¹⁰	1869	1747	1,474	2,047	2,251

Indicator	2014	2015	2016	2017	2018
# Facilities reporting ¹¹	1201	1243	1283	1366	1338
Data form completeness (%) ¹²	95%	94%	93%	98%	97%

Definitions:

¹ Number of patients presenting with signs or symptoms considered to be possibly due to malaria (e.g., this could be the number of patients presenting with fever or history of fever in the previous 24 or 48 hours)

² Number of patients receiving a diagnostic test for malaria (RDT or microscopy). All ages, outpatient, inpatient

³ Total # cases: Total number of reported malaria cases. All ages, outpatient, inpatient, confirmed and unconfirmed cases.

⁴ Number confirmed cases: Total diagnostically confirmed cases. All ages, outpatient, inpatient.

⁵ Number presumed cases: Total clinical/presumed/unconfirmed cases. All ages, outpatient, inpatient.

⁶ Percent Malaria Cases confirmed: # confirmed cases/ Total # cases

⁷ Test Positivity Rate (TPR): Number of confirmed cases/Number of patients receiving a diagnostic test for malaria (RDT or microscopy)

⁸ Total #<5 cases: Total number of <5 cases. Outpatient, inpatient, confirmed, and unconfirmed.

⁹ Total # <5 cases (#8 above) / Total # of cases (# 3 above)

¹⁰Total # Malaria Deaths Reported: All ages, outpatient, inpatient, confirmed, and unconfirmed.

¹¹Total # of health facilities reporting data into the HMIS/DHIS2 system for that year.

¹²Data completeness: Number of monthly reports received from health facilities/Number of health facility reports expected (i.e., number of facilities expected to report multiplied by the number of months considered).

III. OVERVIEW OF PMI'S SUPPORT OF BENIN'S MALARIA CONTROL STRATEGY

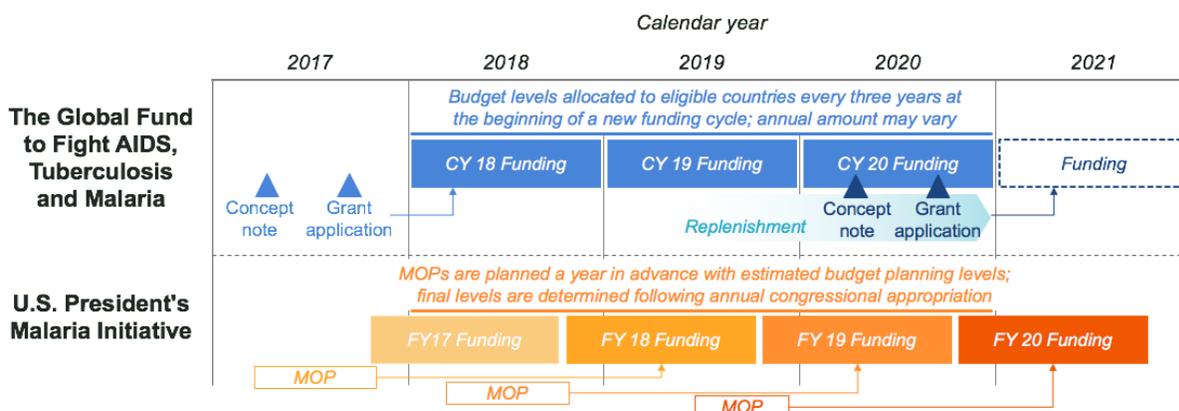
The Benin NMCP National Malaria Strategic Plan (PSN) covers the period from 2017 to 2021. In 2019, the CNLS-TP, a new presidential body created and mandated to design and oversee the implementation of the country's strategies with the goal of eliminating priority diseases by 2030, is developing a new integrated strategic plan (*Plan Stratégique Nationale Intégré*, PSNIE) that encompasses the strategies of all disease control programs, including malaria. With the new PSNIE, Benin is adopting an integrated multi-sectoral approach to tackle priority diseases by rationalizing and coordinating the existing government and partner resources. The content of the new PSNIE will include a number of new strategies (not all part of the current PSN). These strategies include larval source management (LSM), including the implementation of large-scale sanitation activities and larviciding to destroy both temporary and permanent breeding sites to address outdoor mosquito biting and supplement ITNs and IRS. The plan also includes the additional protection of using house screening (i.e. putting up net screens over home openings such as windows, doors and eaves) to further prevent infectious mosquito bites beyond IRS and ITNs; this will further decrease mosquito-vector contact and enhance protection against mosquitoes indoors. However, these interventions currently do not receive PMI resources. In addition, the CNLS-TP is intending to roll out a revamped integrated community health strategy that would require the payment of monthly salaries to community health workers (CHW) which is not supported by PMI.

IV. PARTNER FUNDING LANDSCAPE

PMI emphasizes the importance of partner alignment on malaria control. With the recognition that each of the agencies emphasizes complementary funding support for the national malaria control effort in a given country, over the last year, PMI, Global Fund, and the Bill and Melinda Gates Foundation (BMGF) set out to harmonize financial, supply chain, and programmatic data, and this effort remains ongoing as of the time of this MOP. A harmonized financial taxonomy has been developed for PMI and Global Fund (i.e. mapping cost categories across organizations).

Figure 8 visualizes the annual cycle of PMI funding and the MOP implementation year. As the figure illustrates, any given FY MOP funds activities that take place during the next FY. For example, a FY18 MOP funds implementation during FY19. Whereas Global Fund funding (and often, other partners and host country governments) is based on a three-year grant cycle on a calendar year (CY) timeframe during which activities were implemented. Annual PMI country budget allocations depend largely on the U.S. Congress' total overall malaria funding appropriation to USAID in a given fiscal year, as well as other considerations (e.g., previous funding levels, activity and program pipelines, other donor contributions, known commodity needs/gaps, progress on ongoing PMI-supported activities, clear evidence of continued government commitment to malaria control).

Figure 8: PMI and Global Fund Funding Cycle Alignment¹



Figures 9 and 10 summarize contributions by external partners and host country government in calendar years 2018-20, with the goal of highlighting total country investments. For Benin, data is available for PMI (FY 2019) and Global Fund (CY 2018-2020). As the Global Fund 2021-2023 grant funding cycle is not yet underway at the time of PMI FY 20 MOP development, Global Fund country investments for the 2021 implementation period and beyond are unknown. Note that the host country government invests substantial funding into the national-to-local infrastructure and service

¹ In some cases, Global Fund's funding may come in partway through the calendar year. Funding levels in "Section IV - Partner Funding Landscape" and commodity procurement amounts listed in "Annex A - Intervention Specific Data" may differ given the lag between the year that funding was planned and the year when procurement orders were placed. Differences may be a reflection of timing and/or based on changes in commodity consumption levels at country level, changes in commodity costs, or other donor orders.

delivery for malaria and many other programs. However, no standard method for attributing malaria-specific investments exists. Thus, it may not yet be possible in the FY 2020 MOP cycle to attribute funding from the host country government. There may be similar challenges for other partners.

Figure 9. Annual budget by Level 1 category

Year ¹	Funder	Vector Control	Case Management	Drug-Based prevention ²	Supply Chain ³	Monitoring, Evaluation & Research	Other Cross-Cutting and Health Systems Strengthening	Total
FY17/ CY18	PMI	\$7.6M	\$2.5M	\$0.9M	\$0.7M	\$0.8M	\$3.4M	\$16.0M
	Global Fund	-	\$1.9M	-	\$0.3M	\$0.2M	\$1.9M	\$4.2M
	Total	\$7.6M	\$4.4M	\$0.9M	\$1.0M	\$1.0M	\$5.4M	\$20.2M
FY18/ CY19	PMI	\$6.6M	\$2.7M	\$1.2M	\$1.2M	\$1.8M	\$2.6M	\$16.0M
	Global Fund	\$17.6M	\$1.5M	-	\$0.2M	\$0.3M	\$2.0M	\$21.7M
	Total	\$24.2M	\$4.2M	\$1.2M	\$1.4M	\$2.1M	\$4.6M	\$37.7M
FY19/ CY20	PMI	\$7.3M	\$2.7M	\$1.1M	\$1.1M	\$0.7M	\$3.2M	\$16.0M
	Global Fund	\$1.1M	\$1.6M	-	\$0.2M	\$0.3M	\$2.1M	\$4.4M
	Total	\$7.4M	\$4.4M	\$1.1M	\$1.3M	\$1.0M	\$5.3M	\$20.4M

¹Each year's figures represent the FY for PMI and CY for GFATM that most closely align. Global Fund budget data accurate as of July 1, 2019. PMI budget data accurate as of Sept 1, 2019.

²Drug-based prevention, including SMC and MIP where relevant;

³Covers management of in-country warehousing & distribution of malaria commodities, except for ITNs which are captured under "Vector Control"

Note: Categories shown 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; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using same categories.

Figure 10. Annual budget by Level 3 category, detailed breakdown for PMI and Global Fund

Level 1 Category	Level 3 Category	FY17/CY18 ¹		FY18/CY19 ¹		FY19/CY20 ¹	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
Vector Control	Procure ITNs for Continuous Distribution	-	-	\$2.5M	-	\$1.8M	-
	Distribute ITNs via Continuous Distribution	-	-	\$0.5M	-	\$1.2M	-
	Procure ITNs for Mass Campaigns	\$2.5M	-	-	\$10.0M	-	-
	Distribute ITNs via Mass Campaigns	\$0.5M	-	-	\$4.7M	-	\$0.1M
	Other ITN Implementation*	\$0.1M	-	-	-	-	-
	IRS Implementation ⁴	\$4.3M	-	\$3.6M	-	\$4.2M	-
	Procure IRS Insecticide ⁴	-	-	-	-	-	-
	Other IRS*	\$0.04M	-	-	-	\$0.04M	-

Level 1 Category	Level 3 Category	FY17/CY18 ¹		FY18/CY19 ¹		FY19/CY20 ¹	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
	Entomological Monitoring	\$0.3M	-	-	-	-	-
	SBC for Vector Control ⁵	-	-	-	-	-	-
	Other vector control measures	-	-	-	-	-	-
	Removing human rights- and gender-related barriers to vector control programs**	-	-	-	-	-	-
Case Management	Active Case Detection**	-	-	-	-	-	-
	Community-based case management	-	\$0.6M	-	\$0.6M	-	\$0.6M
	Facility-based case management	-	-	-	-	-	-
	Private-sector case management	-	-	-	-	-	-
	Procure ACTs	-	\$0.9M	-	\$0.6M	\$1.2M	\$0.6M
	Procure Drugs for Severe Malaria	-	-	\$0.1M	-	-	-
	Procure Other Diagnosis-Related Commodities	-	-	-	\$0.02M	-	\$0.03M
	Procure Other Treatment-Related Commodities	-	-	-	-	-	-
	Procure RDTs	-	\$0.2M	\$0.8M	\$0.2M	-	\$0.2M
	Therapeutic Efficacy	\$0.1M	-	\$0.1M	-	\$0.2M	-
	SBCC for Case Management ⁵	-	-	-	-	-	-
	Other Case Management	\$2.4M	-	\$1.7M	-	\$1.4M	-
Drug-Based Prevention²	Procure SMC-Related Commodities	-	-	-	-	\$0.2M	-
	SMC Implementation	-	-	\$0.7M	-	\$0.5M	-
	Prevention of Malaria in Pregnancy Implementation	\$0.9M	-	\$0.5M	-	\$0.5M	-
	Procure IPTp-Related Commodities	-	-	-	-	-	-
	IPTi**	-	-	-	-	-	-
	SC for Drug-Based Prevention ⁵	-	-	-	-	-	-
	Other Prevention**	-	-	-	-	-	-
Supply Chain³	In-Country Supply Chain ³	-	-	-	-	\$0.2M	-
	Supply Chain Infrastructure	-	-	-	-	-	-

Level 1 Category	Level 3 Category	FY17/CY18 ¹		FY18/CY19 ¹		FY19/CY20 ¹	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
	Ensuring Quality	-	-	-	-	-	-
	Pharmaceutical Management Systems Strengthening	\$0.7M	-	\$1.2M	-	\$0.9M	-
	Supply Chain System Strengthening	-	\$0.3M	-	\$0.2M	-	\$0.2M
Monitoring, Evaluation & Research	Reporting, Monitoring, and Evaluation	\$0.8M	-	\$1.1M	-	\$0.7M	-
	Program and data quality, analysis and operations research	-	\$0.2M	\$0.7M	\$0.2M	-	\$0.2M
	Surveys	-	\$0.02M	-	\$0.1M	-	\$0.03M
	Other Data Sources**	-	-	-	-	-	-
	Support for FETP*	-	-	-	-	-	-
Other Cross-Cutting and Health Systems Strengthening	Integrated service delivery, quality improvement, and national health strategies**	-	-	-	-	-	-
	Financial management systems**	-	-	-	-	-	-
	Community responses and systems**	-	-	-	-	-	-
	Support for PCV and SPAs*	\$0.03M	-	\$0.0M	-	\$0.0M	-
	Cross-Cutting Human Resources for Health**	-	-	-	-	-	-
	Central and Regional Program management ⁶	\$0.7M	\$0.2M	\$0.1M	\$0.3M	\$0.3M	\$0.3M
	In-Country Staffing and Administration*	\$2.0M	-	\$2.0M	-	\$2.0M	-
	Other Program Management**	-	\$1.7M	-	\$1.7M	-	\$1.8M
	SBC Unspecified ⁵	\$0.7M	-	\$0.5M	-	\$0.8M	-
Total	\$16.0M	\$4.2M	\$16.0M	\$21.7M	\$16.0M	\$4.4M	

1. Each year's figures represent the FY for PMI and CY for Global Fund that most closely align. Global Fund budget data accurate as of July 1, 2019. PMI budget data accurate as of Sept 1, 2019;

2. Drug-based prevention, including SMC and MIP where relevant;

3. Covers management of in-country warehousing & distribution of malaria commodities, except for ITNs which are captured under "Vector Control";

4. May include cost of IRS insecticides if full cost of IRS implementation including commodities was bundled within single line in prior year's Table 2;

5. SBC was not historically split in the PMI budget across intervention areas, hence the row "SBC (unspecified)" for the FY2020 MOP cycle. Going forward, SBC proposed activities will be categorized across vector control, case management, and prevention (new categories).

6. PMI Proposed Activity "National-level support for case management" rolls up under "Case Management" Level 1

Note: Categories shown 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; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using same categories.

* Category currently funded by PMI only

** Category currently funded by Global Fund only

Figure 11. Annual budget, breakdown by commodity

Year ¹	Funder	ITNs for Continuous Distribution	ITNs for Mass Distribution	IRS Insecticide ⁴	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
FY17/ CY18	PMI ²	-	\$2.5M	-	-	-	-	-	-	\$2.5M
	Global Fund ³	-	-	-	\$0.9M	\$0.2M	-	-	-	\$1.1M
	Total	-	\$2.5M	-	\$0.9M	\$0.2M	-	-	-	\$3.6M
FY18/ CY19	PMI ²	\$2.5M	-	-	-	\$0.8M	\$0.1M	-	-	\$3.4M
	Global Fund ³	-	\$10.0M	-	\$0.6M	\$0.2M	-	-	-	\$10.8M
	Total	\$2.5M	\$10.0M	-	\$0.6M	\$1.0M	\$0.1M	-	-	\$14.2M
FY19/ CY20	PMI ²	\$1.8M	-	-	\$1.2M	-	-	\$0.2M	-	\$3.2M
	Global Fund ³	-	-	-	\$0.6M	\$0.2M	-	-	-	\$0.9M
	Total	\$1.8M	-	-	\$1.8M	\$0.2M	-	\$0.2M	-	\$4.1M

¹Each year's figures represent the FY for PMI and CY for Global Fund that most closely align. Global Fund budget data accurate as of July 1, 2019. PMI budget data accurate as of Sept 1, 2019 ;

²PMI commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs.

³Global Fund commodity costs in table above only include ex-works commodity value in a given year. Additional costs, including quality control, freight, insurance, and customs totaled \$3.1M over the CY 2018-2020 period;

⁴IRS insecticide; for PMI, IRS insecticide commodity costs may be inextricable from IRS implementation costs in historical data – field left blank where this is the case.

Note: Categories shown 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; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using the same categories.

V. ACTIVITIES TO BE SUPPORTED WITH FY 2020 FUNDING

Please see the FY 2020 budget tables (Tables 1 and 2) for a detailed list of activities PMI proposes to support in Benin with FY 2020 funding. Please refer to www.pmi.gov/resource-library/mops for the latest tables. Key data used for decision-making can be found in Annex A.

ANNEX A: INTERVENTION-SPECIFIC DATA

1. VECTOR CONTROL

NMCP objective

In the current PSNIE of Benin, the NMCP considers ITNs, IRS, and entomological monitoring as its key vector control strategies. Insecticide-based interventions used in Benin include:

1. Provision of ITNs through two main delivery channels:
 - a. Universal coverage campaigns every three years
 - b. Routine service delivery to pregnant women and children under five years of age through:
 - i. Antenatal care (ANC)
 - ii. Expanded Program on Immunization (EPI) services in public health facilities;
2. Supplementary distribution of ITNs (to complement the main delivery channels)
 - a. Continuous ITN distribution through school-based distribution
 - b. Sale of ITNs in private sector through social marketing strategies
3. Provision of IRS in the following manner:
 - a. Providing IRS to at least 80% of eligible geographic areas in Benin
 - b. Performing, at least one seasonal IRS campaign annually, in at least one regional department of the country using an extended-release insecticide during the high transmission season.
4. Applying effective and environmentally sound practices using insecticide classes that are carefully selected and monitored entomologically for resistance.

Under the NMCP, consideration is given to the inclusion of supplementary vector control interventions such as larval source management (LSM) and house screening. These interventions are under consideration to address gaps in current interventions (i.e. IRS and ITNs) such as outdoor biting, incomplete ITN usage and house ineligibility for IRS spraying. These activities would only be done where they are practical, evidence suggests that it is impactful, and the intervention is cost-effective. Currently, there is no funding for these activities by PMI or other partners.

NMCP approach

ITNs: According to the National Strategic Plan (PSN), the NMCP targets universal access to ITNs through an overall two-pronged approach:

- nationwide mass ITN distributions every three years that provide free ITNs to all population groups (defined as one long-lasting ITN for every two people); and
- routine distribution of ITNs in public and private health facilities to pregnant women through ANC and to children under five years of age through EPI clinic services. The NMCP also supports the distribution of ITNs to children attending public-sector primary schools and in the private sector through social marketing.

IRS: PMI continues to be the primary technical and financial partner of IRS in Benin. The 2018 IRS campaign was the twelfth round of IRS supported by PMI in Benin and the second round in Donga and Alibori Departments. IRS in the Atacora Department was withdrawn in 2018. Three objectives for the 2019 spray campaign were pursued:

- Cover at least 85 percent of eligible structures found in six districts of Donga and Alibori departments.
- Increase national and local capacity in planning, implementing and supervising IRS.
- Implement cost-efficient activities to save funds and ensure ease of management.

Given these objectives, PMI aimed to cover approximately 348,978 structures in the six targeted districts of Donga and Alibori departments, and to protect as many of the estimated 1,112,610 people living in these communities as possible. To achieve these objectives, PMI worked with several partners including the Ministry of Health (MoH) and the NMCP, whose activities included:

- validation of IRS management tools, including information, education, and communication (IEC) tools, data collection and verification forms, report forms, checklists, etc.;
- support with planning the IRS campaign;
- training IEC mobilizers and spray operations (SOPs);
- supervision during the IRS campaign; and
- support with validating data collected.

LSM and house screening: Routine operational LSM and house screening for malaria control are under consideration. Strategic direction for these interventions is still being discussed within the MoH and with partners.

PMI objective, in support of NMCP

PMI has supported the collection of entomological indicator data since 2009 to inform and guide the country about issues related to 1) vector-insecticide resistance, and 2) ITNs and IRS efficacy. In the NMCP's current PSN, ITNs, IRS, and entomological monitoring are considered as key vector control strategies. PMI assures activities from these strategies are aligned with PMI guidance.

Entomological monitoring and insecticide resistance management

- PMI provides financial and technical support for entomologic monitoring to provide information on mosquito bionomics and track vector resistance in order to inform decision-making such as on selection of ITNs, IRS insecticides and spray sites.
- PMI conducts entomological monitoring and evaluation by collecting data on six primary indicators: vector density, taxonomy, parity, mosquito behavior, infection rate, and vector-insecticide resistance. Additionally, the duration of ITNs and IRS insecticidal effect is tracked to validate adequate duration of effect to cover peak transmission periods.
- Vector-insecticide resistance data is used to track changes in phenotypic and molecular insecticide resistance levels in local vector populations. Measurement of other indicators validates the ongoing impact of ITNs and IRS on target vector populations.
- PMI employs Benin's *Centre de Recherche Entomologique de Cotonou* (CREC: Entomological Research Center of Cotonou), which applies their standard entomological and biochemical and molecular capacity to estimate vector populations, vector-parasite infection rates and the frequency of insecticide resistance.

Insecticide-treated nets

- PMI provides financial and technical support for ITN procurement and distribution.
- Since its launch in 2008, PMI has purchased and distributed approximately 7.9 million ITNs.
- PMI provides technical assistance to the planning, coordination, logistical management of ITN distribution in Benin. PMI supports M&E committees, monitoring, supervision, and SBCC training.

Indoor residual spraying

- PMI provides financial and technical support for IRS campaigns.
- PMI is the sole donor funding of IRS in Benin; 13 rounds of IRS have been conducted in Benin since 2008.
- Since 2015, PMI has been supporting CREC, an installation of Benin's MoH, through direct funding to carry out IRS pilot feasibility assessments, entomology monitoring and evaluation activities.

- Because of support afforded to CREC, the NMCP is participating in all key components of the IRS program such as selection of insecticides and spray sites based on entomological results provided by CREC, a local institution sitting in the MoH. PMI's support of CREC serves as a good example of PMI's commitment to transferring technical and administrative capacity to national partners.
- PMI is also supporting microplanning, and field operations including environmental compliance, supervision, and training of campaign staff.
- Since the withdrawal of the IRS from seven communes in Atacora and the launch of IRS in six communes in Donga and Alibori in 2017, the NMCP has also received PMI funds to coordinate and implement enhanced epidemiological and socio-entomological surveillance in the northern region of the country to inform future IRS campaigns.

Currently, PMI does not support LSM or indoor screening in Benin.

PMI-supported recent progress (past ~12-18 months)

Through PMI's support, the following activities have been achieved.

- IRS training: From April to May 2019, 1,629 IRS personnel have been trained to conduct various roles in the IRS campaign. The personnel consist of coordinators, supervisors, sprayers, washers, community mobilizers, drivers, data entry security guards, pump maintenance technicians, storekeepers and assistants, and clinicians
- Study on household resident behavior: To identify household practices that may have implications on supported interventions such as ITNs and IRS. An unpublished study, conducted in northern Benin, was done where 594 household residents in 96 households were monitored to assess nighttime social behaviors. The study demonstrated that there are various resident behavioral barriers to current vector control strategies being implemented in Benin. Generally, household residents were either not inside their sprayed houses or not under an ITN during mosquito peak biting. Furthermore, many homes had many belongings or clothes hanging on the walls, which provided alternative resting sites for mosquitoes beside the sprayed walls.
- Entomological assessment of IRS: Entomological monitoring of IRS has been occurring in the departments of Atacora, Alibori and Donga since 2015. Figure A1 details of entomological monitoring surveillance sites in the PMI supported IRS sites. The table provides information on the timing of when sites are sprayed and surveyed.

Figure A1. Entomological Surveillance Sites (Districts) in Areas Receiving IRS Since 2015 Supported by PMI.

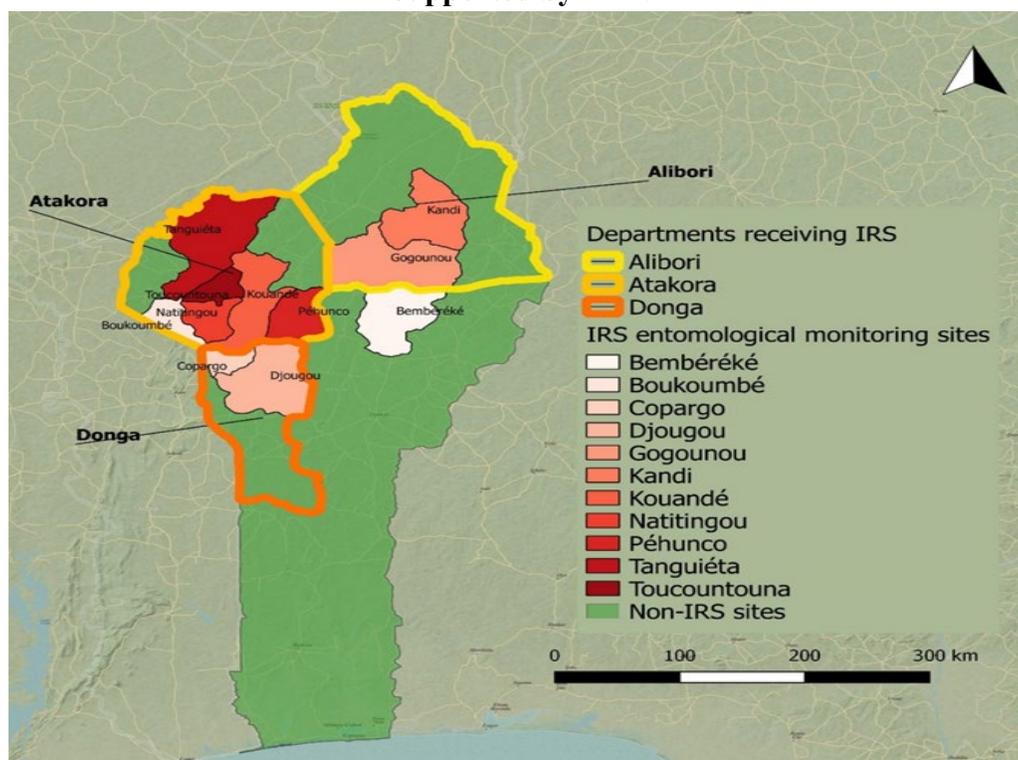


Figure A2.E Annual Entomological Monitoring of PMI-Supported IRS Sites Since 2015.

Departments	Districts	2015	2016	2017	2018	2019
Alibori	Gogounou	NS/NM	NS/NM	S/M	S/M	S/M
	Segbana	NS/NM	NS/NM	S/M	S/M	S/M
	Kandi	NS/NM	NS/NM	S/M	S/M	S/M
Atacora	Boukombe	S/M	S/M	W/M	W/M	W/M
	Kouande	S/M	S/M	W/M	W/M	W/M
	Natitingou	S/M	S/M	W/M	W/M	W/M
	Pehunco	S/M	S/M	S/M	S/M	W/M
	Kerou	S/M	S/M	S/M	S/M	W/M
	Tanguieta	S/M	S/M	W/M	W/M	W/M
	Materi	S/M	S/M	W/M	W/M	W/M

	Cobly	S/M	S/M	W/M	W/M	W/M
	Toukountouna	S/M	S/M	W/M	W/M	W/M
Donga	Copargo	NS/M	NS/M	S/M	S/M	S/M
	Djougou	NS/NM	NS/NM	S/M	S/M	S/M
	Ouake	NS/NM	NS/NM	S/M	S/M	S/M
Other	Bembereke	NS/NM	NS/NM	NS/M	NS/M	NS/M

S/M = Sprayed and monitored, NS/M = Not sprayed and monitored, NS/NM = Not sprayed and not monitored, W/M = Withdrawn spray and monitored

Because withdrawal of IRS, even in the presence of ITNs, has been associated with a rebound in entomological indicators of transmission, PMI has provided support to CREC to monitor the potential rally of these indicators as well as insecticide resistance.

- **Operational research:** PMI also supported CREC's completion of operational research in conjunction with CDC to evaluate the ability and use of colorimetric field tests in determining when to replace ITNs ^{2,3}.
- **Modeling:** PMI has been supporting an impact modeling simulation at the request of the President's Office to understand inputs required to get to elimination by 2030. In May 2019, a dissemination workshop of modeling results focused on reviewing the epi profile and the data sources used to develop it, and the preliminary results of the model. Planning is underway for the risk map/stratification. This will involve:
 - Development of an epidemiological profile
 - Malaria Atlas Project (MAP) risk mapping outputs and impact simulations
 - Cost-effective analyses
 - Translation of results into operational planning
- **Net durability monitoring** – CREC is finalizing its report on efficacy and durability of three types of polyester-based ITNs (DawaPlus 2.0, PermaNet 2.0 and Yorkool) distributed in 2017 during a national campaign. The study was conducted in three districts: one located in the North (Djougou), one in the South-east (Dogbo) and the last in the South-west (Kétou). Five hundred ITNs were randomly sampled from each of the 3 districts. The survival and physical integrity of these ITNs were assessed. In addition, the effectiveness of the ITNs was determined by WHO cone testing. Results of this study are reported in the following section.

² Azondekon R, Gnanguenon V, Oke-Agbo F, Houevoessa S, Green M, Akogbeto M. (2011) A tracking tool for long-lasting insecticidal (mosquito) net intervention following a national distribution in Benin. Parasit Vectors. 2014 Jan 4;7:6. doi: 10.1186/1756-3305-7-6. PubMed PMID: 24387635; PubMed Central PMCID: PMC3892047.

³ Green MD, Atieli F, Akogbeto M. Rapid colorimetric field test to determine levels of deltamethrin on PermaNet surfaces: association with mosquito bioactivity. Trop Med Int Health. 2009 Apr;14(4):381-8. doi: 10.1111/j.1365-3156.2009.02247.x. Epub 2009 Feb 22. PubMed PMID: 19254275.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- IRS workshop: One week prior to the 2019 MOP, PMI supported an IRS workshop to refine the extent of IRS for malaria control. This workshop reviewed all available data on IRS. The data reviewed at the workshop included:
 - epidemiological and entomological impact indicators,
 - mosquito insecticide resistance profiles,
 - IRS cost and cost-effectiveness,
 - household resident behavior in relation to IRS and ITNs,
 - operations and logistics of IRS implementers, and
 - alternative malaria control strategies such as the next generation ITNs, Piperonyl-butoxide (PBO) based ITNs and dual active ingredients (AI) (i.e. pyrethroids ITNs supplemented with chlorfenapyr and pyriproxyfen). Outputs from modeled-scenario analysis was also used to guide the decision-making process. The reason for this workshop was due to emerging concerns of the limited extent to which IRS can be implemented in Benin because of the high cost. In the 2019 IRS campaign, only 2 of 12 departments received IRS representing only ~14% of the population potentially protected by IRS at a cost ~26% of PMI's Benin budget; this suggests a serious cost gap. This workshop likely represents the first of many in-depth dialogues with the NMCP on IRS in Benin.
- Continued support of IRS: This will be contingent on clear evidence of positive epidemiological impact of IRS in the targeted areas of Benin in comparison with other interventions. For example, greater investment may be placed on next generation ITNs (i.e. PBO and dual AI ITNs). In addition to greater emphasis on ITNs, there may be more scale-up of community health workers to treat cases and reduce the infectious reservoir. The impact of IRS will be mainly evaluated by analysis of data from existing information systems including data from survey and routine data (epidemiological, entomological and social-cultural). In addition, PMI will support an independent evaluation of the 2020 IRS coverage that will be funded out of MOP 2017 reprogramming. However, the results from a Bill and Melinda Gates Foundation (BMGF) funded cost-effective study that will be conducted as part of the malaria modeling will also be a major factor in moving IRS forward.
- Continued support for ITNs: Benin is one of three PMI focus countries that have been approved to conduct village-scale randomized cluster comparisons of six new ITN products using a resistance to damage (RD) score approach developed by the WHO. The funding for this project is ending. CREC will do one additional year of monitoring in 2020 using pipeline funds. Coordination with the other focus countries will also be done in FY2020. For Benin, CREC

will finalize the analysis and write-up the report/publication in FY2020. Using FY 2018 resources, PMI will procure and distribute 750,000 ITNs to health facilities for routine distribution to pregnant women and children under five years of age. PMI continues to support ITN durability-related monitoring following national ITN distributions. The MOP also includes funding to support scale-up of a school-based distribution activity. ITN durability monitoring activities are also done to better inform ITN selection for mass campaigns.

- Continued support for SBC: PMI also supports SBC to increase compliance with nightly use of ITNs and improve ITN care and handling messaging.
- Continued support for entomological monitoring: PMI provides financial and technical support for entomologic monitoring to track vector resistance and inform selection of IRS insecticides and spray sites.

1.A. 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

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

Currently, funding levels in the FY 2020 budget for entomological monitoring activities in CY 2021 will remain the same. However, the FY 2019 budget for 2020 IRS activities will be reviewed and re-programmed, as needed and feasible to allow for improvements to the IRS activities to better inform the 2021 activities. Still, whether future campaigns will focus on next generation ITNs, or new paradigms of IRS deployment, it will be important to continue evaluating entomological indicators and associate them with epidemiological indicators. PMI will work with Benin to revise work plans to address entomological monitoring needs.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

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 A3. Entomological Monitoring Sites in Intervention and Control Areas for Longitudinal Entomological Monitoring or Insecticide Resistance (IR) Testing

Districts	Total sentinel sites	Activities	Supported by
Bembereke (control)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI
Copargo (intervention)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI
Djougou (intervention)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI
Gogounou (intervention)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI
Kandi (intervention)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI
Kouande (control)	2	<ul style="list-style-type: none"> • Molecular IR testing • Longitudinal monitoring 	PMI

Figure A4. Report of Entomological Monitoring from June to August 2019

Site	Major Vector	Minor Vector	Peak Abundance	Preferred Biting Location	Preferred Host	Peak Sporozoite Rate	Annual* EIR
Bembereke (control)	<i>An. gambiae</i> , s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i> , <i>An. funestus</i>	Indoors: 12 – 2 AM and Outdoors: 1 – 3 AM	Indoors: 55%	Human	1.20	142.56
Copargo	<i>An. gambiae</i> s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i> , <i>An. funestus</i>	Indoors: 1– 3 AM and Outdoors: 1 – 3 AM	Outdoor: 60%	Human	0.34	7.56
Djougou	<i>An. gambiae</i> s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i> , <i>An. funestus</i>	Indoors: 1– 3 AM and Outdoors: 1 – 3 AM	Outdoor: 58%	Human	0.24	7.56
Gogounou	<i>An. gambiae</i> s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i>	Indoors: 1– 3 AM and Outdoors: 1 – 3 AM	Outdoor: 54%	Human	1.12	15
Kandi	<i>An. gambiae</i> s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i>	Indoors: 1– 3 AM and Outdoors: 1 – 3 AM	Outdoor: 60%	Human	0.00	0.00
Kouande (control)	<i>An. gambiae</i> s.l.	<i>An. coluzzii</i> , <i>An. arabiensis</i> , <i>An. funestus</i>	Indoors: 12 – 2 AM and Outdoors: 1 – 3AM	Indoor: 59%	Human	9.43	232.56

* Annual entomological inoculation rate (EIR) based on June to August 2019 surveys; N/A: While exophily rates have been measured in the past in Benin, there is currently no data. However, past studies have shown 0 to 13% exophily rates during pre-IRS surveys suggesting ~87% resting indoors (see PMI report: <https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/benin-2015-entomological-monitoring-report.pdf?sfvrsn=6>)

Note: Information about preferred resting location is not available.

Conclusion

According to the most recent available surveys, the 2019 bionomical data shows that *An. gambiae* s.l. are the primary vectors and are biting both indoors and outdoors. This indicates that indoor interventions (ITNs, IRS) may still be effective, but outdoor biting is likely to maintain the cycle of transmission, even with good coverage of indoor interventions. Overall, *An. gambiae* s.s. was the most abundant vector (~90%) found in this recent survey, but other vectors such as *An. coluzzii*, *An. arabiensis*, and *An. funestus* were also reported albeit in lower abundance than *An. gambiae* s.s. However, past studies have suggested that *An. coluzzi* may play a moderate to high role in malaria transmission in northern Benin.⁴ While it will be important to monitor species population dynamics and insecticide resistance profiles, current entomological practices are sufficient to monitor bionomical trends.

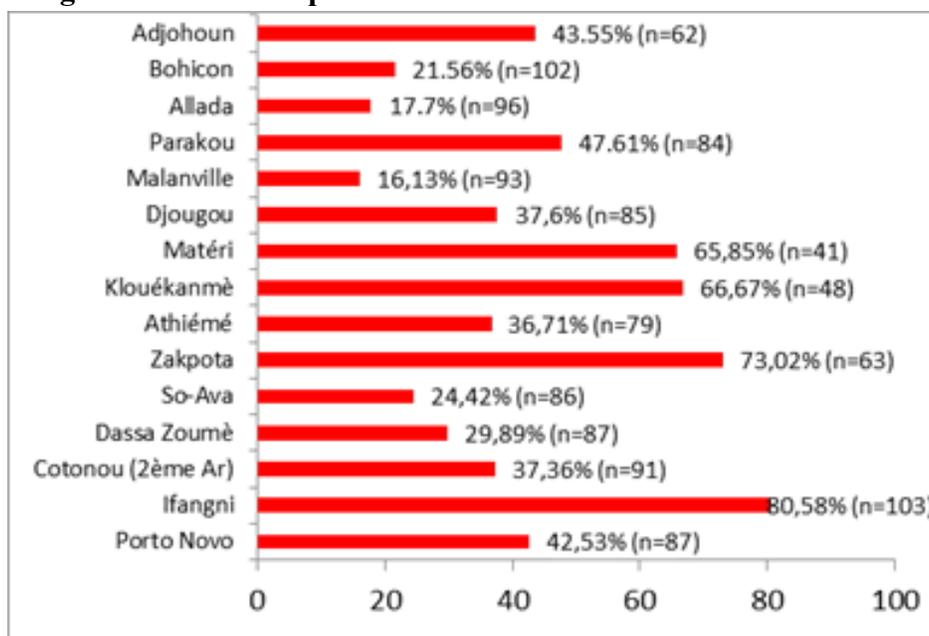
Key Question 2

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

Supporting Data

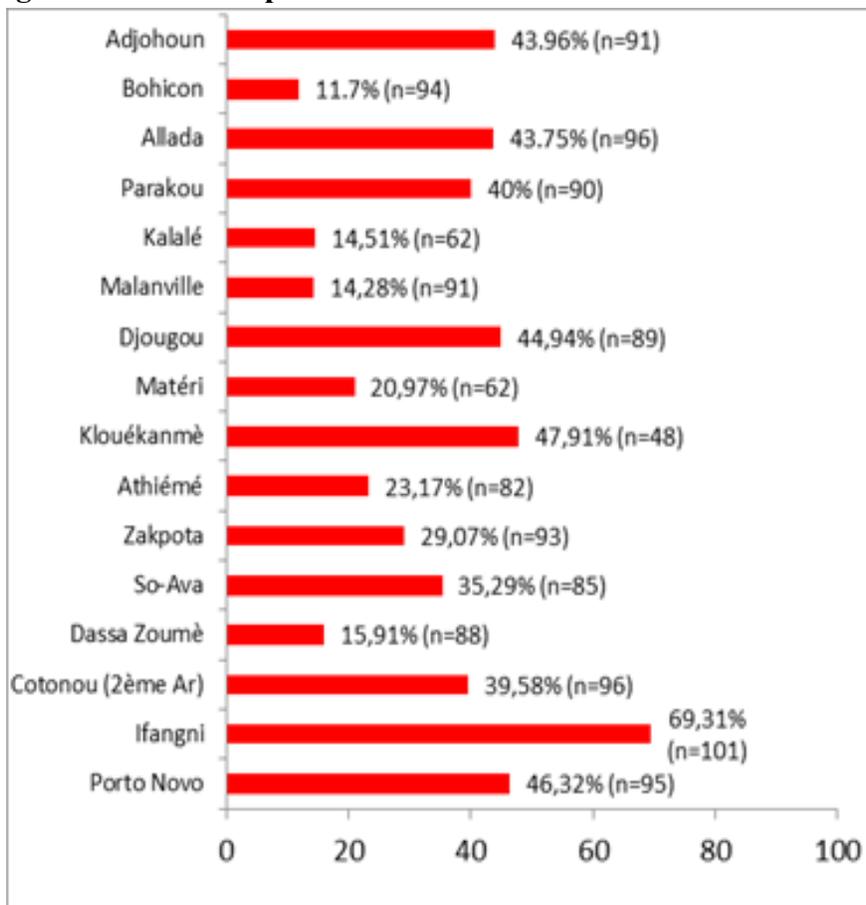
Entomological monitoring in 2017 and 2018 conducted in ~53 communes confirmed the continued presence of malaria vector insecticide resistance to pyrethroids (mortality rate range: 11.7% to 90.5%).

Figure A5. Sub-Sample of Sites Tested for Permethrin Resistance



⁴ Akogbéto MC, Salako AS, Dagnon F, Aïkpon R, Kouletio M, Sovi A, Sezonlin M. Blood feeding behaviour comparison and contribution of *Anopheles coluzzii* and *Anopheles gambiae*, two sibling species living in sympatry, to malaria transmission in Alibori and Donga region, northern Benin, West Africa. *Malar J.* 2018 Aug 22;17(1):307. doi: 10.1186/s12936-018-2452-9. PubMed PMID: 30134912; PubMed Central PMCID: PMC6106899.

Figure A6. Sub-Sample of Sites Tested for Deltamethrin Resistance



Insecticide resistance tests with PBO and pyrethroids showed that PBO was only able to restore full susceptibility to *An gambiae s.l.* to deltamethrin in 5 of 18 communes tested and, for permethrin 1 of 17 communes tested. Figure A7 shows the lower and upper range of PBO improvements in insecticide killing compared to the specific pyrethroids only.

Figure A7. Range of Restoration of Susceptibility to Pyrethroid after Exposure to PBO

Insecticide	Limit	Δ (change)	Pyrethroid only	Pyrethroid+PBO
Permethrin	Lower	31.25%	43.75%	75.00%
Permethrin	Upper	87.87%	6.06%	93.93%
Deltamethrin	Lower	14.89%	83.14%	98.03%
Deltamethrin	Upper	82.87%	15.91%	98.78%

Figure A8. Sub-Sample of Sites Tested for PBO + Deltamethrin Insecticide Killing

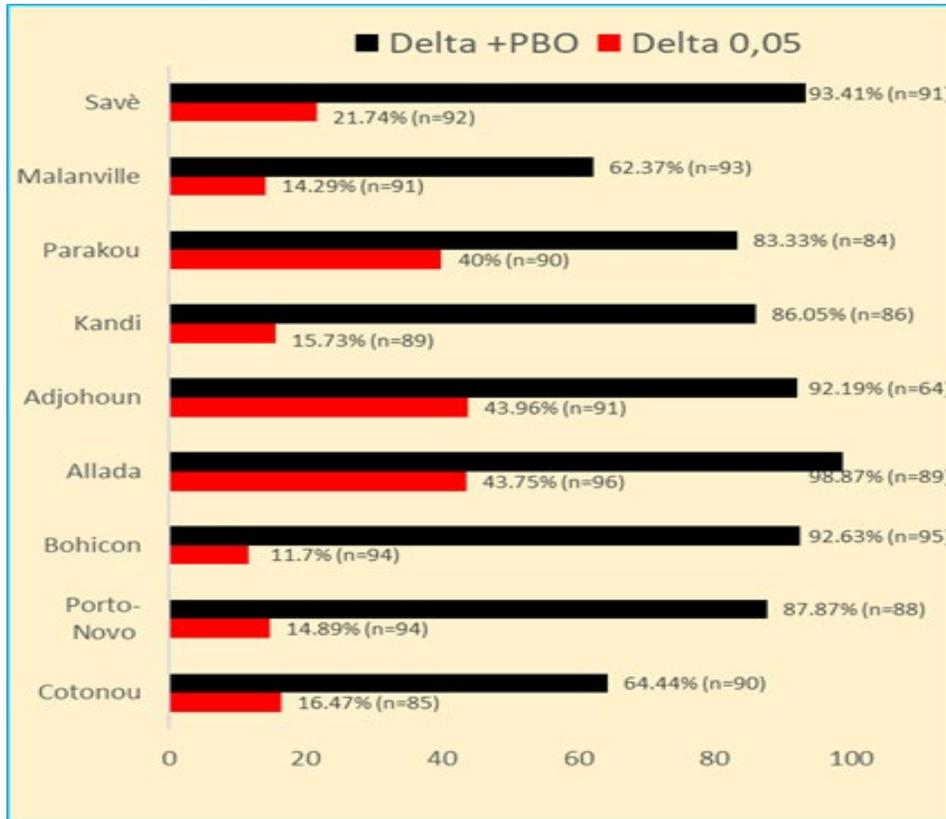
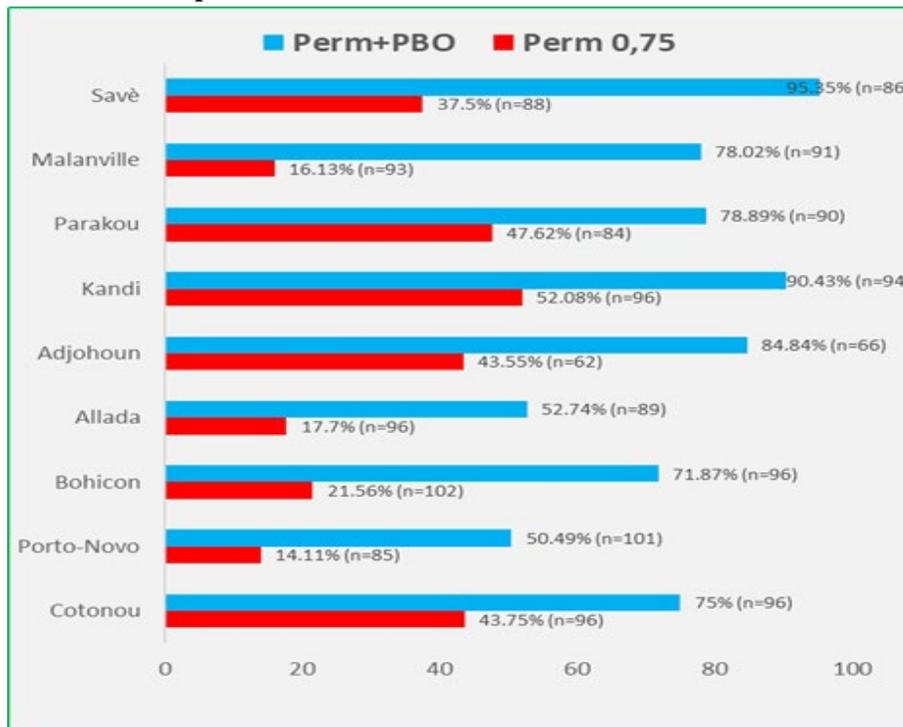


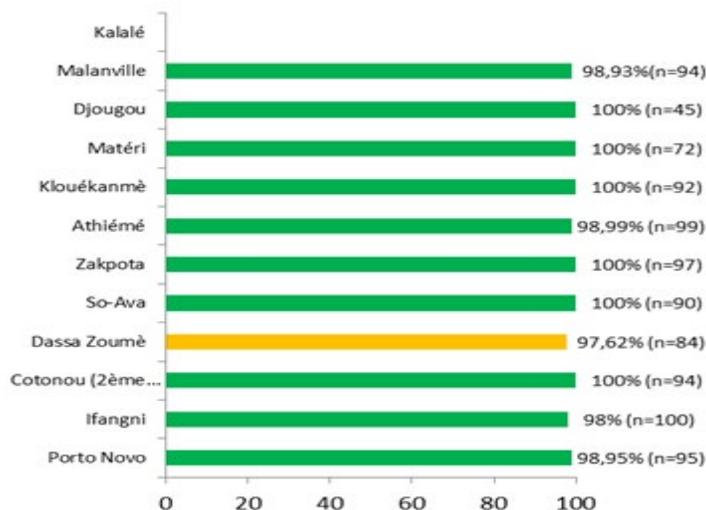
Figure A9. Sub-Sample of Sites Tested for PBO + Permethrin Insecticide Killing



Carbamate (mortality rate range: 57.8% to 100.0%), as well as the organochlorine, DDT (mortality rate range 1.0% to 14%) were also tested.

While resistance to the organophosphate, fenitrothion was detected (mortality rate range: 72.2% to 100%), full susceptibility of *Anopheles gambiae* s.l. populations to Pirimiphos-methyl (organophosphate) was observed except in the commune of Dassa Zoume located in Collines department which had a mortality rate of 97.62% of 84 mosquitoes tested.

Figure A10. Sub-Sample of Sites Tested for Pirimiphos-Methyl Resistance



Conclusion

Insecticide resistance, in particular pyrethroid resistance, continues to be a major threat to vector control in Benin since pyrethroids continue to be a crucial chemical on ITNs. PBO was able to restore some insecticidal activity to pyrethroids but not to WHO-recommended levels. However, in some cases there was still a great improvement (i.e. greater than 80% change in restored susceptibility to both permethrin and deltamethrin). The current 2020 PMI technical guidance says PBO ITNs can be considered if assays with PBO show $\geq 85\%$ killing or an absolute increase in killing by 10%. Thus, the use of ITNs with PBO in Benin may allow improved protection.

While bioassays suggested that *Anopheles* of Benin are still susceptible to Actellic, PMI will continue to monitor the resistance situation since one site did report suboptimal insecticide activity ($< 98\%$) in Actellic bioassays.

Key Question 3

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

In-country capacity for entomological monitoring is stable. CREC has substantial capacity, through PMI support, to conduct standard entomological monitoring and insecticide resistance monitoring.

- *Personnel*: Trained field staff are available for field sampling, WHO wall bioassays, morphological species identification and dissection; trained laboratory staff are available for phenotypic insecticide resistance testing, and molecular testing for species identification and insecticide resistance markers; there is dedicated staff for mosquito and animal rearing; trained staff are available for durability monitoring of ITNs including hole counting and ITN bio-efficacy test (i.e. WHO cone bio-assays and tunnel test).
- *Facility and equipment*: CREC has fully functional designated laboratories for molecular analyses. CREC has fully functional designated laboratories for molecular analyses. These labs include standard laboratory equipment with conventional and quantitative PCR machines; there are functional insectaries equipment with climate controls and barriers to prevent mosquito escape. Several mosquito genera including Anopheles, Aedes and Culex are housed in the insectary along with the standard reference strain of *Anopheles gambiae* s.s., Kisumu strain; there is a functional animal unit that houses rabbits, guinea pigs and pigeon in designated cages for each animal. These animals are used for mosquito feeds.

However, continued funding of CREC is dependent on external donor support. Ranking of CREC capacity has been indicated in their program inventory.

The University of Abomey and Benin's NMCP are developing capacity to do insecticide resistance monitoring using Advanced Molecular Diagnostics (AMD). This project is in collaboration with the Kenya Medical Research Institution (KEMRI) and Kenya's NMCP to be able to evaluate insecticide resistance mechanisms using next generation sequencing and bioinformatics.⁵ This project is being financially and technically supported by the BMGF, CDC and H3ABioNet (<https://h3abionet.org>).

Conclusion

Currently, entomological activities will continue to proceed with little change. CREC has capacity to conduct entomological field sampling, mosquito rearing, durability monitoring, insecticide resistance testing and other entomological techniques. Because CREC has such developed capacity through PMI support, PMI Guinea have sent personnel and samples to CREC for training and analysis of samples. Other counties (e.g. Côte d'Ivoire) are considering sending personnel to be trained at CREC. Emerging techniques such as AMD are not currently available at CREC. However, the University of Abomey may soon have this capacity through their project with BMGF. PMI will continue to monitor

⁵ Genetic Approaches to Malaria Control in Africa (<https://gcgh.grandchallenges.org/grant/genetic-approaches-malaria-control-africa>)

the developments with the University of Abomey as this may complement current insecticide surveillance activities of CREC.

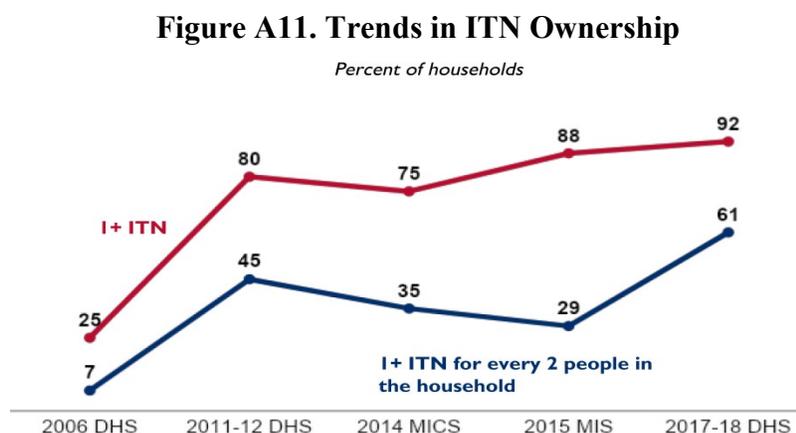
1.B. INSECTICIDE-TREATED NETS (ITNs)

PMI Goal
Achieve high ITN coverage and usage of effective nets in endemic PMI-supported areas (in the context of the current insecticide resistance); and maintain high coverage and use with consistent ITN distribution (via campaigns and/or continuous channels in a combination that is most effective given country context). Determine the geographic distributions, bionomics, and insecticide resistance profiles of the main malaria vectors in the country to inform vector control decision-making.
Are you proposing to increase, decrease, or maintain funding allocation levels for ITN distribution and SBC activities? Why? What data did you use to arrive at that conclusion?
<p>While ITNs will be purchased to support continuous distribution channels, funding in this category will slightly decrease from 2018 levels in support of other priorities; while this is an increase from FY19 levels, a large quantity of ITNs were earmarked in CY20 with pipeline funds from previous years. Discussions with BMGF are ongoing to support:</p> <ul style="list-style-type: none"> a) PBO ITN procurement to fill gaps, and b) digitization of ITN campaigns (i.e. geo-referencing target houses, tracking of barcoded vouchers and mobile payment for campaign staff). <p>Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.</p>

Key Question 1

How has net ownership evolved since the start of PMI in the country? Are households fully covered?

Supporting Data



Conclusion

The trend in ITN ownership has generally been increasing based on DHS (2006, 2011-2012, 2017-2018). MICS 2014 and MIS 2015 surveys showed some variation. There has been a ~73% increase in ITN ownership from 2006 to 2017 where the 2017-2018 DHS survey reported that 92% of households had an ITN compared to just 25% in 2006 (note that the 2017 DHS was carried out a few weeks after the mass distribution campaign). For houses that had at least two ITN, there has also been a ~88% increase from 2006 to 2017 DHS.

The high percentage of households with an ITN suggests the distribution campaigns have been successful in making sure Benin households have ITNs. The percentage of ITNs for every 2 people in the household can still be improved since this is only 61%. However, it is still a remarkable achievement to see an 88% increase in ITN access.

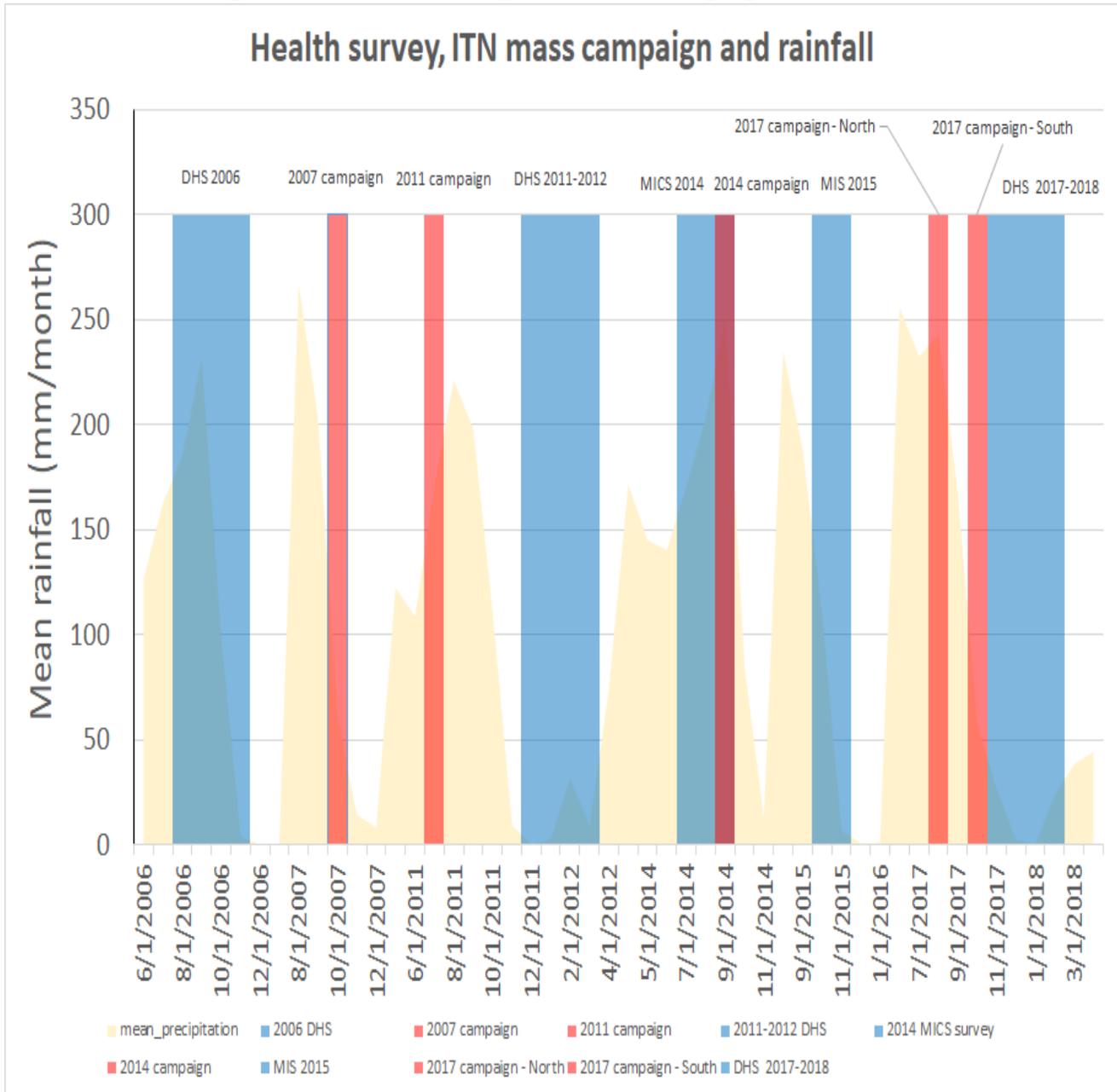
Nonetheless, these data should be interpreted with the caveat that the timing of the survey may have influenced the percentage. Still, the high percentage of ITN ownership demonstrates the effectiveness of the mass campaigns in achieving high coverage. It will be important to constantly assess the effectiveness of ITNs at protecting the population even in the face of good ITN access (and use), particularly in areas of high malaria rates.

Figure A12. Timeline of mass campaigns and health surveys for interpretation of results

Health survey or mass campaign									
2016 DHS	2007 campaign	2011 campaign	2011-12 DHS	2014 MICS survey	2014 campaign	2015 MIS	2017 campaign - North	2017 campaign - South	2017-18 DHS
Survey or campaign month and year									
Aug 2006 to Nov 2006	Oct 2007	Jul 2011	Dec 2011 to Mar 2012	Jul 2014 to Sep 2014	Sep 2014	Oct 2015 to Nov 2015	Aug 2017	Oct 2017	Nov 2017 to Feb 2018

Note: Surveys occurring just after campaign are ideal for capturing optimum coverage rates.

Figure A13. Health Survey, ITN Mass Campaign and Rainfall



Key Question 2

What proportion of the population has access to an ITN? In contrast, what proportion of the population reports using an ITN? What is the ratio between access and use? Does it vary geographically?

Supporting Data

Figure A14. Trends in ITN Access and Use

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

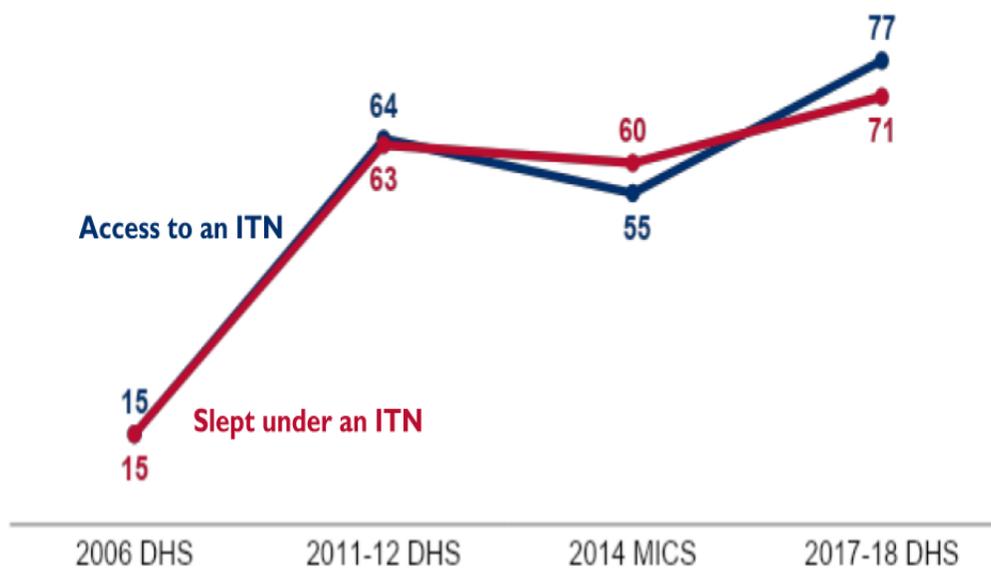
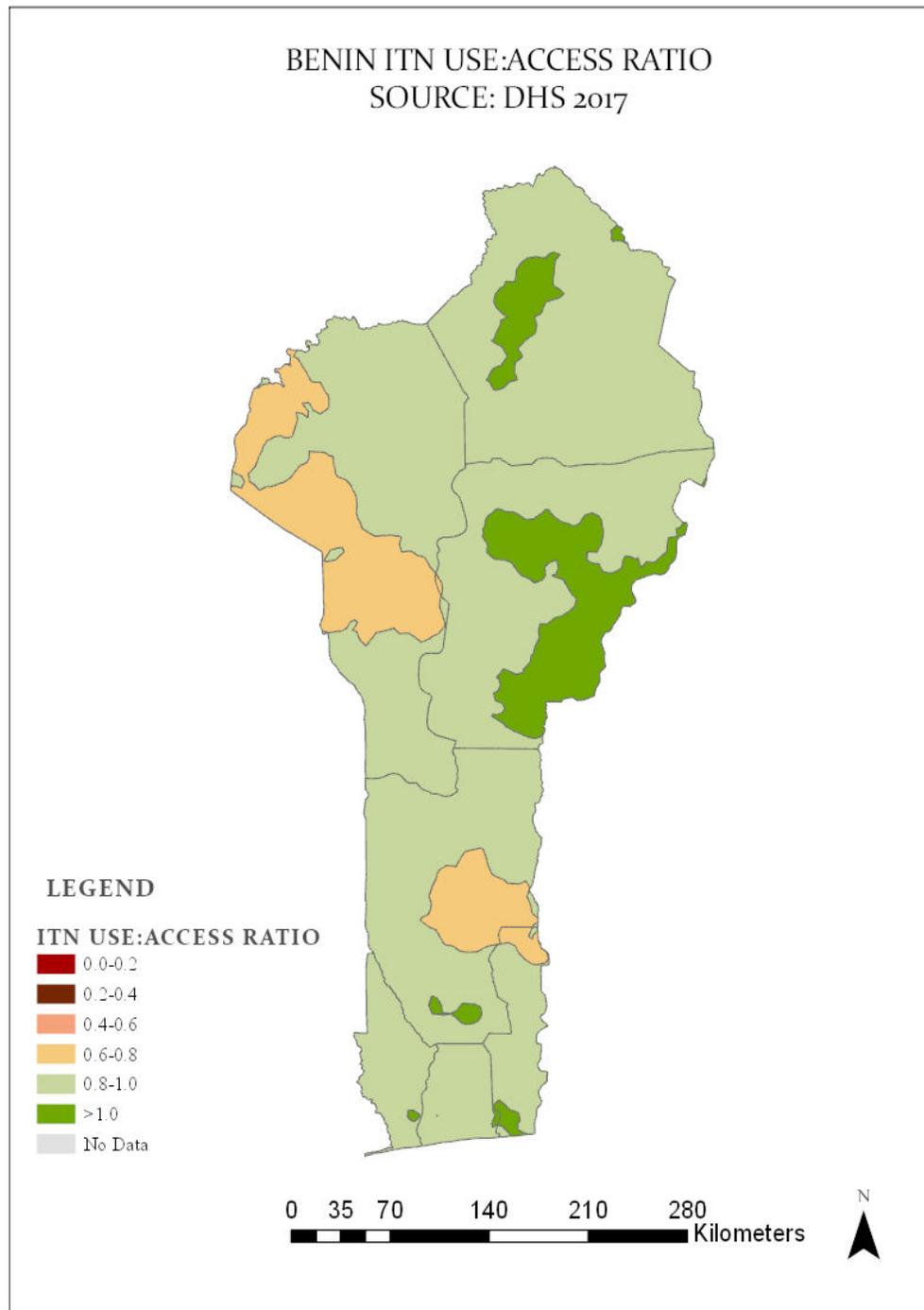


Figure A15. Benin ITN Use:Access Ratio, from DHS 2017



Conclusion

Figures A14-15 show there is generally good reported use of ITNs for people who have them. Still, there are some target areas in the departments of Atacora, Donga, Collines and Plateau that have relatively low use-to-access ratios (0.6 – 0.8). Potentially, some targeted SBC interventions may be needed in those areas.

Key Question 3

In areas where ITN access is high but use is low, what is known about key barriers/facilitators to use?

Supporting Data

Figure A16. Facilitators and Barriers to ITN Use

Facilitator	Type of Factor	Source	Evidence
High perceived and real susceptibility throughout year in most areas	Internal/Environmental	SNIGS, DHS 17/18	Apart from the capital area (4% prevalence) other areas range from 18%-55%. Although SNIGS shows seasonal variation, especially in the North, there is almost year-round transmission
Relatively high access and usage	Internal/Environmental	DHS 17/18	DHS 2017/18 has shown high access to ITNs with 92% of respondents reporting they own at least one ITN
High education and socioeconomic status	Internal	SBC strategy	People with high education and good socioeconomic status are aware of the importance of ITNs and can procure and use their own ITNs in case of need and do not necessarily have to wait for the mass campaign.
Barrier	Type of Factor	Source	Evidence
During the hot season, feeling that ITNs will be hot or suffocating	Internal	SBC strategy, CREC study	An unpublished CREC study found that during the hot season, on average, ~39% of the observed population (in northern Benin) were outdoors and not protected by an ITN either all night or some portion of the night. During the sample period, on average, ~26% of the observed population indoors were not protected by an ITN either all night or some portion of the night.
Belief that ITNs may catch fire	Internal	SBC strategy	A study by Egrot ⁶ et al 2014, reported that 56% of 91 people interviewed stated that ITNs can catch on fire of which 34 of the 56 people interviewed narrate specific events they heard or experienced. The perception that ITNs have a potentially negative effect hinders the use rate in the real world, at least for some.
The types of housing (small room for many people, tiny windows may discourage use.)	Environmental	SBC strategy/CREC study	An unpublished CREC study observed that the majority of houses in targeted intervention areas are small and poorly lit. At night, household residents are obliged to rest outside to have more space and increase ventilation because of the small windows. This stifling feeling felt by residents is more pronounced in the hot months.
The use of traditional mosquito repellent	Internal	NMCP supervision report/CREC study	An unpublished CREC study found 72.7% household residents declared that they used other preventive measures against mosquitoes, including mosquito coils, insecticide sprays, or local herbs.

⁶ Egrot et al. Reports of long-lasting insecticidal bed nets catching on fire: a threat to bed net users and to successful malaria control?. Malaria Journal 2014, 13:247

Conclusion

ITNs will remain the major vector control intervention, especially with the introduction of PBO and G2 ITNs. SBC efforts need to focus on the use of ITNs all night and every night with a special emphasis on the hot season and how to use/hang ITNs outside, especially in the north where there is evidence of outdoor sleeping during the hot season. SBC efforts on correct usage and precautions to take in the home to encourage usage, and on appropriate ITN care and handling to maintain physical durability of ITN to extend its useful life.

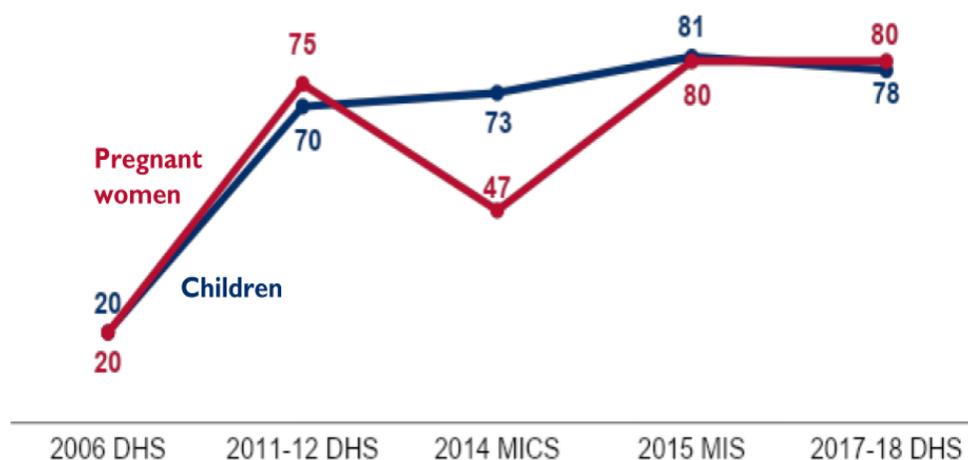
There is a dearth of knowledge on intermediate determinants of behavior change in Benin. More in-depth research is urgently needed. To remedy this, PMI/Benin (using both FY19 and FY20 funding) will support the conduct of a Malaria Behavior Survey (MBS) to measure malaria-related behaviors and their ideational determinants.

Key Question 4

What percent of pregnant women and children under 5 report sleeping under an ITN?

Supporting Data

Figure A17. Trends in ITN Use among Children and Pregnant Women
Percent of children under 5 and pregnant women age 15-49 who slept under an ITN the night before the survey



Conclusion

The trend in ITN use for pregnant and children <5 has increased by ~75% and 74% respectively, based on 2006 DHS and 2017-2018 DHS. While the 2014 MICS showed a sharp drop in ITN use among pregnant women, use in children <5 still remained high at 73%. However, it seems the trend in ITN use in pregnant women and children <5 may be flattening. It will be important to monitor this trend to make improvement in ITN use and make sure use does not drop. Nonetheless, as mentioned

above, these data should be interpreted carefully since the timing of the surveys may have influenced the percentage.

Key Question 5

What channels are used to distribute ITNs?

Supporting Data

Figure A18.ITN Distribution Channels per Year

	2015	2016	2017	2018	2019	2020	2021
EPI⁷	X	X	X	240,000	225,000	X	165,000
ANC⁸	X	X	X	560,000	525,000	X	385,000
Schools				X	65,000		100,000
Mass Campaign			X			2,792,273	

X = quantities not available

Conclusion

ITN distribution in Benin seems successful based on access to ITN from DHS, MIS, and MICS surveys. Based on CRECs recent assessment there seems to be some discordance between reported ITN usage and actual ITN usage. PMI will continue to monitor this situation and will try to develop appropriate measures to address this gap.

Key Question 6

What is the estimated need for ITNs over the next three calendar years? What volume of ITNs are available from partners and the public sector for the next three calendar years?

⁷ EPI distribution per year is 30% of the total nets procured.

⁸ ANC distribution per year is 70% of the total nets procured

Supporting Data

Figure A19. Gap Analysis Table for ITNs

Calendar Year	2019	2020	2021
Total Targeted Population ^{1 2}	12,272,332	12,703,091	13,148,969
Continuous Distribution Needs			
Channel #1: ANC public sector ^{3 4}	407,024	421,311	436,099
Channel #2: EPI public sector ^{5 6}	312,364	323,328	334,677
Channel #3: private sector ANC 1 et EPI ⁷	308,309	319,131	330,332
Channel #4: School ⁸	200,000	0	100,000
<i>Estimated Total Need for Continuous Channels</i>	1,227,697	1,063,770	1,201,108
Mass Campaign Distribution Needs			
2020 mass distribution campaign(s)	0	8,609,873	0
<i>Estimated Total Need for Campaigns</i>	0	8,609,873	0
Total ITN Need: Routine and Campaign	1,227,697	9,673,643	1,201,108
Partner Contributions			
ITNs carried over from previous year	400,621	37,924	
ITNs from MOH	100,000	500,000	100,000
ITNs from Global Fund (BMGF)		1,501,641	
ITNs from Global Fund	-	3,815,959	-
ITNs from other donors (PSI, Private sector)	15,000	15,000	15,000
ITNs planned with PMI funding	750,000	3,542,273	550,000
Total ITNs Available	1,265,621	9,412,797	665,000
Total ITN Surplus (Gap)	37,924	-260,846	-536,108

¹INSAE 2019-2020-2021 Estimates based on 2013 population data (<https://www.insae-bj.org/statistiques/statistiques-demographiques>)

²Expected annual population growth rate (<https://www.insae-bj.org/statistiques/statistiques-demographiques>) = 3.5%

³Expected percentage of the population that is pregnant (plan stratégique intégré santé de reproduction, de la mère, du nouveau né , de l'enfant, de l'adolescent et du jeune 2017-2021) = 4.74%

⁴Public Sector ANC needs = 70% of total ANC needs

⁵EPI needs = proportion of total population that are children <1 year old (INSAE 2019-2020-2021 estimates based on 2013 population data)

⁶Public Sector EPI needs = 70% of total EPI needs (MIS 2015)

⁷Private Sector ANC & EPI needs = 30% of total ANC and EPI needs (MIS 2015)

⁸School needs based on estimate of distribution during first and last years of primary school in Atlantic department: 100,000 in 2018 and 2021 and 200,000 in 2019 (ITNs saved for school-based distribution are planned to be used for piloting digitalization of 2020 campaign)

Conclusion

With FY 2020 funds PMI will procure 550,000 PBO ITNs to contribute 50% of the estimated routine distribution needs of 1,201,108 ITNs. ITNs donated by PMI will be distributed only via ANC and EPI channels. In addition, PMI will provide operation costs of school-based distribution in one commune with the lowest ITN coverage rate after the mass distribution campaign if the NMCP ensures availability of campaign ITNs. Results of the previous school-based distribution were evaluated before and after the campaign, showing in control areas ITN coverage dropped more drastically than in intervention zones. School-based distribution of ITNs helped maintain coverage.

Key Question 7

What is the current status of durability monitoring?

Supporting Data

Figure A20. Durability Monitoring of the ITNs Distributed in the Mass Campaign in 2017

Campaign Date	Sites	Brands	Baseline	12-month	18-month	24-month	36-month
Oct 2017	Ketou	DawaPlus 2.0	X	X	X	-	-
	Dogbo	PermaNet 2.0	X	X	X	-	-
	Djougou	Yorkool	X	X	X	-	-

Conclusion

Monitoring is ongoing, and conclusions will be presented at the end of the monitoring activity.

Key Question 8

What are the in-country considerations that impact your funding allocation in this category? If there is a specific budget line item in Table 2 that is not covered by the above questions, please address here.

Supporting Data

Pyrethroids resistance is a major threat to malaria control in Benin. There were only 5 districts that met WHO criteria of mosquito susceptibility to deltamethrin and only 1 district for permethrin. Studies with PBO showed that restoration of susceptibility to these pyrethroids ranged from 13% to >80%. Given the poor performance of pyrethroids in bioassays, PMI Benin has opted for purchasing PBO ITN to provide better protection than standard ITNs. These ITNs will be distributed during the mass campaign in 2020. Funding for these ITNs has already been budgeted in the 2018 MOP for 2020 mass campaign. In 2021, PMI Benin will continue purchasing PBO ITNs for continuous distribution channels.

Benin is very stable and ITN distribution has been occurring regularly without any major incident.

Conclusion

PMI support will be maintained with an emphasis on SBC during mass campaigns to promote better retention in situations when ITN attrition is attributed to user behavior such as giving away or selling the ITN, using the ITN for other reasons, or inadequate care of the ITN.

1.C. INDOOR RESIDUAL SPRAYING (IRS)

Key Goal

Ensure high spray coverage, with an appropriate insecticide, in targeted endemic areas of the country.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

There will be a \$718,886 and \$1,190,000 decrease in IRS funding relative to 2018 and 2019 funding levels respectively. This is being done to support other priority areas such as the procurement of (more expensive) PBO ITNs, strengthened commodity and supply chain management and improved data collection and quality. However, the future of IRS in Benin is still being considered. Several factors are under examination for continued use of IRS in Benin. This includes the relatively high cost of IRS for limited coverage, epidemiological data suggesting limited impact, and concerns regarding the efficacy and efficiency of IRS deployment.

To support decision-making of IRS in Benin, improvements to IRS deployment will be done during the 2020 spray campaign. This will include better household enumeration via satellite imagery and enhanced supervision of IRS coverage using remote sensing technology. Improvements to epidemiological and entomological monitoring will also be done to assess and address gaps. The reprogramming of the 2019 PMI budget will be used to support the 2020 IRS activities, depending on the availability of funding. Improvements made in the implementation and monitoring of 2020 campaign will serve as a critical decision point for the 2021 IRS campaign. The impact and cost-effectiveness of IRS for malaria control is a cross-cutting issue for all PMI countries. Therefore, the PMI Vector Monitoring and Control Technical (VMCT) group will be regularly consulted to help guide the scale and scope of IRS activities based on the available data in Benin and elsewhere.

Potentially, future IRS campaigns may involve finer scale targeting or modified paradigms of IRS deployment. For example, IRS may be done in areas where there is a high attrition rate of ITNs, and coverage is needed until additional ITNs can be deployed. In this scenario, standard or new types of ITNs, as appropriate, would be the primary vector control intervention with IRS serving to support or maintain gains. Therefore, funding earmarked in this MOP for activities in 2021 may be reprogrammed in 2020 to align with any new IRS decisions.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

What areas are targeted for IRS and why?

Supporting Data

PMI targets for IRS include six communes (Kandi, Gogounou and Segbana in Alibori Department, and Djougou, Copargo and Ouake in Donga Department) (from May to October) in the hope of achieving cost-effective impact (see map and table above). These specific communes have been targeted because they represent a significant malaria risk and the NMCP provided oversight at these specific sites during the last IRS campaign. Hence, the NMCP have greater operational familiarity and are poised to transition IRS activities to their direct operational capacity. This is being done to reduce the operational cost associated with the current implementer.

Conclusion

PMI has been the sole implementer of IRS in Benin since 2015. PMI is currently working with NMCP to re-evaluate the role of IRS for malaria control.

Key Question 2

In PMI-supported areas, what spray coverage rates have been achieved in the past 5 years?

Supporting Data

Figure A21. Spray Coverage 2016 - 2020

Calendar Year	Number of Departments Sprayed	Departments Names**	Number of Structures Sprayed	Coverage Rate	Population Protected
2016	1	Atacora	269,179	91%	858,113
2017	3	Alibori, Atacora, Donga	384,109	92%	1,226,161
2018	3	Alibori, Atacora, Donga	400,997	90.6%	1,321,758
2019	2	Alibori, Donga	335,207	86.5%	1,077,411
2020*	2	Alibori, Donga	~348,978	> 85%	~1,112,610

*Denotes targets **If more than 15 districts, list regions/provinces.

Conclusion

PMI Benin continued support of IRS is contingent on the existence of strong evidence effectiveness to reduce malaria morbidity and mortality in the targeted areas. In past campaigns, households have been targeted using the most recent census estimates and geographic reconnaissance of spray operators. There is concern that many houses are missed by spray operators due to the extensive

terrain. Therefore, provisional estimates for targeted structures in the 2021 campaign (see Figure A22) take into consideration better targeting using satellite imagery and applying that to 2020 estimates of structured sprayed. PMI proposes achieving approximately 20% increase in households sprayed and population protected with remote sensing of households in the targeted areas based on assessments in other PMI countries implementing IRS.

Figure A22. Projected Coverage 2021

Calendar Year	Number of Departments Sprayed	Departments Names	Number of Structures Sprayed	Coverage Rate	Population Protected
*2021	2	Alibori, Donga	~418,774	> 85%	1,335,133

*Denotes targets

Figure A23. Proposed Coverage Targets

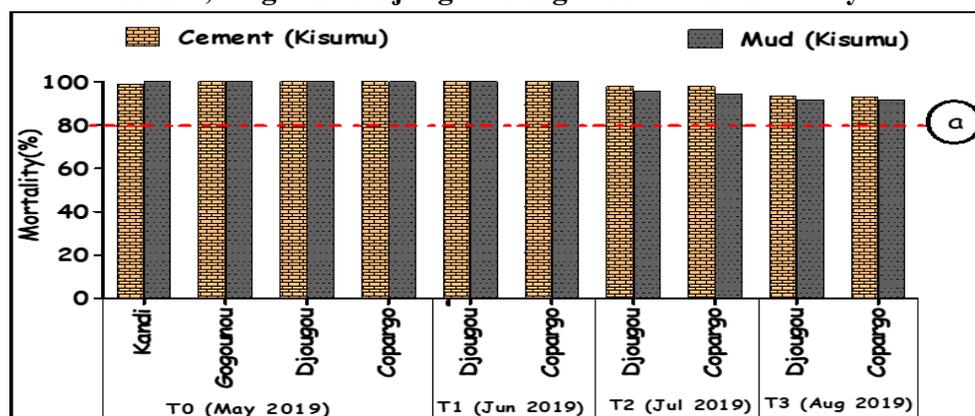
Department	District	Targeted Structures	Targeted Population	Area (km ²)
Donga	Copargo	30,775	83,498	1,042
	Djougou	156,967	464,251	4,714
	Ouaké	37,884	95,582	889
Alibori	Gogounou	62,882	228,763	5,924
	Kandi	88,267	317,852	4,309
	Ségbana	41,998	145,184	5,231
Total		418,774	1,335,132	22,109

Key Question 3

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

Supporting Data

Figure A24. Residual activity of Actellic 300 CS on Mud and Cement Walls for 3-months in Kandi, Gogounou Djougou using WHO Cone Bioassays.



Conclusion

Actellic 300 CS still met the criteria of 80% mortality of susceptible mosquitoes exposed to walls, after three months. However, cone bioassays in Benin of past years have shown that mortality of susceptible mosquitoes exposed to walls five-months post-IRS were well below the 80% mortality rate threshold ⁹.

Monitoring in 2019 is still ongoing to determine current trends.

Key Question 4

What is the plan for insecticide rotation? What insecticide will be used next in PMI-supported areas?

Supporting Data

Figure A25. Insecticide Use in PMI-Supported Areas, 2017 - 2020

Year	Kerou	Péhunco	Copargo	Djougou	Ouake	Gogunou	Kandi	Ségbana
2017	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl
2018	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl
2019			pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl	pirimiphos-methyl
2020*			Clothianidin/Deltamethrin	Clothianidin/Deltamethrin	Clothianidin/Deltamethrin	Clothianidin/Deltamethrin	Clothianidin/Deltamethrin	Clothianidin/Deltamethrin

*Denotes planned insecticide classes

⁹ Benin 2017 Entomological Monitoring Final Report <https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/benin-2017-entomological-monitoring-final-report.pdf>

Conclusion

Pirimiphos-methyl, in the organophosphate class of insecticides, has been used since 2015 in all PMI supported IRS departments. Because this same insecticide has been used for five years, it will be important to switch to a new insecticide class in 2020 to mitigate any possible buildup of resistance in the mosquito population.

Studies in Benin have shown clothianidin/deltamethrin insecticides to have higher residual activity on different wall types and suggested this insecticide combination as a good candidate for IRS campaigns.¹⁰

Key Question 5

Are any PMI-supported areas considering withdrawing IRS? If so, what programs are in place to cover anticipated increases in malaria cases and promote consistent net use and care-seeking behaviors?

Supporting Data

For the 2021 spray campaign, the communes of Gogounou, Kandi, and Segbana in Alibori department and Copargo, Djougou, and Ouake in Donga department will be targeted. However, IRS conducted in these areas in CY 2021 will be contingent on the results of the 2020 IRS campaign. Several gaps have been identified in current IRS implementation such as:

- Inadequate geolocation of all houses in the target areas: A geo-mapping activity in Zimbabwe found a 20% difference in eligible structures found by geo-mapping vs. geographic reconnaissance of spray operators. Structures missed by spray operators were dispersed throughout the districts.¹¹ In Benin, structures are found by spray operator reconnaissance; this approach may be missing many structures that should be sprayed.
- Concerns with health center reporting of malaria cases: A data analysis conducted by PMI and the NMCP found limited impact of IRS on 2016 to 2018 health facility malaria data. However, there seems to be some over reporting of malaria cases in select health centers based on malaria tests conducted and test positivity rates at seasonal time intervals.

In the upcoming IRS campaign (2020) effort will be applied to address these issues. For example, remote sensing will be used to map all structures in target areas and greater emphasis will be placed

¹⁰ Agossa FR, Padonou GG, Fassinou AJYH, Odjo EM, Akuoko OK, Salako A, Koukpo ZC, Nwangwu UC, Akinro B, Sezonlin M, Akogbeto MC. Small-scale field evaluation of the efficacy and residual effect of Fludora® Fusion (mixture of clothianidin and deltamethrin) against susceptible and resistant *Anopheles gambiae* populations from Benin, West Africa. *Malar J.* 2018 Dec 29;17(1):484. doi: 10.1186/s12936-018-2633-6.

¹¹ Zimbabwe End of Spray Report 2018. Rockville, MD. The PMI VectorLink Project, Abt Associates Inc.

on quality control on malaria diagnostics in health facilities in target areas. These improvements to the 2020 campaign will be assessed to determine the extent of future IRS campaigns.

If a decision is made to scale back IRS or change the paradigm of IRS deployment, PMI will work with the NMCP to make sure there is adequate coverage of ITNs and there is appropriate SBC messaging on: a) IRS withdrawal, b) ITN usage and c) seeking treatment if you have a fever. Malaria commodities such as RDTs, and drugs will be assessed to determine if there is sufficient stock and topped-up if necessary. CHWs coverage will also be assessed to assure access to treatment is sufficient. Entomological monitoring will continue to assess mosquito burden.

Conclusion

PMI is working with the NMCP to reassess and potentially re-define the role of IRS in Benin. Based on the results of the 2020 IRS campaign and assessments with the NMCP, the VMCT, and other partners, a decision will be made on whether IRS will continue as stated above in 2021 or whether there will be a fundamental change in the IRS strategy in Benin.

Key Question 6

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

Improving the quality of the 2020 campaign: In anticipation of the 2020 IRS campaign, the 2019 budget and 2020 work plan will be reprogrammed and revised respectively to address gaps in past campaigns. The data from the 2020 IRS campaign will be evaluated to inform the 2021 campaign:

1. Geo-location of houses to improve targeting. The current IRS campaign in Benin does not use remote sensing technology to geo-locate houses. This was suggested as a potential gap in IRS coverage, where spray operators are responsible for identifying houses to spray and may miss various areas due to terrain accessibility or remote human settlements. Efforts will be made to try to include remote sensing and greater supervision of spray operators into 2020 IRS activities to find all houses in targeted areas. Under MOP 2017 we are proposing to reprogram \$200K under a mission bilateral to conduct an independent evaluation of the coverage as well as some aspects of the quality of IRS
2. Improvement to health facility monitoring. Over-reporting of malaria cases was identified as a potential reason for the limited impact of IRS on reducing malaria transmission. Enhanced supervision and RDTs readers, if feasible, at selected sentinel sites will be used to improve data collection for evaluation IRS of epidemiological indicators.
3. Improvements in entomological surveillance to assess community effect. While the impact of IRS shows limited effect on epidemiological indicators, entomological indicators are usually reduced by the IRS campaign. This may be attributed to the selection of structures for entomological monitoring, which are usually sprayed structures. To assess community effect,

un-sprayed structures in sprayed areas will be included in the entomological monitoring. (Modification of CREC work plan)

4. Cost-effectiveness analysis of IRS (Assessment of IRS). The IRS cost effectiveness analysis will be part of the overall cost analysis that will be done as the next phase in malaria modeling in Benin that PMI is collaborating with BMGF. Plans are being set for a Health Economist to do a TDY in Benin to have discussions with CNLS-TP concerning the details of this support including the timing and the hiring of local consultants who will be assisting with data collection. GF is also interested in this work as it will be used to inform the upcoming grant development exercise which is scheduled to start during Q2 of 2020.

NMCP IRS handover: In 2021, we anticipate a handover of IRS operations from the implementing partner (IP) to the NMCP. The IP will continue to assist with insecticide procurement, micro-planning, supervision, and environmental compliance, but all other aspects of the IRS activities will be handed over to the NMCP. PMI will support this through government to government support. However, this handover is contingent on the results of the 2020 campaign and decision-making with the NMCP, PMI and other partners.

Conclusion

Currently, PMI continues supporting IRS. However, assessment of the impact of the IRS is ongoing and PMI is constantly working with the NMCP to have the best evidence of impact, and the most optimized and cost-effective strategy for malaria control.

2. HUMAN HEALTH

2.A CASE MANAGEMENT

NMCP objective
The overall case management objectives as stated in the national guidelines are to promptly and accurately diagnose all suspected malaria cases and ensure proper treatment for all confirmed cases to prevent death and other complications related to malaria.
NMCP approach
The Benin National Strategic Plan and the new PSNIE set the following specific objectives: <ul style="list-style-type: none"> • 100% of all suspected malaria cases in public and authorized private health facilities as well as at the community level are tested. • 100% of all confirmed malaria cases in public and authorized private health facilities as well as at the community level are treated correctly (as per national guidelines).

- 100% of severe malaria cases in public and authorized private health facilities are managed correctly (as per national guidelines).

The current malaria policy authorizes the use of microscopy for malaria diagnosis at hospitals and communal health centers that have the capacity (microscope(s) and a trained laboratory technician), and promotes the use of RDTs throughout the health system; however, access to RDTs and microscopy continues to be a challenge, particularly at peripheral levels. The national malaria case management guidelines follow WHO guidelines and standards. In the or AS-AQ and the introduction of injectable artesunate is still underway.

At the community level, CHWs perform malaria related activities under iCCM and the broader, national community-based High Impact Intervention package (PIHI). CHWs test febrile children five years of age and under for malaria using RDTs and provide ACTs to those children who test positive. They also conduct home visits to educate household members about malaria prevention, including the importance of seeking clinical care early. To date, 66 of 77 communes in the country are covered by PIHI interventions under the following donor-led mechanisms: USAID (19 communes), UNICEF (25 communes), Global Fund/CRS (22 communes).

PMI objective, in support of NMCP

Early and prompt diagnosis of *Plasmodium* infection followed by adequate treatment with an effective antimalarial are the cornerstones of case management. PMI's object is aligned with the NMCP's strategy and policy on malaria case management in Benin. This focused approach allows the program to maximize program impact on reducing malaria morbidity and mortality. PMI and its partners are engaged in activities to increase coverage and quality of case management-related activities.

PMI-supported recent progress (past ~12-18 months)

- Supported a therapeutic efficacy study (TES) in 2 sites in Bohicon and Kandi. Data collection is finished, and data is being analyzed.
- Piloted the implementation of injectable artesunate in 15 hospitals with plans to implement this policy nationwide.
- Provided commodities for malaria diagnosis and treatment of malaria at health facilities and community level.
- Supported community health work activities in 19 communes in 9 departments to allow for improved access for community case management of malaria.
- Trained 1,000 health workers on malaria case management guidelines
- Supervised health providers on malaria case management nationwide including the Outreach Training and Supportive Supervision (OTSS) for malaria diagnosis in 118 hospitals that conduct malaria microscopy

PMI-supported planned activities (next ~12-18 months, with currently available funds)

In the next 12 months, PMI plans to:

- Support the revision of the malaria strategy and updating current treatment guidelines to reflect that artesunate-amodiaquine is no longer a first-line treatment for uncomplicated malaria, include injectable artesunate and artemether as first-line treatment for severe malaria as well as rectal artesunate as a pre-referral treatment.
- Assist in the revision of training materials, commodities, and supervision to roll out injectable artesunate as the first-line treatment of severe malaria.
- Continue to strengthen and support malaria case management at health facility and community level.
- Procure antimalarials for uncomplicated and severe malaria.
- Procure RDTs and microscopy reagents and enhance OTSS.
- Train additional 1,500 community health workers including auxiliary nurses (non-skilled on malaria diagnosis and treatment)

PMI Goal

Improve access to and utilization 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 be able to provide high quality, effective care.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

PMI intends to maintain the same funding for this intervention. Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

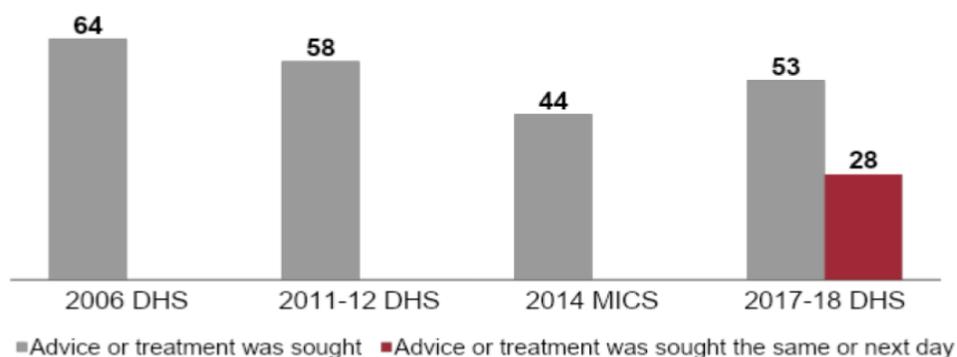
Key Question 1

What is the status of care-seeking?

Supporting Data

Figure A26. Trends in Care Seeking for Fever

Among children under 5 with fever in the 2 weeks before the survey, percent for whom advice or treatment was sought



*Excludes treatment or advice from a traditional practitioner

Conclusion

Timely care-seeking behavior continues to be suboptimal as evidenced by past surveys. This shows the need for the development and implementation of SBC interventions to increase community awareness of malaria symptoms and availability of trained staff and diagnostic-related commodities at health posts and community health workers trained and available to treat suspected malaria cases.

Key Question 2

What is known about the major barriers and facilitators to care-seeking?

Supporting Data

Figure A27. Facilitators and Barriers to Care-Seeking

Facilitator	Type of Factor	Data Source	Evidence
Presence of a CHW in the community	Environmental	CATCH OR study; Project documents	CHW are in charge of promoting care seeking behaviors and refer severe cases that are identified in their community
Barrier	Type of Factor	Data Source	Evidence
Belief that Seeking Treatment Immediately is Important	Internal/Social	DHS 17/18	Although 53% of patients or their caregivers in case of children eventually seek treatment only 28% do so promptly. The reasons for this are unclear (knowledge? financial?)

Conclusion

SBC efforts around prompt care-seeking need to improve. More research needs to be conducted on why caregivers do not take their children to a qualified provider. SBC efforts need to be coordinated with service providers both at the facility and (especially) at the community levels.

There is a dearth of knowledge on intermediate determinants of behavior change in Benin. More in-depth research is urgently needed. To remedy this, PMI/Benin (using both FY19 and FY20 funding) will support the conduct of an MBS to measure malaria-related behaviors and their ideational determinants.

Key Question 3

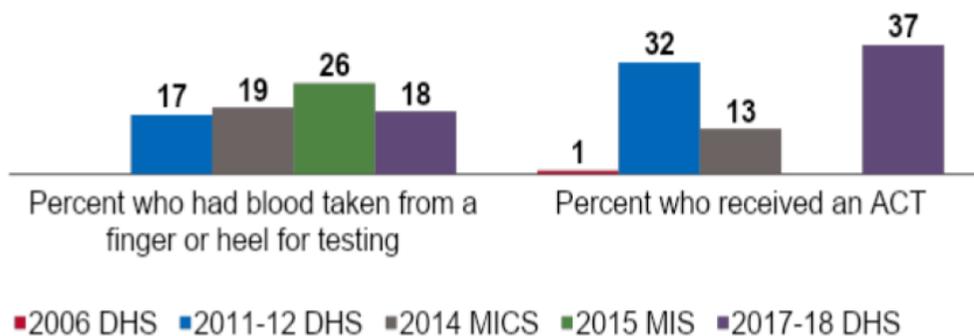
How have malaria testing and treatment practices evolved over time?

Supporting Data

Figure A28. Trends in Diagnosis and Treatment of Children with Fever

Among children under 5 with fever in the 2 weeks before the survey

Among children under 5 with fever in the 2 weeks before the survey who received any antimalarial



Conclusion

Survey based data shows that testing rates have not changed significantly over the last decade. However, recent analysis of health routine data has shown high rates of malaria testing using RDTs with significantly higher positivity rates in the ranges of 81% and 74.2% in 2017 and 2018 respectively without differences in seasonality. The reasons behind these results could be due to a

combination of clinical practices and knowledge about recommendations in Benin to test all fever cases. This presents a challenge that requires that we work with our partners in new and innovative ways to increase adherence to malaria case management guidelines at both the health facilities and community level. We also need to increase our support to the private sector to expand access to high quality health care and treatment. Benin NMCP has chosen to use one first-line treatment (AL) for uncomplicated malaria, as the second option (ASAQ) was associated with common side effects.

Key Question 4

What is known about provider behavior in relation to testing and treatment practices?

Supporting Data

Figure A29. Facilitators and Barriers to Testing and Treatment

Facilitator	Factor	Data Source	Evidence
Clear policy and guidelines for the diagnostic and case management at community and health facility level.	Environmental	National Strategic Plan	Existence of supporting documentation.
Barrier	Factor	Data Source	Evidence
Limited catchment area of community health agents.	Environmental	Discussions with technical partners and National Strategic Plan	Although there is a push through the CNLSTP and NMCP to increase the number of performing CHWs, there is still a shortage which will continue to make it difficult for caregivers in remote communities to seek prompt, proper care
Suboptimal adherence to case management guidelines among health workers	Unknown	DHS17/18; Analysis of facility data	From DHS data, children with a fever are not getting tested and treated with an ACT. These may include fevers that do not present at a health center but not all. Analysis of the TPR finds that in a number of clinics, all fevers that present are tested, almost all tested positive and are ultimately treated. Further assessments are needed on factors influencing health worker behavior.
Non-skilled (and not trained malaria guidelines) health workers are the most likely to receive patients in health facilities	Unknown		

Conclusion

Benin has made considerable steps towards the implementation of a rational and evidence-based policy for antimalarial treatment. There is a need now to expand on existing avenues and strategies to expand coverage and access (community health workers and private sector). The USAID-funded private sector project continues to be a good channel to reach the private sector through its support to private clinics in their authorization process, alignment with the MOH policies such as reporting into the DHIS-2 as well as the improvement of the quality of health services they offer. Another major area of concern is the implementation of the new strategy for treatment of severe cases of malaria with injectable artesunate that is not yet fully rolled out. Furthermore, the data suggests that the determinants of provider behavior need to be reviewed. PMI will support NMCP efforts to explore the determinants of provider behavior through the implementation (using FY19 funds) of a malaria-specific health facility survey in a nationally-representative sample of health facilities to evaluate malaria case management practices, including IPTp among pregnant women, and assess health worker performance and attitudes. Finally, PMI also will help the NMCP investigate the causes of the high RDT test positivity rates during malaria low transmission periods in Benin health facilities using quantitative and qualitative approaches.

Key Question 5

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

Supporting Data

A total of additional 1500 health providers including auxiliary HWs will be trained on malaria diagnosis and case management guidelines in 2020, with an emphasis on adherence to testing results and referral of severe cases. A focus will also be made on interpersonal skills to promote patient-centered care. Benin is currently revamping its community-health strategy.

Figure A30. Matrix of community health coverage by partners

Department	USAID	UNICEF	GLOBAL FUNDS/CRS
Alibori (6 communes)	0 commune	6 communes	0 commune
Borgou (8 communes)	0 commune	8 communes	0 Commune
Atacora (9 communes)	0 Commune	0 Commune	6 communes
Donga (4 communes)	4 communes	0 Commune	0 Communes
Zou (9 communes)	0 commune	9 communes	0 Commune
Collines (6 communes)	2 communes	0 Commune	4 communes
Oueme (9 communes)	0 Commune	0 Commune	3 communes

Department	USAID	UNICEF	GLOBAL FUNDS/CRS
Plateau (5 communes)	0 Commune	0 Commune	5 communes
Mono (6 communes)	6 communes	0 Commune	0 Commune
Couffo (6 communes)	0 Commune	0 Commune	0 Commune
Atlantique (8 communes)	5 communes	0 commune	0 commune
Littoral (1 commune)	0 commune	0 communes	1 communes
Total	17 communes	23 communes	19 communes

Note: Among 77 Communes, almost 18 do not have available Donor to cover community health activities fees. To those communes, Government of Benin will allocate funds, especially to cover stipends paid to Community health workers.

Conclusion

Although community-based case management of malaria has been available in Benin for some time, its implementation has been variable and supported by different donors. The CNLS-TP is beginning implementation of a project to ensure nationwide coverage with CHWs (where indicated) all providing the same level of services. Different donors, including PMI, will support the overall CHW program rather than their “own” CHW activity.

Key Question 6

What is the estimated need for RDTs for FY 2020?

Supporting Data

Figure A31. Gap Analysis Table for RDTs

Calendar Year	2019	2020	2021
RDT Needs			
Total country population	12,272,332	12,703,091	13,148,969
Population at risk for malaria	12,272,332	12,703,091	13,148,969
PMI-targeted at-risk population	12,272,332	12,703,091	13,148,969
Total Consumption estimates (12 months) ¹	2,884,599	2,985,560	3,090,055
Security stock (9 months) ¹	2,163,449	2,239,170	0
Total number of projected fever cases ¹	5,048,048	5,224,730	3,090,055
Total RDT Needs¹	5,048,048	5,224,730	3,090,055
Partner Contributions (to PMI target population if not entire area at risk)*			
RDTs carried over from previous year ²	1,630,536	852,488	
RDTs from Government		93,750	100,000
RDTs from Global Fund		2,110,900	
RDTs from other donors	150,000	150,000	150,000

Calendar Year	2019	2020	2021
RDTs arriving at year end (PMI and other funding)		1,268,750	
RDTs planned with PMI funding	4,120,000	0	2,000,000
Total RDTs Available	5,900,536	4,475,888	2,250,000
Total RDT Surplus (Gap)	852,488	-748,842	-840,055

¹ Source:

The method used to calculate TDR needs is based on consumption: we used the consumption data for 2017 in view of the stock outage observed with TDR in 2018 and the closure of clandestine hospitals. An increase rate of 3.52% was applied twice to obtain the 2019 needs estimates and 3 times for the 2020 needs. The quantity of RDTs has been adjusted based on the assumption that the community level will use the equivalence of 1/2 of the public sector consumption (new NMCP directive requires 1.5:1 RDT/ACT ratio at the community level)

A security stock of 9 months (accounting for data quality issues and delivery lead time) has been added to the provisions to get the total need per year except for CY 2021.

² CAME Inventory Data on 28/01/2019

Conclusion

The total need of RDTs in Benin for FY 2020 is 3.1 million tests. This quantity is much lower than the quantity for prior years as it has been adjusted to account for the security stock that is planned for CY 2019 and 2020. PMI and Global Fund have traditionally been the main supporters for RDT procurement in Benin. In FY 2020, PMI will procure approximately 65% (2 million RDTs) of the country needs. We believe Global Fund and the GoB will be able to fill the remaining gap and meet country needs.

Key Question 7

What is the estimated need for ACTs for FY 2020?

Supporting Data

Figure A32. Gap Analysis Table for ACTs

Calendar Year	2019	2020	2021
ACT Needs			
Total country population	12,272,332	12,703,091	13,148,969
Population at risk for malaria	12,272,332	12,703,091	13,148,969
PMI-targeted at-risk population	12,272,332	12,703,091	13,148,969
Total Consumption estimates (12 months) ¹	2,521,895	2,610,161	2,701,517
Security stock (9 months) ¹	1,891,421	1,957,621	0
Total projected number of malaria cases ¹	4,413,316	4,567,782	2,701,517
Total ACT Needs¹	4,413,316	4,567,782	2,701,517
Partner Contributions (to PMI target population if not entire area at risk)¹			
ACTs carried over from previous year ²	972,880	884,667	930,215
ACTs from Government		540,000	540,000
ACTs from Global Fund	1,335,869	1,065,331	-

Calendar Year	2019	2020	2021
ACTs from other donors (UNICEF)	150,000	150,000	150,000
ACTs arriving at year end (PMI and others)		858,000	
ACTs planned with PMI funding ³	2,839,234	2,000,000	2,000,000
Total ACTs Available	5,297,983	5,497,998	3,620,215
Total ACT Surplus (Gap)	884,667	930,215	918,698

¹ Sources : The method used to calculate ACT needs is based on consumption: we used the consumption data for 2017 in view of the stock outage observed with TDR in 2018 and the closure of clandestine hospitals. An increase rate of 3.52% was applied twice to obtain the 2019 needs estimates and 3 times for the 2020 needs.

A security stock of 9 months (accounting for data quality issues and delivery lead time) has been added to the provisions to get the total need per year except for CY 2021

The total need for ACT has been obtained by summing the needs for each presentation

² CAME Inventory Data on 28/01/2019

³ Planned quantity + 2019 Gap ordered through PMI

Conclusion

The total need of ACT treatments Benin for FY 2020 is 2.7 million. Similarly, to RDTs, the quantity is much lower than the quantity for prior years as it has been adjusted to account for the security stock that is planned for CY 2019 and 2020. PMI and Global Fund are the main supporters for ACT procurement in Benin. In FY 2020, PMI will procure approximately 74% of the country needs, or 2 million ACT treatments. We believe Global Fund and the GoB will be able to fill the remaining gap and meet country needs.

Key Question 8

What is the projected need for severe malaria treatment and any other treatments as applicable?

Supporting Data

Figure A33. Gap Analysis Table for Injectable Artesunate

Calendar Year	2019	2020	2021
Injectable Artesunate Needs			
Projected Number of Severe Cases ¹	173,134	179,194	185,465
Projected # of severe cases among children ¹	109,814	113,657	117,636
Projected # of severe cases among adults ¹	63,320	65,536	67,830
Total Injectable Artesunate vials Needs	899,322	930,798	963,376
Partner Contributions			
Injectable artesunate vials carried over from previous year	2,470	0	-
Injectable artesunate vials from Government	23,515	117,575	200,000
Injectable artesunate vials from Global Fund	-	-	-

Calendar Year	2019	2020	2021
Injectable artesunate vials from other donors	-	-	-
Injectable Artesunate arriving at year end (PMI)		100,000	
Injectable artesunate vials planned with PMI funding	0	50,000	200,000
Total Injectable Artesunate vials Available	25,985	267,575	400,000
Total Injectable Artesunate vials Surplus (Gap)	-873,337	-663,223	-563,376

Footnotes:

¹source: artesunate being a new product there was no consumption data. The needs estimate was based on morbidity data. To do this we have identified from DHIS 2 the number of children under five years of age with severe malaria and those over five years of age with severe malaria (including adults). We then applied to these identified populations the number of artesunate doses that are needed on average per age group. here we took as standard presentation the artesunate 60mg

Figure A34. Gap Analysis Table for RAS

Calendar Year	2019	2020	2021
Artesunate Suppository Needs			
Number of severe cases expected to require pre-referral dose at community level ¹	5,491	5,684	5,884
Total Artesunate Suppository Needs	5491	5684	5884
Partner Contributions			
Artesunate suppositories carried over from previous year	0	4,509	
Artesunate suppositories from Government	-	-	-
Artesunate suppositories from Global Fund	-	-	-
Artesunate suppositories from other donors	-	-	-
Artesunate suppositories planned with PMI funding	10,000		5,884
Total Artesunate Suppositories Available	10,000	4,509	5,884
Total Artesunate Suppositories Surplus (Gap)	4,509	-1,175	0

¹ 10% of severe cases are expected to require pre-referral dose at community

Conclusion

The total need of injectable artesunate in Benin is 963,000 vials. Treatment for severe malaria is a major concern for Benin. In 2019, the country adopted a new first line for severe malaria, injectable artesunate, and conducted a pilot in the country for training of healthcare workers. With this change, procurement and distribution of parental quinine, former first-line for severe malaria, was stopped. Therefore, there is a pressing need to fill stocks at all levels of the distribution system. PMI will work with the Global Fund to coordinate implementation scale up of the use of injectable artesunate nationwide. PMI will provide training assistance for health care providers on the guidelines and develop job aids. PMI will contribute 20% (200,000 vials) of the needs and believe that GoB and GF will be able to fill the remaining gap and meet the country needs.

In addition, PMI will procure approximately 5,884 rectal artesunate suppositories (RAS) to be used for the pre-referral of the children with severe malaria from the primary health facilities to the

hospitals where severe malaria is treated in Benin. Due to the cold chain condition that is required for the storage of the RAS, Benin policy doesn't allow the use of the RAS at the community level.

Key Question 9

Are the first-line ACTs effective and monitored regularly?

Supporting Data

Figure A35. Completed and Ongoing Antimalarial Therapeutic Efficacy Studies

Year	Sites	Treatment arms	PCR-corrected ACPR>90%?	Where molecular resistance work was completed or the plan, if any, for molecular resistance work
2017 ¹	Djougou, Klouekanme	AL	Yes	CDC Atlanta (PARMA)
2019	Bohicon, Kandi	AL	TBD	Dakar, Universite Cheikh Anta Diop (PARMA Hub) (To be confirmed)

¹Source: Efficacy of artemether-lumefantrine for the treatment of uncomplicated Plasmodium falciparum malaria in Klouekanmey and Djougou, Republic of Benin, ASTMH 2018

Footnotes - ACPR: adequate clinical and parasitological response; AL: artemether-lumefantrine; PARMA: PMI-supported Antimalarial Resistance Monitoring in Africa

Conclusion

As of 2017, AL remains efficacious in Benin.

Key Question 10

Are there other key items, such as lab strengthening, private sector support, etc. that should be considered?

Supporting Data

- Need to identify and support a national laboratory that can assist with activities related to quality control of diagnosis and different evaluations in Benin (e.g., TES)
- Define optimal way to engage the private sector in malaria case management in Benin
- Enhance/expand OTSS for malaria diagnosis in other health facilities/hospitals

Conclusion

There is a critical need to continue to work with Benin NMCP to update guidelines and national policies around malaria case management, including the roll out of treatment for severe malaria.

Key Question 11

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

None to report.

Conclusion

None.

2.B. DRUG-BASED PREVENTION

NMCP objective
NMCP objectives for SMC and IPTp: <ul style="list-style-type: none">● 95% of pregnant women receive at least 2 doses of SP under direct supervision of a health providers for protection against malaria● 95% of children aged 3 to 59 months in selected high-endemic areas receive SP / AQ in chemoprevention (4 doses after 4 passages) during the high transmission season (Seasonal Malaria Chemoprevention or SMC)
NMCP approach
<ul style="list-style-type: none">● Though the 2016 WHO ANC guidelines are yet to be included in Benin's policy documents, since March 2019 the NMCP is verbally recommending to health providers to administer under direct observation of a HW one IPTp dose at each antenatal visit starting from the 13th week of pregnancy thus providing an opportunity to provide up to five doses of SP. Each of the doses should be given at a monthly interval. The program is envisioning to update the national guidelines that are still recommending a maximum of 3 doses.● Benin adopted SMC in 2018. 4 eligible health zones (Sahelian zones neighboring Burkina Faso and Niger) were identified for implementation. Approximately 100,000 children from 3 to 59 months are targeted.
PMI objective, in support of NMCP
<ul style="list-style-type: none">● PMI supports the procurement of SP for IPTp nationwide and also training and supervision of healthcare workers attending to pregnant women.● PMI is providing support in the procurement of SPAQ in 2 eligible health zones for children from 3 -59 months for SMC.
PMI-supported recent progress (past ~12-18 months)
<ul style="list-style-type: none">● PMI procured 583,500 doses of SP in 2018 for IPTp in 2019.● PMI-funded supervision of health providers on IPTp nationwide in all of the 12 departments.

- PMI contributed to discussions regarding Benin national policies to comply with the WHO guidelines on IPTp dosing schemes.
- PMI funded the roll out of IPTp in the community by trained health care providers in five health zones. This has led to the slight increase in IPTp coverage in two health zones.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- PMI will support the rapid evaluation of the community-based IPTp and will scale it up to 5 additional health zones.
- PMI will continue to support the supervision of health providers on IPTp
- PMI will help Benin NMCP update national guidelines on IPTp to align with WHO recommendations.
- PMI will continue to contribute to the procurement of SP and SPAQ to meet its targets in terms of support to IPTp and SMC. GOB will be strongly encouraged to procure SP to help cover any potential gap.

2.B.i SEASONAL MALARIA CHEMOPREVENTION (SMC)

PMI Goal

Support the national strategy for SMC addressing relevant geographic areas and age groups, which includes 4 rounds, for children aged 3-59 months, in accordance with the WHO recommendations

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

The funding allocation for SMC will be maintained as PMI is intending to continue to support the two previously enrolled health zones (Tanguieta-Materi-Cobli and Malanville-Karimama). Preliminary campaign data have shown a very high coverage rate and a slight decrease in the number of malaria cases in 2019 compared to previous years data.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

What is the estimated need for SMC commodities over the next three years and what proportion of this need will PMI support?

Figure A36. Gap Analysis Table for SMC

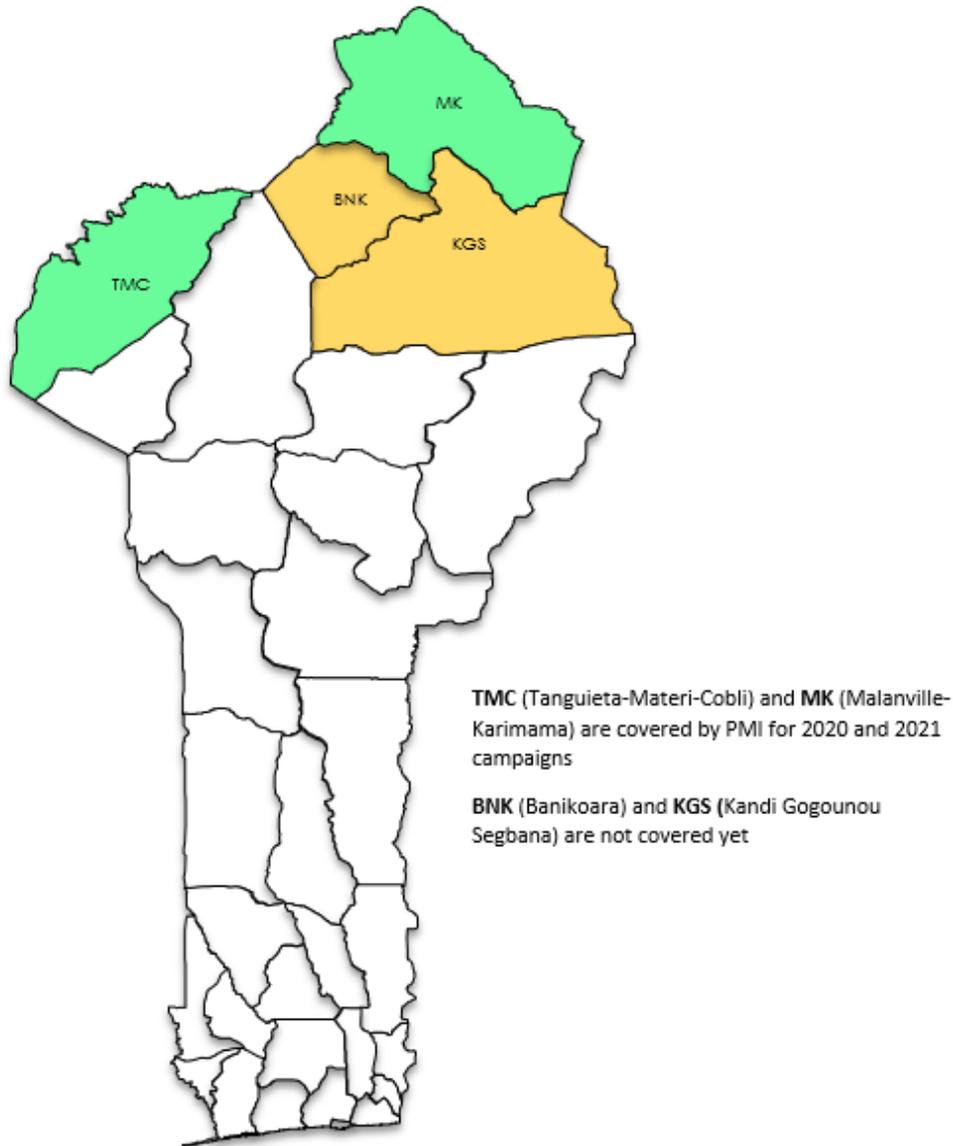
Calendar Year	2019	2020	2021
SMC drug (SP+AQ) Needs			
Population ZS Malanville-karimama	359,193	371,765	384,777
Population ZS Tanguieta-Materi Cobli	305,422	316,112	327,176
Population targeted for SMC ¹	117,637	121,754	126,016
PMI-targeted population for SMC ¹	117,637	121,754	126,016
Population 3-11 months targeted for SMC	23,926	24,764	25,630
Population 12-59 months targeted for SMC	93,711	96,991	100,385
Total SPAQ 3-11 months needs	110,252	114,110	118,104
Total SPAQ 12-59 months needs	431,819	446,933	462,575
Total SP+AQ Needs	542,071	561,043	580,680
Partner Contributions (to PMI target population if not entire area at risk)			
SP+AQ carried over from previous year	0	47,047	11,904
SP+AQ from Government	-	-	-
SP+AQ from Global Fund	-	-	-
SP+AQ from Other Donors	-	-	-
SP+AQ 500/25/153mg planned with PMI funding ²	436,387	262,950	
SP+AQ 250/12.5/76.5mg planned with PMI funding ²	152,731	262,950	
Total SP+AQ planned with PMI funding ²	589,118	525,900	580,000
Total SP+AQ Available	589,118	572,947	591,904
Total SP+AQ Surplus (Gap)	47,047	11,904	11,225

¹ Source : Population data from SMC 2019 Campaign in TMC and MK Health Zones

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² SP+AQ planned quantity + 2019 Gap ordered through PMI

Figure A37. SMC-Eligible Zones



Conclusion

Results from the first-ever 2019 SMC implementation in Benin are very promising in terms of decreasing malaria morbidity and mortality in the targeted areas. PMI's support in the two health zones covered since 2019 will be maintained. GF has committed to provide funding for the remaining two eligible health zones in CY 2021 (through its new grant).

Key Question 2

What are the estimated non-commodity resource needs to properly deliver SMC over the next 3 years?

Supporting Data

PMI will cover two health zones (5 communes) to provide SMC to approximately 100,000 children from 3 to 59 months. PMI funds will cover:

- the training of the staff involved in the campaign (CHWs, health providers, SBC agents)
- census to identify the 0-59 months children
- campaign supplies (cup, spoon, vest to identify the CHWs, ink, printing of registers, etc.,)
- operations of the campaign (incentive of CHWs and other staff, fuel, travel cost, SBC campaign via local radio, town criers).

Conclusion

In 2019, NMCP Benin decided to supervise the administration of the second and third dose during each round as a means to improve coverage and guarantee acceptability. This has increased operational costs by 36%. The supervision of second and third doses will not continue in the upcoming campaigns. PMI remains the only donor funding SMC in Benin.

Key Question 3

What does the data show about SMC refusal rates? How do refusal rates change from round to round? What barriers are contributing to SMC refusal rates?

Supporting Data

Figure A38. Facilitators and Barriers to SMC Refusal

Facilitator	Type of Factor	Data Source	Evidence
High acceptance among men.	Social	PMI site visit report during the campaign supervision	Sensitization using local radios and “ <i>fadas</i> ” (men’s social groups) were very effective, especially for initial acceptance.
Barrier	Type of Factor	Data Source	Evidence
CHWs arrival coincides with farming activities	Environmental	PMI site visit report during the campaign supervision	Caregivers are often in the fields at the time the CHW visits.
Perception that the medicine is harmful	Social	PMI site visit report during the campaign supervision	Rumors was spread about the effects of the SMC drugs

Conclusion

Refusal rates were low (under 5%) during the 2019 SMC campaign. Targeting men through “*fadas*” and negotiation to increase community awareness of the importance of SMC helped reduce refusal.

Key Question 4

What are the in-country considerations that impact your funding allocation in this category? If there is a specific budget line item in Table 2 that is not covered by the above questions, please address here.

Supporting Data

To date, only two out of the four eligible health zones are covered under PMI funds. The NMCP is envisioning to include the expansion to the two remaining zones in their next application for Global Funds grant. In 2020, the gap will remain but 2021 all of the 4 eligible health zones are expected to be covered.

Conclusion

PMI/Benin will continue to support SMC in 2 health zones with FY2020 funds.

2.B.ii MALARIA PREVENTION IN PREGNANCY (MIP)

PMI Goal

PMI supports the national strategy for MIP, which includes provision of ITNs at first antenatal care (ANC) visit, intermittent preventive treatment for pregnant women (IPTp) to all pregnant women in malaria endemic area starting at 13 weeks gestational age, for a minimum of 3 doses, and effective case management of malaria, in accordance with WHO recommendations

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

With MOP 2020, PMI suggests increasing the MIP budget from the previous MOP level of \$480,000 to \$675,000, an increase of \$195,000. In FY 2019, PMI did not plan to contribute to the procurement of SP as the planned orders with MOP FY 2018 funding together with the government's contribution of 500,000 doses was enough to cover the country's needs. The gap analysis has estimated the SP needs for the year 2021 at 1,807,457 doses. As agreed during the recent US-Benin bilateral review, the Government of Benin plans to procure 500,000 doses of SP for 2021 leaving a gap of 1,307,457. The proposed increase in the MIP budget will be used to procure more SP to cover the remaining gap of 1,300,000 doses to ensure an adequate supply for pregnant women to receive three doses throughout their pregnancy.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

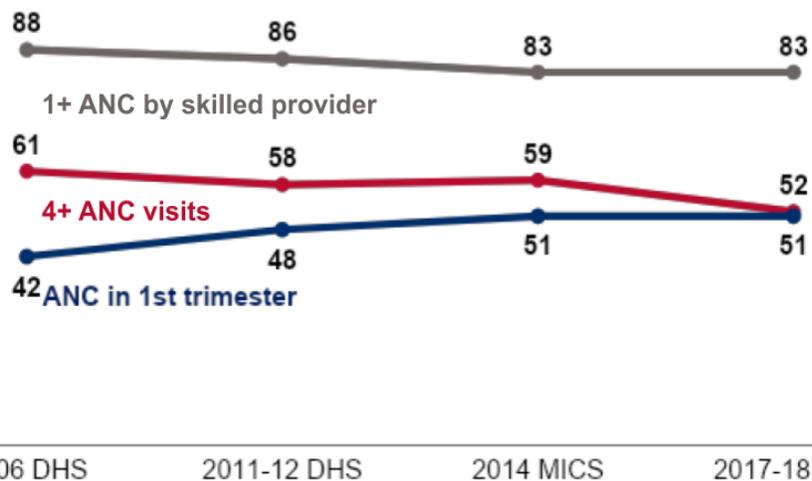
Key Question 1

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

Supporting Data

Figure A39. Trends in ANC Coverage

Percent of women age 15-49 with a live birth in the 5 years before the survey for most recent birth



Conclusion

Since the 2006 DHS, ANC numbers have seen a slight downward trend. Despite high first ANC coverage, with 83% of women receiving ANC from a trained provider, and relatively early initial presentation, with nearly half of pregnant women presenting prior to the fourth month, retention in care is moderate, with only about half of women making at least four visits.

Adequate quality of ANC services continues to be a challenge, and as a result, uptake of services remains low, particularly with regards to ANC visits in the first trimester. The NMCP anticipates seeing significant improvements with the implementation of community IPTp and the national rollout of the WHO ANC guidelines.

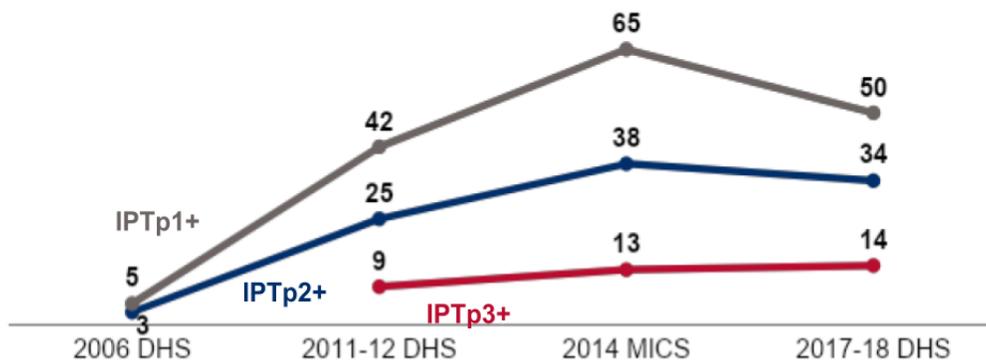
Key Question 2

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

Supporting Data

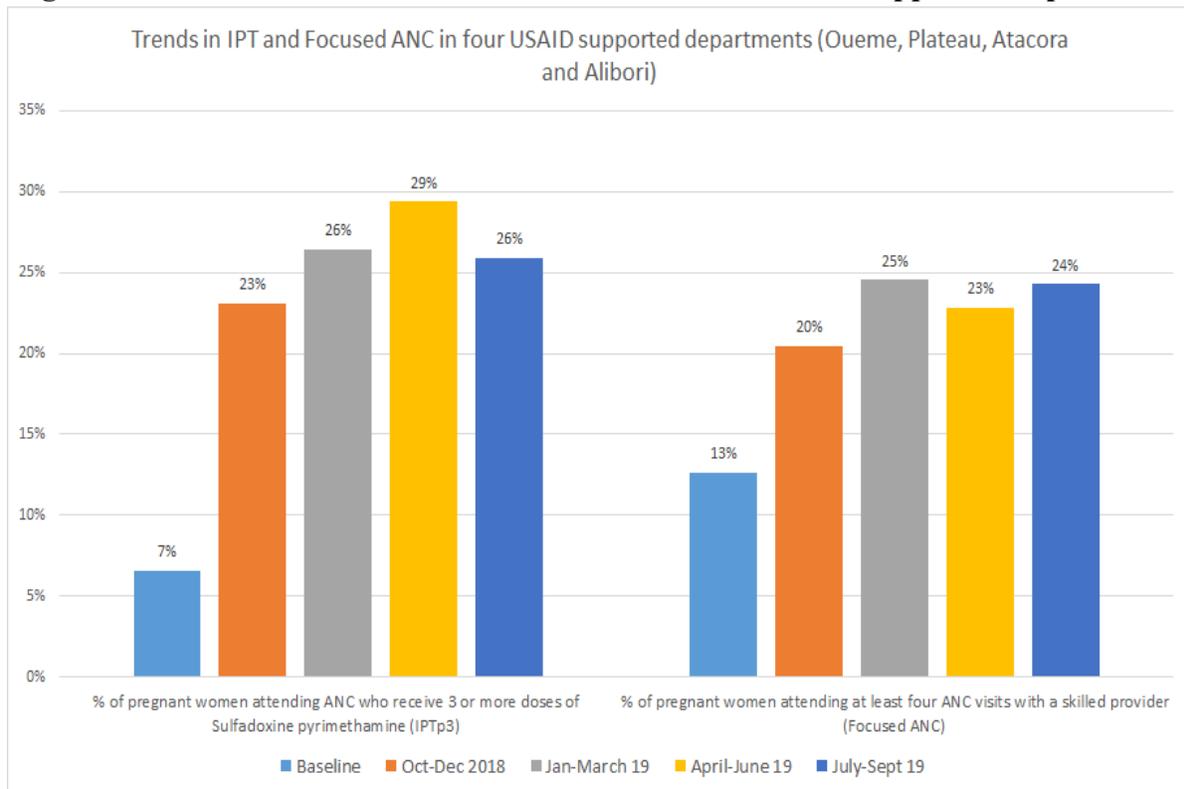
Figure A40. Trends in IPTp

Percent of women age 15-49 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: These indicators have been recalculated according to the newest definition (at least the specified number of doses of SP/Fansidar from any source) wherever possible

Figure A41. Trends in IPT and Focused ANC in Four USAID-Supported Departments



Conclusion

Despite the recent acceptance of the 2016 WHO recommendation for a minimum of 8 ANC contacts and revision of guidelines to provide for three doses of IPTp (IPTp3) at monthly intervals beginning in the second trimester of pregnancy up until delivery, there is still a huge gap between ANC attendance and receipt of IPTp, providing ample opportunities for improvement. According to the 2017-2018 DHS, only 34% of women received IPTp2, and only 14% received IPTp3. While IPTp coverage continues to gain ground, increasing from 28% in 2011 to 60% in 2017 per the national routine malaria information system reports, it remains weak across all PMI-supported departments. According to results from the baseline study conducted in year 1 of a PMI supported bilateral project (2018), IPTp3 coverage ranged from 5.9% (in areas with lowest coverage) to 8.5% (in areas of highest coverage). However, recent routine data in the four USAID supported departments shows significant improvement in IPTp3 uptake see (graph above).

Key Question 3

What is the gap between ANC attendance and IPTp uptake? What barriers and facilitators exist, especially among providers?

Supporting Data

Figure A42. Trends in Missed Opportunities for IPTp

Percent of women age 15-49

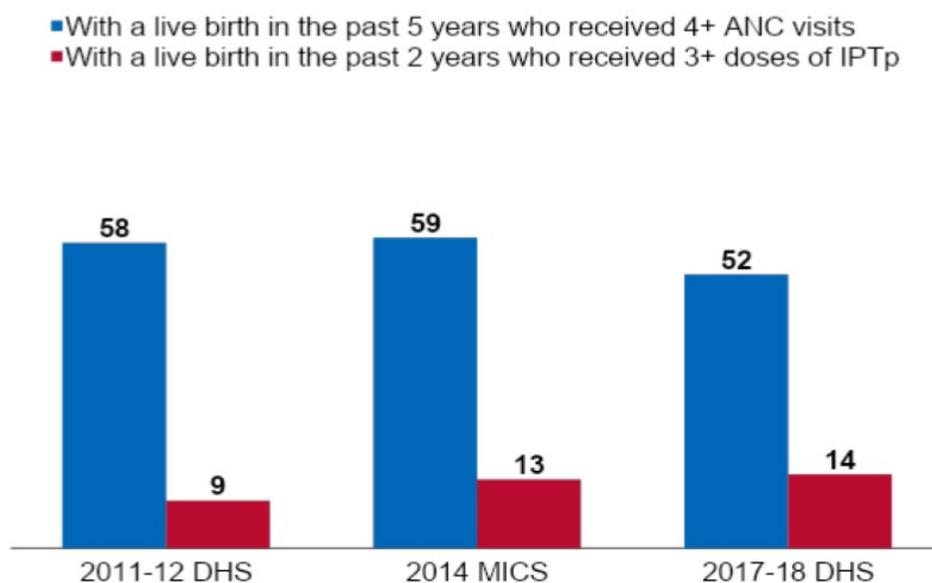


Figure A43. Facilitators to ANC Attendance and Barriers to IPTp Uptake

Facilitator	Type of Factor	Source	Evidence
High ANC attendance	Internal	DHS 17/18	52% women attend 4 plus ANC visits with over 80% attending at least one ANC visit. This provides the opportunity for relatively high IPTp delivery.
Involvement of community health workers in referring Pregnant women for IPTp services	Environmental	NMCP reports	Although limited in scope, this could be expanded to regions that have low IPTp coverage.
Treatment and training manuals have been updated to reflect the new IPTp policy	Environmental	NMCP guidelines	Treatment and training manuals exist.
Barrier	Type of Factor	Source	Evidence
Perceived risk of danger of malaria in pregnancy by pregnant women	Internal	SBC Plan	As malaria is common, no added danger seen in malaria during pregnancy by pregnant women.
Suboptimal Adherence to MIP (IPTp) Guidelines Among Health Workers	Internal/ Environmental	DHS 17/18	ANC 4 attendance by pregnant women in Benin is relatively high at over 50 percent. Even if all of these women attended ANC 1 in their first trimester, IPTp 3 coverage should be around 50%. However, only 14% of women reported receiving at least 3 doses of IPTp.

Conclusion

Relatively high ANC coverage provides a good entree for improving IPTp coverage, however this is not borne out in reality. Expansion of the community outreach IPTp program would probably help. SBC activities focusing on increasing knowledge about the dangers of malaria during pregnancy for mothers and babies could help empower expectant mothers to request SP during ANC visits (or to more readily accept SP if patient refusal is the issue). However, more examination of determinants of provider behavior needs to be explored to understand why IPTp does not track ANC attendance.

There is also a dearth of knowledge on intermediate determinants of behavior change in Benin. To address these issues, PMI/Benin will support (1) the implementation (using FY19 funds) of a malaria-specific health facility survey in a nationally-representative sample of health facilities to evaluate malaria case management practices, including IPTp among pregnant women, and assess health worker performance and attitudes and (2) the conduct of an MBS to measure malaria-related behaviors and their ideational determinants.

Key Question 4

What proportion of pregnant women with fever and malaria infection are getting diagnosed and treated? What barriers and facilitators exist?

Supporting Data

No data available

Conclusion

No data exist on this.

Key Question 5

What is the estimated need for IPTp commodities over the next three years and what proportion of this need will PMI support?

Supporting Data :

Figure A44. Estimated Need for IPTp Commodities 2019 - 2021

Calendar Year	2019	2020	2021
Total Population at Risk	12,272,332	12,703,091	13,148,969
SP Needs			
Total number of pregnant women	581,709	602,127	623,261
IPTp total probability (ANC1(90%) +ANC2 (70%)+ ANC3(50%) +ANC4(40%) +ANC5(40%))	1.50	2.90	2.90
Total SP Need (in treatments)	872,563	1,746,167	1,807,457
Partner Contributions			
SP carried over from previous years ¹	368,259	124,196	0
SP from Government	45,000	500,000	500,000
SP from Global Fund	-	-	-
SP from Other Donors	-	-	-
SP planned with PMI funding	583,500	1,082,040	1,300,000
Total SP Available	996,759	1,706,236	1,800,000
Total SP Surplus (Gap)	124,196	-39,931	-7,457

Conclusion

The estimated need for SP for Benin over the next three years is 4,426,187 treatments. PMI will be supporting 67% of the need and NMCP 23%. PMI will continue advocating with the NMCP to cover the gap of 10%.

Key Question 6

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

Nothing to report.

Conclusion

Nothing to report.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.A. SUPPLY CHAIN

NMCP objective
The NMCP/PMI objective is to secure the timely availability of quality commodities to support the diagnosis, prevention and treatment of all types of malaria cases for all the Beninese population.
NMCP approach
<p>The NMCP closely coordinates with the Central Medical Stores (CAME) to ensure malaria medicines, products, and supplies are available. Additionally, they work with the National Directorate for Pharmacy and Laboratories to ensure regulatory functions and compliance on malaria-related issues. The strategy is to use different tools, including the logistics management and information system (LMIS), end-user verification (EUV) survey, joint supervision visits, and weekly monitoring summaries, to give feedback and to improve supply chain management.</p> <p>Specifically, the NMCP strategic approach to supply chain strengthening includes:</p> <ul style="list-style-type: none">• Free access to ACTs and RDT for children under five years of age at the community level and health facilities,• Free access to treatment for pregnant women;• Integration of antimalarial commodities into the national supply chain, including conducting EUV that includes commodities for other priority programs;• Introduction of SP/AQ for the seasonal malaria chemoprophylaxis;• Introduction of injectable artesunate in the public sector for severe malaria treatment,• Ensure availability of products where IRS has been withdrawn;• Implementation of “<i>panier commun</i>” (common basket) to secure access to product at the health facility and community levels regardless of the funding source;

- Conduct routine distribution and mass campaign of ITNs s which are supported through the use of young professional logisticians;
- Conduct annual consumption and morbidity-based quantification exercise and supply plans;
- Review quarterly supply plans to make necessary adjustment; and
- Strengthen data collection, visibility and analysis for malaria commodities.

PMI objective, in support of NMCP

PMI supports the implementation of the five-year supply chain system strengthening action plan which started in 2016. This support includes interventions related to the improvement of supply chain governance, integration and harmonization, quantification, procurement, warehousing and distribution, LMIS, Human Resources for Supply Chain Management, and malaria commodity quality assurance and system performance monitoring. With the NMCP, GF, and implementing partners, PMI procures antimalarial commodities based on the NMCP's gap analysis and procurement plan. Reception and distribution of commodities is coordinated by the NMCP and the Central Medical Store (CMS). The commodities are stored in warehouses at the central level before the distribution to the CMS regional warehouses. PMI does not support their distribution to the lower levels but provides technical assistance to strengthen the supply chain system countrywide through the above listed interventions.

Benin has adopted a common basket system for the management of all donor procured commodities and for their distribution, Push and pull strategies are used respectively between health facilities and health zone depot and CHW and health facility to order malaria products.

PMI-supported recent progress (past ~12-18 months)

PMI supported supply chain strengthening through the following:

Policies, Governance, Strategies and Coordination

- Hosted and participated in the NMCP Procurement TWG
- Supported recruitment, training and placement of Young Professional Logisticians (YLPs) in 15 communes
- Provided technical assistance for the development of the supply chain/procurement section of the PSNIE of the CNLS-TP
- Provided technical assistance for the development of a SOP to place and monitor PMI orders
- Provided technical assistance for the development of SOP Manual for LMIS and Stock Management
- Conducted a cost effectiveness and logistics evaluation of CAME
- Contributed to the destruction of 118 tons of counterfeit medicines (incl. ACTs). This activity was funded jointly by PMI, MCH and FP funding streams.

Quantification and Supply Plan

- Provided technical assistance for conducting quantification and developing a gap analysis of malaria products
- Ensured that orders were placed to address product gaps in 2019 and 2020.

Develop supply plan

- Provided technical assistance to introduce the use of PipeLine software to monitor consumption, stock status and orders since June 2019 and motivate for earlier delivery

Warehousing, Distribution and Stock Management

- Developed a plan for implementation of common commodities platform
- Supported the transfer of about 10,000 doses of SPs among three health zone warehouses as part of the routine stock monitoring exercise
- Supported the implementation of the contingency plan for the withdrawal of the IRS in the Atacora department (including the training of 151 health staff on ACTs stock management)
- Conducted a feasibility study for third party logistics implementation between CAME and Health Zone Warehouses
- Provided support logistics for SMC, and IRS withdrawal contingency plan

Data Visibility and LMIS

- Provided TA to the NMCP to review and validation consumption data
- Submitted PMI Quarterly Monitoring Report
- Provided TA to the PSSP to strengthen the YLPs capacity to manage and monitor the performance of the supply chain
- Assisted with the quarterly data collection of ACTs logistics data at the Central, Regional and Health Zone levels
- Trained 60 health facility managers to fill logistics reports: 180 reports were corrected during the quality control exercise conducted during 100% supervisory visits
- Trained 34 health zones warehouse managers to capture A7 data into the DHIS 2.0
- Provided TA for the development of web-based Logistics Data Visualization Platform for all 59 tracer products for all priority programs (incl. NMCP)

Monitoring and Evaluation

- Supported to the withdrawal of the IRS in the Atacora by:
 - Contributing to weekly malaria epidemiologic data report
 - Supporting implementation of recommendation to ensure ACTs availability
- Conducted bi-annual EUV, last one was an integrated EUV and host reporting workshops
- Assisted PPMRm monthly submission

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

Over the next 12-18 months PMI will:

- Continue to provide technical assistance to the NMCP (quantification, supply plan, PPMRm, CPS, GHSC-PSM Coordination, EUV etc.)
- Provide TA to strengthen implementation of the common basket approach
- Assist with ITN distribution with the help of PMI supported YLPs
- Support the recruitment, training and placement of 15 new YLPs
- Finalize and implement the data visualization platform that will receive funding from other donors for rollout and will support all health programs including NMCP.
- Update A7 tracer commodities reporting form and strengthen monthly reporting
- Start pilot implementation of eLMIS in 3 departments
- Contribute to the central medical store regional warehouses extension to ensure good storage conditions to the procured antimalarial commodities as recommended, the results of the economic and logistic study conducted in 2018
- Pilot implementation of 3PL distribution between CAME and Health Zone Warehouses
- Conduct assessment of last mile distribution

PMI Goal

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

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

Based on the following factors, PMI is proposing to maintain MOP 2020 budget at about the same level as for prior years: 1) in addition to resources from PMI and the mission's MCH (\$500,000) and FP (\$450,000) contribution to strengthening supply chain, PMI has directed some of its additional \$1M allocation in FY19 to further strengthen supply chain initiatives, 2) most of the start-up systems development components such as procure manuals, SOPs for procurement, warehousing, quantification, data visibility, quality control, coordination etc. are not expected to need additional support, and 3) other donors have committed to increasing their contribution towards supply chain systems strengthening.

PMI will maintain its current support in limited geographic areas where it has YLPs--with other donors taking on the remaining areas. PMI will also continue to focus on providing leadership and coordination functions at central level for the overall supply chain. Over the next three years different development partners have committed to fund implementation of different aspects of the supply

chain. PMI, through its implementing partner, has been leading planning and coordination discussions bringing together all supply chain funding partners in the country to decide on funding allocations. Donors who have committed to increasing their funding and to taking on new roles include: the Global Fund, through its new health system strengthening grant and the World Bank in addition to UNFPA, that not only focuses on FP products, but also contributes to other cross-cutting aspects of the logistics system. Additional resources from partners will support different components of the system including the selection of the list of essential medicines, quantification and acquisition of commodities, storage and distribution, logistics, disposal (post market control), eLMIS, human resources and eLearning. Figure A45 provides a summary of the projected funding by donors over the next three years.

Figure A45. Projected Donor Funding

Partner	Selection	Storage	Distribution	Disposal	eLMIS	eLearn	Human Resources	Total
GF	\$36K	\$616K		\$80K	\$337K	\$130K	\$430K	\$1629K
WB	\$61K		\$70K		\$884K	\$435K	\$650K	\$2,100K
USAID	\$200K				\$180K		\$350K	\$730K
UNFPA								TBD
Total	\$297K	\$616K	\$70K	\$80K	\$1,401K	\$565K	\$1,430K	\$4,459K

Note: Qualification and Acquisition are marked as TBD due to pending information on out-year funding levels

Furthermore, PMI through its supply chain partner holds the position of secretariat for a coalition of supply chain experts which is an influential subgroup within the development partners group (PTF). In this position, PMI will continue to play a coordination and catalytic role to ensure that there is appropriate planning and investments for supply chain.

Key Question 1

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

Supporting Data

Figure A46. Central Stock Levels for ACTs

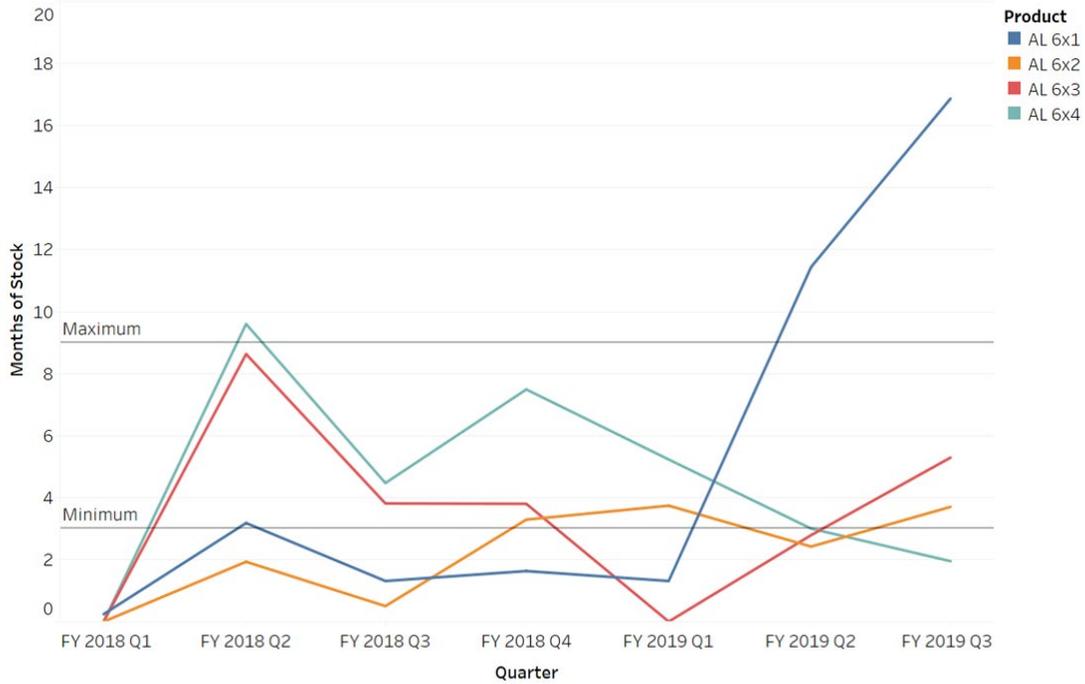


Figure A47. Central Stock Levels for RDTs, SP, and Inn Artesunate, 60mg

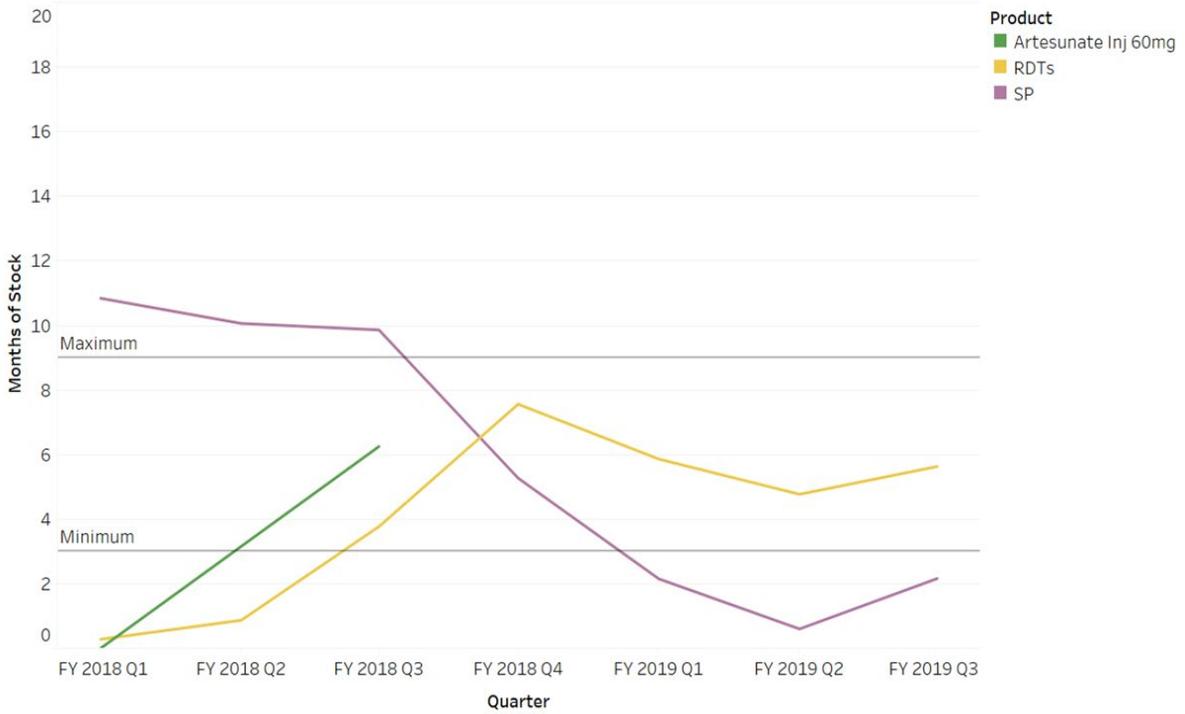


Figure A48. Stocked According to Plan for FY 2019 per GHSC-TA Francophone TO

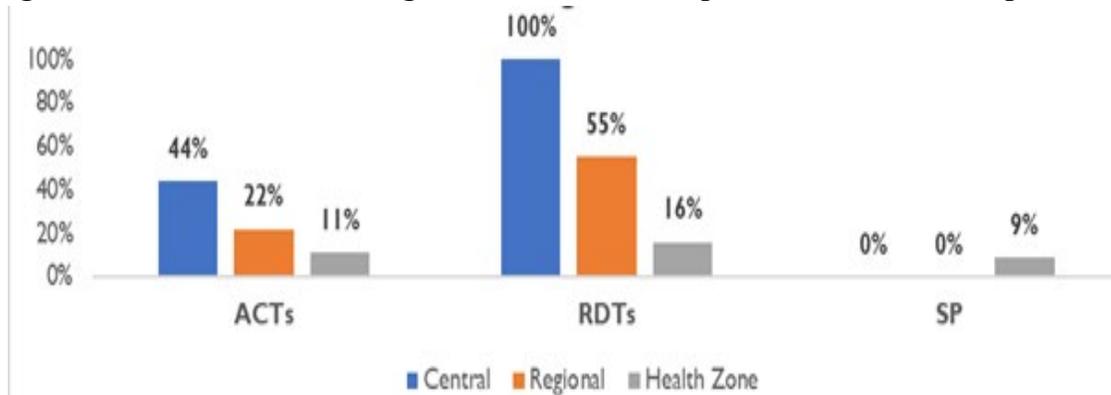


Figure A49. Recommended Minimum and Maximum Levels for NMCP Commodities

Region	Number of Months	
	Minimum	Maximum
Central	3	9
Regional	3	6
DRZ	2	3

Conclusion

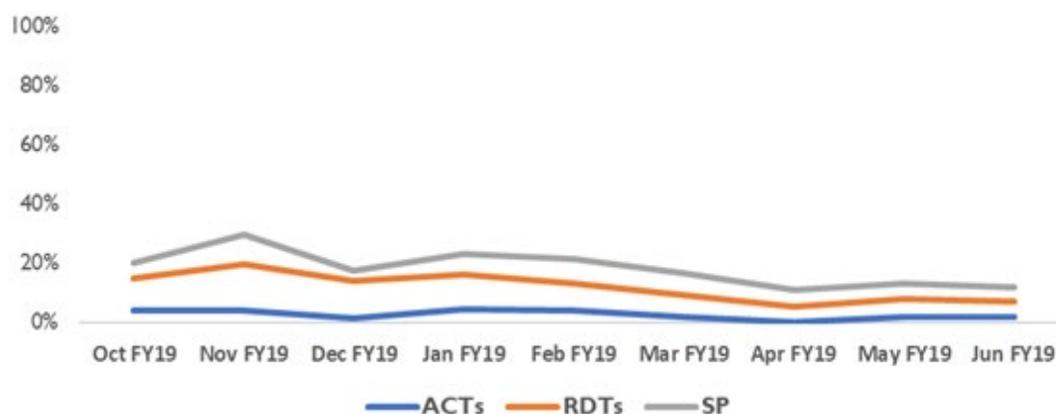
The data correspond to the average over three quarters of FY 2019 (Q1, Q2 and Q3). During the period under review, overall only 39% of the products were stocked according to the plan; RDTs and ACTs have the best results (100% and 44%) and SP has the worst. The poor result for ACTs is in part due to the fact that there was an overstock of AL 6 (high quantities ordered through the GF) and stock out of other pack size of AL. It also appears that the CAME regional warehouses and the health zone warehouses (DRZS) do not respect the recommended Min/Max. Availability of funds at the Health Zone/DRZS level to purchase enough quantities, DRZS managers turnover are some of the reasons as well. The delivery of 390,000 doses of SP that was expected on May 6, 2019 was eventually delivered on August 19, 2019.

Key Question 2

What are the trends in facility- and community health worker-level stock out rates for ACTs, RDTs and SP over the last year is there a seasonal or geographic difference in stock out rates?

Supporting Data

Figure A50. DHIS2 Facilities Stockout Rate



Conclusion

There is an improvement in product stock-out rates at the health facility level. This could be explained by the presence of young professional logisticians in health facilities and the monthly monitoring of regional supply chain officers through 100% supervision. Despite issues related to access to some of the health zones in the North of the country during the rainy season, the collected data shows that stocks are better managed in the Northern part of the country, therefore leadership need to be improved in the weaker health zones.

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

Figure A51. DHIS2 ACTs Consumed vs Malaria Cases

Period	ACT Consumed	No. of Malaria cases	Difference
Oct-18	285,011	255,044	-29,967
Nov-18	264,402	238,026	-26,376
Dec-18	173,469	178,419	4,950
Jan-19	134,384	129,559	-4,825
Feb-19	125,170	111,939	-13,231
Mar-19	154,068	139,164	-14,904

Period	ACT Consumed	No. of Malaria cases	Difference
Apr-19	139,083	116,969	-22,114
May-19	188,713	150,272	-38,441
Jun-19	435,297	239,895	-195,402
TOTAL	1,899,597	1,559,287	-340,310

Figure A52. RDTs Consumed vs. Number tested

Period	RDT Consumption	Number of Cases tested with RDTs	Difference
Oct-18	252,791	251,863	-928
Nov-18	281,723	239,459	-42,264
Dec-18	235,510	187,422	-48,088
Jan-19	118,415	140,753	22,338
Feb-19	124,569	139,071	14,502
Mar-19	149,245	173,266	24,021
Apr-19	144,455	149,638	5,183
May-19	174,276	184,905	10,629
Jun-19	232,486	279,015	46,529
TOTAL	1,713,470	1,745,392	31,922

Conclusion

The amount of ACTs consumed is greater than the number of malaria cases. This can be explained by the fact that in the DHIS 2.0, reporting of logistics data is known to be more complete and reliable than morbidity data. Moreover, reporting has been improving since the deployment of the YLP program and reporting monitoring by PMI. On the other hand, with regard to morbidity data, no specific action has been taken to improve the completeness of these data.

The second element that can explain these results is the switching between ACT presentations. As it was reported, to reduce the overstock of AL 6 x 1 and avoid stock out of other pack sizes a patient that requires AL 6 x 3 was given 3 blister pack of AL 6 x 1. If not recorded as AL 6 x3 this increase the number of ACTs consumed compared to the number of cases treated. Directives to prevent that have been developed and disseminated.

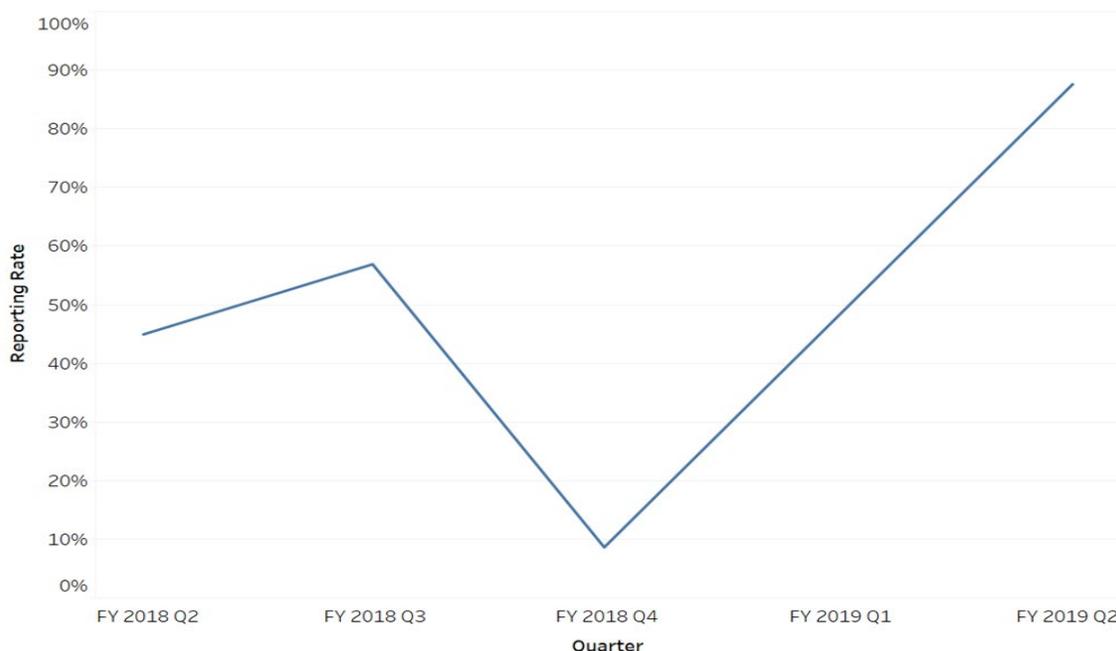
The quantity of RDTs consumed is almost equal to that of cases tested using RDT. Again, this can be explained as a result of the YLP program implementation which includes monitoring the completeness of the submitted reports.

Key Question 4

What are the trends in LMIS reporting rates?

Supporting Data

Figure A53. LMIS Reporting Rate



Conclusion

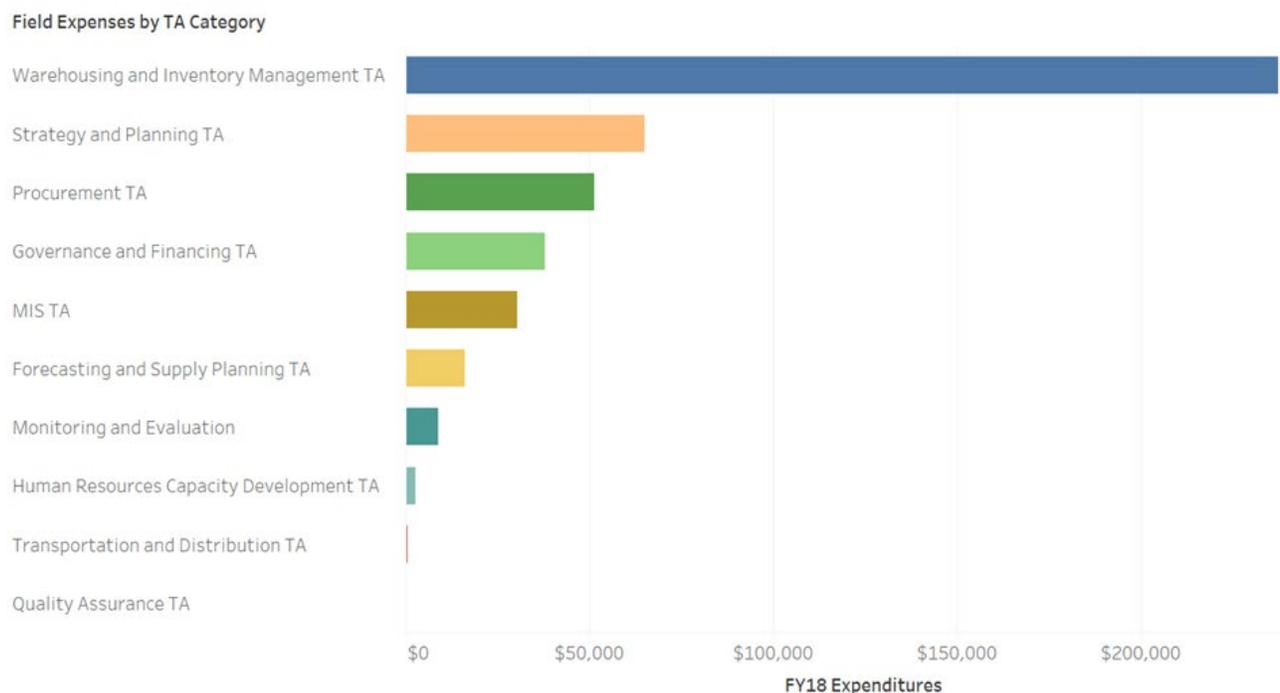
The best reporting rate has been recorded from FY 2019 Q1 to FY 2019 Q2 ~ 90%. The lowest one are shown over FY 2018 Q2 to FY 2018 Q3 with less than 60% which decreased to less than 10% in FY 2018 Q4. This trend in FY 2018 is due to the fact that logistics data reporting in DHIS2 started with a pilot of 10 health zones supported by a USAID/Benin bilateral project which ended in October 2018. In addition, a high staff turnover (new staff that have not been trained on the DHIS 2.0) in June might be responsible for the performance drop. The increase is no doubt due to the intervention of the YLP which started from January 2019. This trend will be improved further with the increase of the YLP over the country with PMI, WB, GF, UNFPA and UNICEF funds. As they will continue improving the reporting rate and data quality nationwide. The implementation of the new logistics data visualization platform should allow for better monitoring of the reporting practices for all levels of the supply chain, from the central level down to the health facilities.

Key Question 5

What are the main supply chain functions supported by PMI? For areas that are not as strong is there additional investment that PMI should make? In areas performing well, is it dependent on PMI/donor funding and so should be maintained?

Supporting Data

Figure A54. PMI Supply Chain Investments in FY 2018



As mentioned above, procurement, warehousing, quantification, data visibility, quality control, capacity building, governance, coordination and options analysis are the main functions supported by PMI. This should be maintained as the country is not “self-reliant” yet despite some financial support from the Government of Benin. In addition to PMI, GF and UNICEF also support the PNLN.

Conclusion

Programming funds should remain at about the same level. However, PMI will increase support to CAME for the proposed new cross docking warehouse in Bohicon.

Key Question 6

What are the in-country considerations that impact your funding allocation in this category? If there is a specific budget line item in Table 2 that is not covered by the above questions, please address here.

Supporting Data

Despite some isolated demonstrations that followed the legislative elections early this year, Benin remains a stable country. The current government is improving road and ICT infrastructure at a decent speed and is also working on improving access to quality health care services particularly for the poor population (ARCH initiative).

Conclusion

None.

3.B. SURVEILLANCE, MONITORING & EVALUATION (SM&E)

NMCP objective
<p>The 2017-2021 NSP describes indicators and targets set forth by the NMCP to capture the spatial distribution of malaria morbidity and mortality across the country. This information can be used to longitudinally track malaria trends over time in order to adjust program interventions, or propose new strategies, and ultimately reduce malaria burden.</p> <p>The specific objectives of the NSP are to:</p> <ul style="list-style-type: none">• Reduce malaria incidence by at least 25% (compared to 2015)• Reduce malaria related deaths by at least 25% (compared to 2015)• Strengthen the institutional capacity of the NMCP at all levels <p>The objectives of the NSP pertaining to HMIS, are to, by the end of 2021:</p> <ul style="list-style-type: none">• Have 80% of licensed public and private health facilities provide monthly epidemiologic data• Have 100% of the key NMCP indicators reported within the required time period• Ensure that 100% of departmental teams and national coordination have modern communication tools (Internet, corporate phone, intranet, etc.);
NMCP approach
<ul style="list-style-type: none">• Overview: NMCP prioritizes epidemiological surveillance as fundamental element of malaria control. NMCP's approach to epidemiological surveillance involves systematically and continuously collecting, analyzing, interpreting and disseminating malaria related data for decision-making.• HMIS: The health management information system (HMIS), referred to as SNIGS, as well as the IDSR, both routinely report malaria data. <i>The Direction de Programmation et de la Prospective</i> (DPP) is responsible for designing and coordinating the process of planning, programming, budgeting and monitoring health sector programs, including the management

of HMIS. The NMCP works in coordination with the DPP to collect and process malaria data on the HMIS. The NMCP had developed a complimentary system (SIRP) that included additional information not previously captured on the routine system and ensure regular data flow when the SNIGS was not functioning well, but as of 2015 the SIRP is now fully integrated into the SNIGS. Routine data collection is done monthly through the HMIS at all levels of the health pyramid using paper-based data collection and reporting tools at the health facility levels and DHIS2 at the health zone, commune, departmental and national levels. All public health facilities and private facilities are expected to report in the SIRP via DHIS2. In addition to health facilities, surveillance is also done at community level by community health workers (*relais communautaire*).

- Routine data quality reviews/audits: The NMCP carries out routine quarterly data validation workshops at the departmental level; national, departmental and health zone levels participate to monitor the consistency and quality of all malaria data from all health facilities. The NMCP also carries out routine supervision at department and health zone levels, as well as data quality audits every six months at the departmental level.
- Monthly or quarterly malaria bulletin: NMCP produces quarterly malaria bulletins, but given the sometimes-long process of data validation, these are often produced on data a year old. The DPP also produces annual health statistics reports.
- Data availability: The DPP provides direct access to the DHIS2 platform and works collaboratively with the NMCP at the national, department, and health zone levels to ensure regular access to all data stored on DHIS2. Some partners have also been provided access and work closely with the DPP on improving the overall function and use of the system; all those who have been provided a login and password have access to the data.
- Data use: Data are analyzed on a quarterly basis to assess progress towards the national strategic plan objectives. Data are used to calculate contractual indicators that are shared with partners (GF, WHO, RBM, etc.). Data are used to calculate gaps
- Surveys: In addition, surveys and studies are conducted to assess the implementation, coverage and impacts of malaria control interventions.

PMI objective, in support of NMCP

PMI's investment in surveillance, monitoring and evaluation in Benin aims to help the NMCP and MOH improve the availability, accuracy, timeliness and completeness of malaria-related data. Through its direct government-to-government support to the NMCP, PMI seeks to strengthen the routine data system implementation at district and national levels, including data review and analysis. In the four USAID focus departments of Alibori, Atacora, Oueme, Plateau, PMI provides more intensive technical assistance to the MOH to strengthen HMIS, including at the community level. PMI support for SM&E complements effort supported by other USAID health programs as well as the Global Fund, and other donors.

PMI-supported recent progress (past ~12-18 months)

- Supported the development of the national HMIS operational plan with activities aimed at: Improved data quality; Use of data for decision making; Performance evaluation of the HMIS implementation, and; Training
- Supported for the revision of the HMIS data collection tools
- Supported dashboard development in DHIS2 (while these are not yet in use, the dashboards are expected to facilitate the use of malaria-related HMIS data at all levels, including trends in malaria incidence)
- Provided support for NMCP to implement HMIS data validation for the 4 quarters of 2018 and the first quarter of 2019
- Provided support for NMCP to supervise HMIS data collection and reporting in 120 health
- Developed 7 malaria data bulletins
- Provided technical assistance to further develop and implement (for both pilot and scale up) CommCare as the community data reporting platform for CHWs. This support also included:
 - Support to MOH to align key implementing partners and other donors around one platform
 - Development of action plan for local server hosting (moving away from cloud hosting at the request of the MOH)
 - Testing automated DHIS2-CommCare data integration
 - Training and support for maintenance

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- Providing continued support at district and national levels for implementation of the HMIS, including data review and analysis, through the continuation of quarterly review meetings, production and dissemination of malaria bulletins, and routine data quality monitoring performed by the district health offices.
- Technical assistance to the MOH to strengthen HMIS in USAID-focus departments of Alibori, Atacora, Oueme, Plateau, including strengthening data collection, making data validation more efficient, decentralizing data supervision responsibilities, improving data quality and timeliness of dissemination.
- Strengthening epidemiological data in 40 selected health facilities to monitor the epidemiological effects of 1) withdrawing IRS; 2) introduction of NGenIRS; 3) continuation of Pirmiphos-methyl CS IRS. This activity will support additional supervision and monitoring of routine data recorded in the targeted areas to ensure data are routinely validated at the 40 health facilities on a monthly basis.

PMI 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.

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?

The proposed funding level of \$500,000 is a slight decrease from last year's \$700,000. Given the new investments from the Bill and Melinda Gates Foundation and the Global Fund under Workstream A, the PMI/Benin team believes this funding level will suffice to help improve data availability, quality (timeliness and completeness) and use.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

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

Supporting Data

Figure A55. Planned Data Collection Activities 2015 - 2023

Data Source	Data Collection Activities	Year								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
Household Surveys	Demographic Health Survey (DHS)			x	x				x	
	Malaria Indicator Survey (MIS)	x*					x*			
	Multiple Indicator Cluster Survey (MICS)						x*			
	EPI survey									
Health Facility Surveys	Service Provision Assessment (SPA)									
	Service Availability Readiness Assessment (SARA) survey	x*			x*		x*		x*	
	Other Health Facility Survey									

Data Source	Data Collection Activities	Year								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
Other Surveys	EUV	x	x	x	x	x	x			
	School-based Malaria Survey				x					
	Other (Household coverage survey--10 districts)				x					
	Other (Malaria Impact Evaluation)									
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System									
	Support to HMIS	x	x	x	x	x	x			
	Support to Integrated Disease Surveillance and Response (IDSR)	x*								
	Other (Electronic Logistics Management Information System (eLMIS))					x	x	x	x	x
	Other (Malaria Rapid Reporting System)									

*Asterisk denotes non-PMI funded activities; x denotes completed activities and (x) denotes planned activities.

Conclusion

Benin uses a combination of population and facility-based surveys to track progress made with regards to malaria morbidity and mortality. In 2020, the PNLIP is planning to implement a Malaria Indicator Survey with funding from the Global Fund. PMI will continue to invest in strengthening malaria-related routine data systems in FY2020.

Key Question 2

What HMIS activities have been supported in your country? What current priorities will be supported with this MOP funding?

Supporting Data

Figure A56. HMIS Activities and Priorities FY2018 – FY2020

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does other donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Central Level					
Register, tools (e.g. checklists, indicator glossary), job aids (design, indicators, definition of data elements, data dictionary, system support)	X	X	X		
Data quality assessments (separate from supervision – funding for travel to lower levels)	X	X	X		
Program monitoring and technical assistance (funding for travel to lower levels)	X	X	X		
Training (funding for central level to conduct training at lower levels, capacity building, i.e. on the job training for central level staff)	X	X	X		
Human Resources (secondment of person in NMCP for SM&E, office/team for SM&E)	X	X	X		
Data Use (analysis, interpretation, visualization (dashboards, bulletins, dissemination/feedback to lower levels, decision-making)	X	X	X		
Policy guidelines and coordination (updating policies, guidelines, supporting sub-committee meetings, supporting participation in sub-committee meetings)	X	X	X		
External relations/Communications/Outreach (support travel to international meetings and publications)	X	X	X		
Support to annual operational plans for national malaria program	X	X	X		
Desk review to catch “logic errors system” (TA to catch errors)	X	X	X		
Admin 1 Level (Region/Province/State). PMI supports activities in 12 regions; Global Fund supports activities in 0.					
Registers (warehousing, printing, distribution)					
Data quality assessments (separate from supervision – funding for travel to lower levels)	X	X	X		
Program monitoring and technical assistance (funding for travel to lower levels)	X	X	X		
Training (funding for Admin 2 staff to conduct training at lower levels, capacity building (i.e. on the job training for Admin 2 staff)	X	X	X		
Human Resources (secondment of person for malaria SM&E, office/team for SM&E)	X				

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does other donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Data Use (analysis, interpretation, visualization (dashboards, bulletins), dissemination/feedback to lower levels, decision-making)	X	X	X		
Adaptation of national policy guidelines and coordination (adapting policies, guidelines, supporting sub-committee meetings, supporting participation in sub-committee meetings)					
Adaptation of checklists and job-aides					
Participation in national meetings (support for travel costs)					
Support to Annual Operational Plans for Admin 1 Malaria Program	X	X	X		
Admin 2 Level (District)					
Data entry, summary, and transmission (training, re-training, computers, internet, tools)	X	X	X		
Supervision (training, traveling, supervision tools/checklists, create/design system for organized/methodical supervision)	X	X	X		
Data validation (data validation activities before monthly data submission - organize health facilities)	X	X	X		
Monthly/Quarterly data quality review meetings (venue, meeting support)	X	X	X		
Data Use (analysis, interpretation, visualization (i.e. dashboards), dissemination/feedback to facilities, decision-making)	X	X	X		
Human Resources (secondment of person for malaria SM&E, office/team for SM&E)	X	X	X		
Annual planning with Admin 1 (support travel)	X	X	X		
Facility Level					
Data collection/entry, summary, and transmission (training, re-training, computers, internet, tools)	X	X	X		
Supervision of CHWs (training, traveling, administering supervision tools/checklists of community health workers)	X	X	X	X ¹²	X
Data use (analysis, interpretation, visualization (dashboards), dissemination/feedback to CHWs, decision-making)	X	X	X	X	X
Monthly/Quarterly data quality review meetings(support for travel)	X	X	X	X	X

¹² in only 14 health districts for GF and 10 for PMI

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does other donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Community Level					
Data collection/entry and transmission (training, re-training, tools)	X	X	X	X	X
Data use (analysis, interpretation, decision-making)	X	X	X	X	X
Monthly/quarterly data quality review meetings (support for travel)	X	X	X	X	X

Conclusion

To continue to improve malaria related data quality and use, PMI will continue to support nearly all of the key HMIS strengthening activities. The fairly nascent community-based health information system will receive support from the Global Fund, the Bill and Melinda Gates Foundation and PMI.

Key Question 3

What are the outcomes of HMIS strengthening efforts?

Supporting Data

Figure A57. HMIS Strengthening Efforts 2017 - 2018

		2017	2018
Timeliness	% of reports received on time	29,2%	60,3%
Completeness	"Confirmed malaria cases for children under 5 years of age" was reported in X% of facility-months	83,8%	91,3%
Accuracy	Most recent DQA data	78,7%	98%

Conclusion

From 2017 to 2018, there was an improvement in the timeliness and completeness of the reports based on the data generated by DHIS2. However, a 2019 recent PMI review of epidemiologic data in Benin called quality of data on confirmed malaria cases into question given the abnormally high reported positivity rates. In the next two years, PMI and other donors plan to further examine the use of test positivity rates to assess data quality.

Key Question 4

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

The Government of Benin's current national health insurance initiative presents a strategic opportunity for the health sector to mobilize significant domestic resources for health information systems (HIS) strengthening efforts. The insurance agency will need very accurate data (e.g., on which patient received which service or medicine, which health facility delivered services, etc.) to ensure payments are sent to the right facility at the right time. Since the insurance scheme aims to increase accessibility and utilization of health services, the MOH needs to prepare for this increased demand connecting HIS sub-systems that track service delivery, logistics, and human resources.

Conclusion

PMI's investments in automating data exchange between CommCare and DHIS2 will lay a foundation for more accurate and timely data on demand for and access to health services. Allowing these two key HIS sub-systems to talk to each other (e.g., via an interoperability layer) can efficiently improve forecasting needs in commodities and health workers to reduce the likelihood of stock outs and health worker shortages.

Additional co-investments from the Bill and Melinda Gates Foundation, the Global Fund and PMI in malaria-related data systems are expected to accelerate improvements in data quality and use, including:

- The digitalization of the 2020 national mass ITN campaign which will generate accurate population figures and thus more precise denominator data necessary for the calculation of malaria related indicators
- Additional embedded technical assistance to bolster the NMCP's analytic capabilities

Key Question 4

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

None.

Conclusion

None.

3.C. SOCIAL AND BEHAVIORAL CHANGE (SBC)

NMCP Objective
<p>The PSNIE, which supposedly subsumes disease specific strategies, notes that in general, there is no “systematization and coherence” in health communication and that there is no “conceptual framework” within which to organize communication targeting the general population. It furthermore states that communication activities aimed at specific target groups lack a “unifying framework.” The malaria section of the epidemic and response chapter of the PSNIE does not mention behavior change at all. There is one communication objective tied to a behavior within the PSNIE:</p> <ul style="list-style-type: none">● Behavioral objective: By 2023, 90% of households use malaria prevention methods corresponding to the epidemiological profile of their region.● Communication (knowledge) objective: At least 95% of household members have a good knowledge of malaria transmission and ways of preventing transmission. <p>The PSN 2017-2021 states that the NMCP’s overall objectives are to reduce malaria incidence and mortality by 25% compared to 2015 levels by 2021. NMCP will aim to achieve these objectives through prevention (integrated vector management and chemo prevention), diagnosis and treatment and program strengthening, including SBC. The PSN specifically calls for the development of an integrated national malaria social and behavior change communication plan to attain the specific prevention and case management targets.</p>
NMCP Approach
<p>Benin’s approach to malaria SBC is guided by the National Integrated Social and Behavior Change Communication Plan for Malaria Control in Benin 2017-2021 (<i>Plan National Intégré de Communication pour le Changement Social et Comportemental pour la lutte contre le paludisme au Bénin 2017-2021</i>). Although not yet formally adopted, this comprehensive, theory-driven and evidence-based plan serves as the basis for all malaria SBC interventions in Benin.</p> <p>The SBCC plan contributes to the realization of the country’s vision of a “Benin without malaria by 2030” through three main strategic thrusts:</p> <ul style="list-style-type: none">● Advocacy for greater engagement at the leadership level for the mobilization of human, material and financial resources● Greater visibility for the NMCP, national awareness, community participation, social mobilization and intersectoral alliances● Increased knowledge, change in attitudes, norms and social values, and adoption of priority behaviors through the following strategic communication objectives:

- improve the level of knowledge of target populations and primary and secondary targets and improve the attitudes, norms and practices of the target population
- improve attitudes and behaviors of secondary targets
- improve engagement and mobilization of the different resources needed for social and behavioral change.

The NMCP convenes regular SBC technical working group (TWG) meetings with partners active in malaria social mobilization, advocacy and communications. These partners include: Global Funds/CRS, USAID and IPs, ABMS/PSI, OMS, and UNICEF. All major strategic decisions are made through this working group to ensure that all planned activities are complementary and fit within the NMCP SBC strategy. The National Public Health Directorate includes an overall communications service for the Ministry of Health and each Health Department includes a communications team. At the operational level, Social Mobilization Agents (C/RAMS) are posted in the 34 health zones. CRAMS conducted social mobilization activities jointly with nurses and midwives who operate at health facilities level. They supervise CHWs and town criers who work at the village level.

PMI Objective in Support of NMCP

- PMI supports the NMCP in the implementation of their national SBC strategy through support of and participation in the SBC TWG. This ensures that the NMCP provides strategic leadership in malaria SBC and that all stakeholders are aware of others' activities.
- PMI supports SBC at the community level in 19 communes (other partners ensure this support in the other communes).
- PMI does not support SBC work for larviciding and environmental interventions although these activities are included in the PSN and PSNIE.

PMI-Supported Recent Progress (*Past 12-18 Months*)

- In mid-2019, NMCP conducted advocacy workshops nationwide with local administrative and religious leaders to increase their awareness of malaria and to encourage their participation in and support for malaria control activities, especially at the community level.
- NMCP is also finalizing the *Plan Integre de Communication* that will be released before the end of the year.
- NMCP also conducted SBC campaign nationwide during the World Malaria Day period. This included a caravan to sensitize population on malaria, and radio shows and educational talk on malaria early-care seeking behaviors, educative.
- SBC activities were also conducted in the 4 health zones where PMI piloted the community-based outreach IPTp. This has helped to increase awareness on malaria and particularly on the importance of up-taking the IPTp among pregnant women.

- PMI helped the NMCP develop and run specific SBC campaigns, and adapted SBC activities in SMC areas and in the 2 health zones where IRS was withdrawn.
- In the 10 PIHI health zones, CHWs continued to conduct community-based malaria SBC activities including educational talks and group-discussion during routine household visits.

PMI-Supported Planned Activities (Next 12-18 Months Supported by Currently Available Funds)

- NMCP and partners will pursue and enhance SBC effort during the upcoming years by maintaining the world malaria day and its satellite activities and events.
- NMCP will organize adapted SBC campaigns for SMC and mass ITN distribution campaigns
- NMCP will scale up the malaria school clubs to other departments
- PMI will support the training health workers on SBC and will help develop decentralized and adapted integrated communication plans in its 11 health zones
- CHWs will pursue their routine household visit to maintain population awareness on malaria

PMI Goal

Through the use of social and behavior change 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 morbidity and mortality.

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?

Although there is an agreed upon need for increased resources for SBC within Benin, resources remain limited. The funding allocation for SBC activities will remain the same.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

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

Supporting Data

Figure A58. Summary of Prioritized SBC Programming

Prompt Care-Seeking for Children Under Five Years of Age	Caregivers of Children Under Five Years of Age	Nationwide	According to the DHS 17/18, although 53% of caregivers eventually seek treatment for fevers only 28% do so promptly. This suggests a need for increased SBC activities promoting prompt care seeking.
Provider adherence to guidelines	Health Facility Based Providers	Nationwide	The DHS 17/18 shows a weakness in correct diagnosis and treatment of fever. Analysis of SNIGS data suggests a further weakness in correct diagnosis and treatment (although in the opposite direction). The DHS 17/18 shows a huge gap between ANC4 and IPTp3. In most health centers, case management and ANC are provided by the same health care worker. These two issues point to a need for better understanding of determinants of provider behavior and SBC activities geared towards increasing adherence to national guidelines.

Conclusion

SBC activities to encourage correct and consistent use of ITNs will continue. Data show that when ITNs are present, use is generally high, although there are questions about whether they are used consistently during the hot season. Given that data presented under the case management sections above (and in Key Question 2) priority will be placed on prompt care seeking behavior and provider adherence to guidelines in case management and IPTp. The determinants surrounding provider behavior are not well understood and research is needed to develop appropriate SBC activities.

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

Figure A59. Summary of Determinants and Gaps for FY2020 Prioritized Behaviors

Behavior	Key Facilitators	Key Barriers	Knowledge Gaps
Prompt Care-Seeking for Children Under Five Years of Age	Presence of a CHW in the community	Lack of knowledge that prompt care seeking is important; preference for treatment in the private sector	Information on intermediate determinants of care seeking behavior among caregivers for children under 5 years of age; frequency of use of unqualified private or non-traditional providers as the first recourse for caregivers of children under 5 years of age
Provider adherence to guidelines	Clear policy and guidelines for the diagnostic and case management at community and health facility level.	Suboptimal adherence to case management guidelines among health workers; suboptimal adherence to MIP (IPTp) guidelines among health workers	Determinants of provider behavior

Conclusion

As mentioned in the analyses in the technical sectors, there is a dearth of data on determinants of provider behavior around testing and treatment for malaria and provision of SP during ANC visits. Analysis of HMIS data also points to a practice among a non-negligible percentage of providers of recording all (or most) RDTs as positive in order to justify treatment. To improve and design appropriate interventions PMI/Benin will support the implementation (using FY19 funds) of a malaria-specific health facility survey in a nationally-representative sample of health facilities to evaluate malaria case management practices, including IPTp among pregnant women, and assess health worker performance and attitudes.

To better understand the determinants of caregivers' health care seeking behavior, PMI/Benin (using both FY19 and FY20 funding) will support the conduct of an MBS to measure malaria-related behaviors and their ideational determinants.

Key Question 3

What activities are needed to bolster the country's capacity for SBC? Are these activities needed at the national or sub-national level?

Supporting Data

The following are the proposed activities that can help bolster SBC in Benin:

- Collect more and better data on the determinants of behavior to guide implementation of SBC across the interventions including vector control, SMC, and case management.
- Finalization of the Integrated Malaria Communication Plan.
- Translate social mobilization messages and tools into local languages.
- Identify new channels and innovative approaches to reach out populations with malaria messages.
- Expand SBC strategy in the SMC zones
- SBC campaign before and during the mass distribution campaign to promote better retention in situations when ITN attrition is attributed to user behavior such as giving away or selling the ITN, using the ITN for other reasons, or inadequate care of the ITN.
- Support the organization of the national malaria day campaign
- Support for NMCP's advocacy and SBCC activities with religious and administrative leaders at institutional and community levels to encourage community buy-in, use local funds, and facilitate local leadership of activities in the fight against malaria.
- Support for school clubs and women's groups at the community level.

Conclusion

The activities above will be supported through the bilateral project, the FARA or both.

Key Question 4

What are the in-country considerations that impact your funding allocation in this category? If there is a specific budget line item in Table 2 that is not covered by the above questions, please address here.

Supporting Data

Benin is politically stable and has a favorable environment to implement out SBC strategies and activities.

Conclusion

None.

3.D. PROGRAM EVALUATION AND OPERATIONAL RESEARCH

NMCP objective
The NMCP does not define clear objectives with regards to OR in Benin
NMCP approach
<ul style="list-style-type: none"> • The NMCP is putting in place a strategy to identify all of the on-going malaria research projects in Benin. The Government of Benin has put in place some reforms in early 2019 to scrutinize all research and to give their statistical and ethical approvals. • The NMCP is deeply involved in the process of reviewing malaria-related research design, implementation, and publication.
PMI objective, in support of NMCP
<ul style="list-style-type: none"> • PMI supported the NMCP in 2019 to organize the 2nd national malaria research symposium (<i>deuxièmes journées nationales scientifiques sur le paludisme</i>) to do a comprehensive inventory of all the research studies that are currently being conducted in the area of malaria control. • PMI has engaged in discussion with the program to identify key areas of research on the pertinent topics.
PMI-supported recent progress (past ~12-18 months)
<ul style="list-style-type: none"> • Increasing care seeking behavior among caregivers of children under five years of age with fever in Benin using Behavior Change Communication: A Randomized trial. Under CATCH project (Core-funded) • After 14 months of SBCC activities, using mainly group and interpersonal communication strategies, mothers', fathers' or caregivers' care-seeking behaviors for their febrile children were significantly higher among intervention villages than control villages. The main barriers to care-seeking were financial, distance from health centers, transport and the repeated stock-out of Rapid Diagnostic Tests and Artemisinin-based Combination Therapy. • SBCC and retention, care, repair, use and impact in Benin. Under PADNET project (Core-funded) <p>An experimental random cluster study was conducted in 2014 in a sample of 900 households (HH) from the Seme Podji commune, distributing one ITNs (Perma Net 3) per household (HH) for a period of 33 months. A total of 900 HH from the Seme Podji commune were enrolled in the study. The sample was split into 3 groups (arms) of 300 HH: arm 1 received only SBCC; arm 2 received SBCC and a net repair kit; and arm 3 was the control. SBCC consisted of monthly HH visits by Care Group Leaders, and community dialogues through interpersonal communication to promote continuous net use, reducing damage and repairing nets. The results of the study show that for net</p>

loss due to physical damage beyond repair as stated by net owners, the retention rate for arm 1 was 90%, 94% for arm 2 and 75% for arm 3 ($p < 0.0001$). Net washing more than once per trimester was more frequent in arm 3 (60%) than arm 1 (37%) and arm 2 (30%) ($p < 0.0001$). The proportion of nets with a proportional Hole Index (pHI) of 0 (no/few tiny holes) in arm 3 was 20% while arm 1 had 64% and arm 2 had 75% ($p < 0.0001$). The proportion of nets with a pHI of 64 (not deemed a good barrier), was 38% in arm 3, while arm 1 had 4% and arm 2 had 2%. The proportion of ever-damaged ITNs with signs of repair in arm 3 was 34%, while arm 1 had 95%, and arm 2 had 98% ($p < 0.0001$). The proportion of children under 5 years of age that slept under any ITN with pHI=0 was 21% in arm 3, 62% in arm 1 and 55% in arm 2. The proportion of children under 5 years of age sleeping under a net deemed as a good barrier (pHI<65) was 51% in arm 3, 88% in arm 1 and 73% in arm 2 ($p < 0.0001$).

SBCC for net use and preservation should be promoted nation-wide in order to improve net durability in the protection against malaria.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

Assessing the Impact of Group ANC on IPTp uptake in Benin and the Feasibility and Acceptability of Pregnant Women as a Sentinel Surveillance Population.

The World Health Organization (WHO) has recommended further research into the utility of group antenatal care (ANC) as a means to improve the coverage of Intermittent Preventive Treatment of malaria during pregnancy (IPTp). In most areas of sub-Saharan Africa, women make ample ANC visits, however, coverage of IPTp remains low. PMI will assess whether the use of a group ANC model can improve the quality of ANC by measuring uptake of recommended interventions, primarily IPTp. FY 2019 funds will be used to conduct operational research designed to investigate whether group ANC increases community-level ANC attendance and IPTp uptake. This operational research is in line with the increased demand for evidence-driven decision-making on methods to increase IPTp uptake. Benin is an appropriate country in which to assess group ANC, as coverage of early ANC is high, with 83% of women receiving ANC from a trained provider. This early presentation is critical for the success of the gANC model as clients should be enrolled in group care between 20-24 weeks gestational age. While women tend to start ANC relatively early in Benin, retention in care is moderate, with 52% making at least. This OR will be conducted in the Atlantique department and is scheduled to start in the second quarter of FY 2020.

PMI Goal

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

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?

PMI will continue to fund the OR study: “Assessing the Impact of Group ANC on IPTp uptake in Benin and the Feasibility and Acceptability of Pregnant Women as a Sentinel Surveillance Population” (Funded with core money and FY18 funds)

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

Have technical challenges or operational bottlenecks that require operations research or program evaluation been identified in consultation with the NMCP? How have they been prioritized?

Supporting Data

Figure A60. PE/OR Conducted in Benin with USG, GF, Multilaterals or Other Major Donors

Source of Funding	Institution	Research Question/Topic	Status
Bill & Melinda Gates Foundation/US	University of Abomey Calavi	Building the Capacity for the utility of Next Generation Sequencing in Insecticide Resistance Management by African National Malaria Control programs	Underway
Malaria Research Council/UK	University of Abomey Calavi	Using spatial statistics and genomics to develop epidemiologically relevant definitions of insecticide resistance in African malaria vectors	Complete
DFG/Germany	University of Abomey Calavi	<i>Plasmodium</i> species co-infections in <i>Anopheles</i> mosquitoes: a pilot study of parasite-vector interactions that define transmission in Africa	Underway
LSTM/UK	University of Abomey Calavi	Genome-based diagnostics for mapping, monitoring and management of insecticide resistance in major African malaria vectors	Complete
Wellcome Trust/UK	University of Abomey Calavi	Impact of insecticide resistance and exposure on <i>Plasmodium</i> infection level and prevalence in the malaria vector <i>Anopheles gambiae</i>	Underway

Source of Funding	Institution	Research Question/Topic	Status
CRDI/Canada	Public Health institute of Ouidah (IRSP)/ University of Abomey Calavi	Integrated approaches against malaria based on innovative agricultural practices in West Africa	Complete
TDR/WHO	IRSP/ University of Abomey Calavi	Evaluate the efficacy of IQK kits for insecticides treated materials quantification	Complete
Wellcome Trust/England	IRSP/ University of Abomey Calavi	Study of carbamate and organophosphate resistance in <i>Anopheles gambiae</i> , the main malaria vector in West Africa	Complete
AIEA/ Genève	IRSP/ University of Abomey Calavi	Study of Nutritional Quality of Several Semiochemical Supplements and Their Effects on Larval Development and Dispersal Activity of Adult Belonging to <i>Anopheles gambiae sl.</i>	Complete
Institut de recherche pour le développement (IRD)/France	IRSP/ University of Abomey Calavi	Impact of pesticides used in agriculture on the evolution of insecticide resistance in the main malaria vector in West Africa	Complete
Académie de recherche et de l'enseignement supérieur (ARES) / Belgique	Laboratory of applied medical anthropology (LAMA)/ University of Abomey Calavi	Analyze the production, distribution and commercialization of neo-traditional antimalarial drugs: perceptions, practices and practices in Cotonou and surroundings	Underway
Appui à la Modernisation et à la Réforme des Universités et Grandes Ecoles de Côte d'Ivoire/IRD	LAMA/ University of Abomey Calavi	Understanding the fight against malaria in Côte d'Ivoire and Benin: Social Practices and Resistance	Underway
IITA / WHO	LAMA/ University of Abomey Calavi	Understand the impact of insecticide resistance on the efficacy of IRS LLINs in three epidemiological and ecological contexts in Mali, Benin and Nigeria	Complete
National Geographic Society/IRD	LAMA/ University of Abomey Calavi	Understanding differential susceptibility to malaria of sympatric populations in Atacora, northern Benin: research on human and parasitic factors	Underway
IRD (UMR 216 et UMR 224)	LAMA/ University of Abomey Calavi	Understand how social and cultural decision-making processes for malaria prevention and treatment are built	Complete
Centre de Recherche sur le Paludisme associé à la Grossesse et l'Enfance/IRD (UMR 216 et UMR 224)	LAMA/ University of Abomey Calavi	Insecticide resistance and social practices related to the use of pesticides by populations: how to provide relevant information to control <i>Anopheles gambiae</i> .	Complete
Centre de Recherche sur le Paludisme associé à la Grossesse et l'Enfance/IRD (UMR 216 et UMR 224)	LAMA/ University of Abomey Calavi	Elaborate and test a "toolbox" of multidisciplinary operational evaluation of NMCPs / PALEVALUT 5% FEI Global Fund 2013-2016	Complete
WHO	LAMA/ University of Abomey Calavi	Study of the factors associated with the observance of IPTp in Benin	Complete

Source of Funding	Institution	Research Question/Topic	Status
Gates Malaria Partnership (GMP).	LAMA/ University of Abomey Calavi	Evaluation of the availability and use of ITNs by pregnant women and children under 5 years of age in Dékanmè, Benin	Complete
Special Programme for Research and Training in Tropical Diseases (WHO/TDR).	LAMA/ University of Abomey Calavi	Evaluation of the feasibility of using ACTs for home treatment of malaria in Benin	Complete

Conclusion

PMI will support the NMCP's vision of documenting all of the research underway in Benin. PMI will help NMCP identify key research questions and will help prioritize them based on their relevance.

Key Question 2

In the technical areas covered above, are there specific issues in any of the intervention areas that merit further exploration, in anticipation of establishing intervention strategies that are or could become available in the future that could be applied?

Supporting Data

PMI is currently funding research on sleeping patterns in the areas covered by indoor residual spraying in Northern Benin; further research will help determine in the same regions the reasons why they are not using their ITNs regularly. PMI will continue to put an emphasis on determining the sociological barriers that are preventing us from having reduction of malaria morbidity and mortality in IRS regions. For example, PMI will determine through operational research the barriers to good IPTp uptake in *Atlantique* department.

Conclusion

Many research studies in the area of malaria are already funded by other donors. PMI-supported operational research will be conducted based on the current country needs and research gap.

Key Question 3

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

The country is politically stable. The country also has good research capacities and well-equipped and experienced research centers. The environment is very favorable to conduct productive malaria research in a timely manner.

Conclusion

The environment is good to conduct operational research.

3.E. OTHER HEALTH SYSTEMS STRENGTHENING

NMCP objective
The NMCP has not set any specific objectives with regards to program infrastructure.
NMCP approach
N/A
PMI objective, in support of NMCP Infrastructure
N/A
PMI-supported recent progress (past ~12-18 months)
<ul style="list-style-type: none">● Installation of a complete network equipment for internet service at NMCP including a server for electronic archiving● Financial assistance to organize 4 technical working groups (vector control, supply chain, SBC and case management) quarterly meetings● Support to PC malaria program
PMI-supported planned activities (next ~12-18 months, supported by currently available funds)
<ul style="list-style-type: none">● Procurement of a new generator for NMCP● Installation of an internal telephone network to facilitate in-program communications● Refurbishment of 2 containers that will be repurposed to host NMCP archiving system● An electronic mail management software for the secretariat of the NMCP followed by the training of the secretarial agents in the use of the software.● An electronic stock management software (supply, equipment and furniture and other materials) at the NMCP store / and training of the users in charge of the store and hierarchical● NMCP motor pool Management Software● A database of human resources management● Support to PC malaria program

PMI Goal

The goal of PMI for health systems is to ensure that countries acquire the necessary capacities to enable them to plan and monitor the progress of their malaria control activities. This is made possible when a country has a skilled workforce and an infrastructure to work within.

Key Question 1

What additional capacity development support is needed to operationalize the existing PSN?

Supporting Data

Continued support to PC malaria program: Given a successful small-scale pilot in the Atacora region in 2018, the US Peace Corps scaled the project to 10 villages across northern Benin for the 2019 malaria season. The 2019 Proact team comprises a central leading committee and 10 overseeing PC volunteers each responsible for the CHWs in one control village and once intervention village. To evaluate the efficacy of the ProAct program, in 2019 the overseeing committee examined both the difference in *number of cases* as well as the *geographic spread* of those cases detected in the ProAct and classic CHW regimes. Figure A61 indicates that active cases were higher than passive cases.

Figure A61. Comparison of Active and Passive Malaria Cases

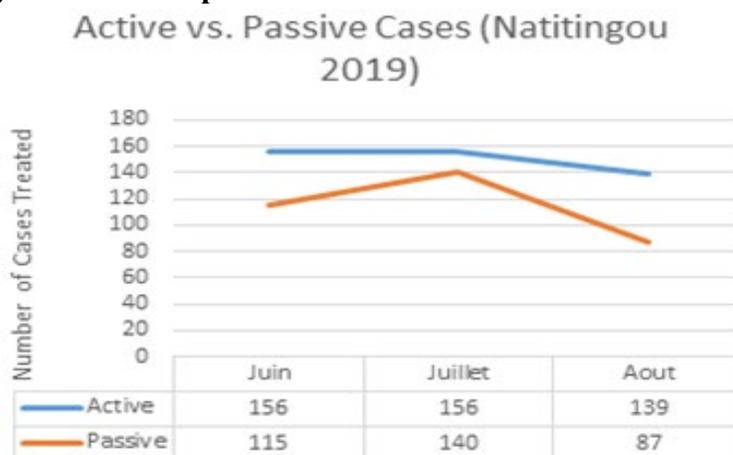
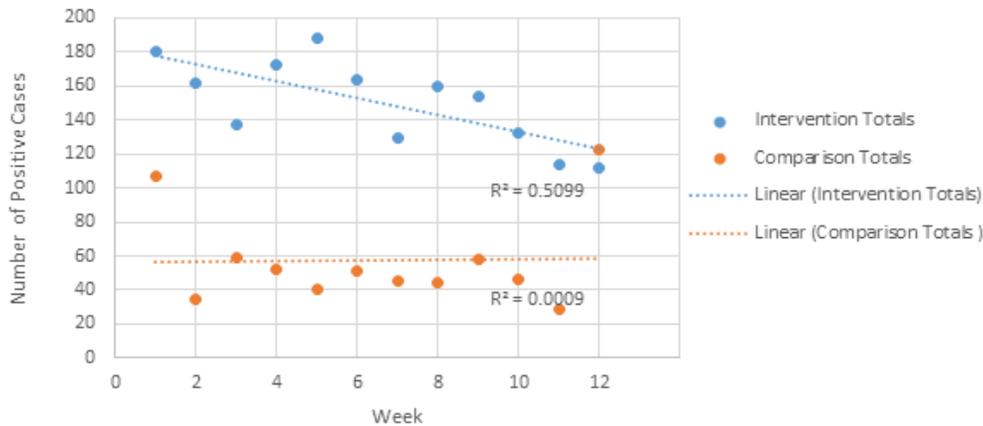


Figure A62 shows that the malaria prevalence in intervention villages decreased from 3.2% to 2.01% over 12 weeks, whereas it increased from 5.2% to 5.4% in the comparison villages.

Figure A62. Weekly Positive RDT Results

Positive cases (active and passive) - Intervention vs. Comparison



Conclusion

The 2019 ProAct project found that CHWs implementing ProAct detected significantly higher numbers of potential malaria cases than their counterparts who didn't implement ProAct both during their active sweeps and passively at home per their standard protocol. The case detection in the active sweep setting is likely due to the low care seeking rates observed in rural Beninese communities while the increased passive detection is likely due to the improved visibility of the CHW due to their weekly sweep. The project furthermore demonstrated that, in the same village, the average actively detected case came from 13% farther than the average passively detected case. A comparison of active detection in villages that ran ProAct against comparison villages of similar sizes and populations that did not run ProAct showed that, in some cases, the average child tested and treated due to ProAct was 3 times as far from the community health worker's home than in the non-ProAct village.

A comparison of active and passive case treatment showed that active cases were higher than passive cases.

Key Question 2

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

In addition to the ProAct activity, Peace Corps Benin Against Malaria group also experimented with the use of the CommCare online mobile application design software in order to better monitor and evaluate its projects. The software was used to design 3 mobile applications:

1. World Malaria Month Sensitization Data Collection: The US Peace Corps ran a month-long intensified period of sensitizations in the month of May, in time with World Malaria Day in late April

and the start of the rainy season in northern Benin (early June). The Benin Against Malaria group took the period of increased activity to pilot an application used to collect data on the sensitizations including location, subject area, cost, number of participants by age and sex, and partnership organizations.

2. Basic Health Needs/Barrier Survey: A questionnaire administered by 8 pairs of Peace Corps Volunteers and community health workers to two communities in Northern Benin. The questionnaire aimed to study access to healthcare and community member behavior patterns in seeking care and covered a wide range of health topic areas including bed net usage, vaccination practices, maternal/prenatal care, perceptions of health care accessibility, and medicine procurement practices.

3. ProAct Data Collection: An application was designed to allow Peace Corps Volunteers and their work counterparts to remotely submit the cases detected during the ProAct campaign to their supervisors. A weekly report of the caseload breakdown by household, gender, age, and symptoms was sent for each of the 43 community health workers involved in the project.

The Peace Corps found that the utilization of mobile data collection greatly facilitated an improved monitoring and evaluation of its activities and plans to ramp up the coverage and sophistication of its mobile reporting in 2020.

The PCVs who supported the implementation of the ProAct and the pilot of ComCare activities are finishing their two-year tour and a new group is picking up the activity.

Conclusion

In 2020 the US Peace Corps plans to again increase the number of villages in which the pilot is run, as well as to scale up the project to include more robust qualitative data collection to help explain trends in the quantitative data acquired. The team is also looking to develop a more sophisticated model of the dollar value per case detected of the ProAct Project.

For MOP 2020 PMI suggests increasing the Peace Corps budget by an additional \$10,000 compared to previous MOP levels.

ANNEX B: COUNTRY PROGRAM INVENTORY

The MOP seeks to facilitate a consultative, collaborative process between PMI, the NMCP, and other partners, where relevant. This section outlines a high-level program inventory along key intervention areas, and is intended to structure discussions around the relative strengths and challenges facing a program, as well as prioritization and opportunities to drive catalytic impact with specific investments.

Key:

Example score

Figure B1. Category: Vector Control

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Entomological Monitoring	Insecticide Resistance monitoring	No insecticide resistance monitoring conducted	Limited insecticide resistance monitoring conducted on an ad-hoc basis	Insecticide Resistance monitoring conducted on an annual basis in a limited number of sites, not covering all administrative units. Occasional monitoring of molecular mechanisms	Insecticide resistance monitoring conducted in a greater number of sites on an annual basis with some collaboration with other partners, routine monitoring of some resistance mechanisms	Regular high-quality insecticide resistance monitoring done in multiple sites per administrative division, consideration of molecular mechanisms and bioassay data, collaboration with other partners and NMCP
	Insectary	No functioning insectaries in country	Insectary present, but frequent ruptures in rearing and contamination of strains, frequent challenges in meeting needs	Insectary present, full-time staff present, some capacity for strain verification, sometimes challenges to get enough mosquitoes, occasional contamination	One or more insectary present, regular verification, rare challenges in getting sufficient mosquitoes, some capacity for strain verification	Highly functioning insectaries with verification of strains, capacity for rearing wild strains, quality controls in place
	Data-based vector control decision making	No consideration of entomological data when making decisions	Limited review of data, reliance on outdated data, uncoordinated analysis of data with limited collaboration with partners	Irregular and incomplete review of data from multiple partners, sometimes in collaboration with research and funding partners	Collaborative but irregular review of entomological data, sometimes providing timely evidence for decisions	Collaborative regular review of entomological data from multiple sources when making decisions about vector control
	Vector bionomics monitoring or research	No research or longitudinal monitoring done in country	Limited longitudinal monitoring and research done in country	Regular vector bionomics monitoring, and vector control research done in country, but generally not having an important role in decision making	Regular vector bionomics and vector control research conducted in country but not sufficient to respond to all major needs of the national program	Regular monitoring driven by program priorities conducted alongside research done in country to provide timely data on the best malaria vector control

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Institutionalization of funding	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
ITNs	Consistent distribution channels, in accordance with national strategy	Infrequent campaigns with no continuous distribution	Regular (e.g., every 3 years) campaigns, no continuous distribution	Regular campaigns, inconsistent continuous distribution	Regular campaigns, plus at least 1 well- managed continuous distribution channel	Regular, well- executed campaigns and well- managed continuous distribution channels
	Regular supervision of routine ITN distribution (e.g. HFs)	No HFs regularly supervised in ITN distribution	0-25% of HFs regularly supervised in ITN distribution	25-50% of HFs regularly supervised in ITN distribution	50-75% of HFs regularly supervised in ITN distribution	75-100% of HFs regularly supervised in ITN distribution
	ITN distribution reporting capabilities	Quantities of ITNs distributed not reported at all into LMIS (or other system)	Some quantities of ITNs distributed reported routinely	Some quantities of ITNs distributed reported routinely but cannot be disaggregated by channel	Quantities of ITNs distributed reported routinely and disaggregated by channel	All ITNs distributed captured routinely, disaggregated, and reported electronically
	Capacity to use data to appropriately target and rotate new types of nets	N/A	No capacity	Limited capacity	Some capacity	Good capacity
IRS	Host country government's IRS implementation capacity	N/A, no host country government implemented spray campaign	Host country government has very limited capacity to implement minor aspects of spray campaign	Host country government has capacity to implement some aspects of spray campaign	Host country government has capacity to implement most aspects of spray campaign	Host country government implements independent spray campaign
	Institutionalization of funding	N/A, no IRS conducted in country	No host country government funding, only supported by external sources (e.g. PMI, GF, mining companies)	Limited host country government funding in addition to external sources	>50% funded by host country government in addition to external sources	Fully funded by host country government, no external sources

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Coverage of Government-Implemented Spray Campaign	N/A, no government-implemented spray campaign	Spray coverage not reported	85+% coverage in some government-sprayed areas	85+% coverage in most government-sprayed areas	85+% coverage in all government-sprayed areas

Figure B2. Category: Case Management

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Community-based CM, if in national strategy	Coverage of CHWs trained in and providing CM (geographic or numerical target)	No CHWs conducting CM	0-25% of national target met	25-50% of national target met	50-75% of national target met	75-100% of national target met
	Regular supervision of CHWs in CM (regular defined as per national QA/QC guidelines)	No CHWs regularly supervised in CM	0-25% of CHWs regularly supervised in CM	25-50% of CHWs regularly supervised in CM	50-75% of CHWs regularly supervised in CM	75-100% of CHWs regularly supervised in CM
	CHW reporting capabilities	CHW-managed cases not reported into HMIS	Some CHW-managed cases routinely reported into HMIS	Cases routinely reported into HMIS but cannot be disaggregated from HF-reported cases	Cases routinely reported into HMIS and can be disaggregated from HF-reported cases	All CHW case data routinely captured and reported electronically
	Institutionalization of funding (salaries and/or other support)	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
Facility based CM	Access to HF-based care (within 5 km of a health facility or as per national definition)	0-20% of population has access to HF	20-40% of population has access to HF	40-60% of population has access to HF	60-80% of population has access to HF	>80% of population has access to HF
	Regular* supervision of public HFs in CM	No HFs regularly supervised in CM	0-25% of HFs regularly supervised in CM	25-50% of HFs regularly supervised in CM	50-75% of HFs regularly supervised in CM	75-100% of HFs regularly supervised in CM

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Drug resistance monitoring	No TES performed in last 3 years	TES performed in last 3 years but results not available	Recent TES results available (within last 3 years) but no training in molecular testing	Recent TES results available (within last 3 years) and in-country staff trained in molecular testing	Recent TES results available (within last 3 years) and in-country capability for molecular testing

Figure B3. Category: Drug-Based Prevention

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
SMC (where applicable)	Geographic scope	No eligible districts receiving SMC		50% eligible districts receiving SMC		All eligible districts receiving SMC
	Coverage in targeted areas (% of eligible children 3-59 months who received complete SMC courses for all 4 rounds)	<60%	60-69%	70-79%	80-89%	90%+
	Institutionalization of funding	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
MIP	National policy exists for malaria prevention in pregnancy	No policy	Policy exists but is not comprehensive (does not cover all aspects of MIP: ITN, IPTp and case management)	Comprehensive policy exists for prevention (ITNs, IPTp) and case management but not all WHO recommendations are included	Policy meets current WHO recommended MIP prevention	Comprehensive, WHO-aligned policy is actively implemented

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Country policy adoption/adaptation of ANC guidelines with at least 4 recommended contacts	No policy	Country has started discussions and consultations for adopting the new ANC guidelines and recommendations	Country has policy specifying ANC contacts but no provision for early delivery of IPTp and is not able to systematically track ANC visits in HMIS	Country policy specifies ANC contacts and has provision for delivery of IPTp at 13-16 weeks but cannot track all ANC visits in HMIS	Country policy specifies the number of contacts be delivered during pregnancy and has a provision for delivery of IPTp at 13-16 weeks and is able to track ANC visits in HMIS.
	National MIP working group established and coordinating effectively	No working group established	Working group formed and meets on an ad hoc basis, TORs are established	Working group engages in regular coordination but does not have mechanisms to ensure programmatic integration across technical areas	Working group coordinates at the national level only with Malaria and Maternal Health and has limited mechanisms for ensuring programmatic integration across technical areas	Working group engages in regular coordination at national and sub-national level with Malaria and Maternal Health and has mechanisms to ensure programmatic integration across technical areas.
	Supportive MIP supervision conducted	No HFs regularly supervised in MIP	0-25% of HFs regularly supervised in MIP	25-50% of HFs regularly supervised in MIP	50-75% of HFs regularly supervised in MIP	75-100% of HFs regularly supervised in MIP
	Routine SP resistance monitoring via biomarkers conducted	No SP resistance monitoring conducted	SP resistance monitoring conducted in the last 6-10 years	SP resistance monitoring conducted in the last year 4-5 years	SP resistance monitoring conducted in the last year 3 years	SP resistance monitoring conducted in the last 3 years and results published or being published.

Figure B4. Category: Supply Chain

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Supply Chain	Forecasting and Procurement Planning	<p>Ad hoc forecasting based on poor, inadequate, or inaccessible data</p> <p>Insufficient skills for selecting and implementing appropriate forecasting methodologies.</p> <p>Procurement plans are not developed from forecasts</p> <p>No coordination among procurers</p>	<p>Annual forecasting and supply planning done but is based on poor, inadequate, or inaccessible data</p> <p>Locally based skills in quantification are developing</p> <p>Review of procurement plans is irregular.</p> <p>Coordination among procurers is limited</p>	<p>Annual forecasts incorporate service and/or/consumption data</p> <p>Supply plans updated semi-annually and incorporate review/revisions of available funding</p> <p>Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized) and among procurers</p>	<p>Semi-annual forecasts incorporate service and/or/consumption data, account for seasonality</p> <p>Supply plans updated quarterly and incorporate review/revisions of available funding</p> <p>Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized). Identified commodity gaps effectively communicated to stakeholders for purposes of resource mobilization</p>	<p>Near real-time demand/consumption, enhanced with additional programmatic contributions, drives monthly forecasting</p> <p>Forecasting and supply planning-specific software used and outputs visible across networks.</p> <p>Supply plans updated monthly and incorporate review/revisions of available funding</p> <p>Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized). Identified commodity gaps effectively communicated to stakeholders for purposes of resource mobilization. Outputs shared through global platforms</p>
	Warehousing/ Storage	<p>Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/facility) compromises ability to ensure</p>	<p>Quality of infrastructure and operations in at least one stock holding level (Central, Sub-central/facility) ensures that</p>	<p>Quality of infrastructure and operations in at least two stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected from damage,</p>	<p>Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected</p>	<p>Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected from damage, deterioration and loss.</p>

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
		<p>commodities are adequately protected from damage, deterioration and loss.</p> <p>Unable to locate stock by batch in central/mid-level stores/warehouses.</p>	<p>commodities are adequately protected from damage, deterioration and loss.</p> <p>Paper-based inventory management system.</p> <p>No SOPs.</p>	<p>deterioration and loss. Warehousing SOPs exist. Able to track inventory level with central level WMS but information is not routinely shared across warehouses.</p> <p>Some maintenance occurring</p> <p>Limited ability to scale storage capacity</p>	<p>from damage, deterioration and loss</p> <p>Stock data is digitized in at least two stock holding levels</p> <p>Some routine maintenance occurring</p> <p>Storage capacity scaled through contracting of third party logistics providers (3PLs)</p>	<p>Storage infrastructure and operations adhere to Good Warehousing Practices and/ or meet in-country compliance standards</p> <p>Stock data is digitized at all stock holding levels and near real-time stock visibility available across networks</p> <p>Routine and predictive maintenance budgeted for and institutionalized</p> <p>Storage capacity is logically located and can be effectively scaled with 3PLs</p>
	Routine distribution/ resupply between stock holding levels	<p>No routine requisition and resupply schedule between stock holding levels</p> <p>No resources routinely available and allocated for transportation from higher to lower stock holding levels</p>	<p>Routine requisition and resupply between at least two stock holding levels according to a schedule</p> <p>Resources for transportation from higher to lower stock holding levels provided on ad hoc basis</p>	<p>Routine resupply between all stock holding levels according to a schedule</p> <p>Allocated resources for transportation from higher to lower stock holding levels provided on an irregular basis and resupply often achieved through unplanned means</p> <p>Resupply performance monitored post-activity</p>	<p>Routine resupply between all stock holding levels according to a schedule shared with all levels and informed by accurate demand signals</p> <p>Allocated resources for transportation provided on a regular basis and augmented with 3PLs</p> <p>Resupply performance monitored real-time</p>	<p>Routine resupply between all stock holding levels according to a schedule shared with all levels and informed by accurate, timely, demand signals</p> <p>Robust emergency and inter-facility resupply mechanisms are in place</p> <p>Allocated resources for transportation available internally or outsourced with 3PLs.</p> <p>Resupply transaction data is digitized for all stock transfers</p>

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
						<p>Near real-time visibility into upstream and downstream activities</p> <p>Resupply operations adhere to GDP and or meet in-country compliance standards for maintaining quality during distribution</p>
	Logistics Management Information System	<p>System to aggregate, analyze, validate and display data (from all levels of the logistics system) that can be used to make logistics decisions and manage the supply chain not institutionalized or followed</p> <p>No facility level records or not maintained. Low reporting rates. No visibility into CHW supplies. No visibility by central level on facilities and none by facility level on central level.</p>	<p>Stand-alone, program specific LMIS processes and structures defined but no formal or ongoing monitoring or measurement protocol exists.</p> <p>Some visibility of facility level inventory and consumption, low reporting rates, mostly paper-based</p>	<p>The country has documented LMIS processes and structures. The structures are functional. Metrics for performance monitoring, quality improvement, and evaluation are systematically used.</p> <p>Migration of data collection and reporting from a paper system to an electronic system at the district level and above. A documented mechanism is in place for maintaining data quality throughout the data supply chain.</p>	<p>Government and stakeholders use the national LMIS systems for key performance monitoring and follow standard practices.</p> <p>Facility inventory and consumption data is digital at facility level, upstream data available to facilities, System alerts for low stock/expiry, use of master product list and master facility list</p> <p>Interoperability with other information systems (e.g., warehouse management, medical records, laboratory management, enterprise resource planning systems, and health information management systems)</p>	<p>Near real time visibility into inventory and consumption data at all levels, data from multiple systems feed into common platform/control tower (automated process), predictive analytics.</p> <p>The government and stakeholders routinely review interoperability activities and modify them to adapt to changing conditions.</p> <p>Compliance with standards for data exchange, messaging, and security is regularly reviewed. The regulatory framework is reviewed and updated to reflect best practices for data exchange, messaging, and systems security.</p>

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Regulatory, Policy and Governance	<p>Legal basis to enable a medicines (and related health commodities - e.g., devices, vaccines, etc.) regulatory agency to function is absent or inappropriate</p> <p>Formal organizational structure regarding in-country stakeholders and relevant agencies to whom authority is delegated, is absent or inadequate (e.g., up-to-date organogram of MOH).</p> <p>Human and financial capacity to enable regulatory functionality, weak or absent</p> <p>No approved supply chain strategic plan</p>	<p>Medicines framework exists and is sufficient to support basic regulatory functions including clinical dossier review (licensing) and marketing authorization with registration.</p> <p>Documented domestic financial support to enable regulatory activities - including human resources</p> <p>Approved supply chain strategic plan but not updated recently. Poorly implemented strategic plan</p>	<p>All SDP levels have in place policies that address STG, quality assurance and HR.</p> <p>Management policies for the supply chain system are in place at the MOH level.</p> <p>Policy and strategic leadership is not always translated into robust implementation plans, and supportive supervision, capacity building and guidance to managers within the system.</p> <p>No consistent approach to pharmacovigilance or a standard reporting structure for pharmacovigilance events</p> <p>Overall quality management system in place to support interface of product licensing, registration, manufacturing, post-marketing surveillance.</p> <p>Approved (and up to date) supply chain strategic plan. Partially implemented</p>	<p>Strong policy and strategic leadership by government, with firm grasp of budgets and financial sustainability</p> <p>Robust implementation plans, and supportive supervision, capacity building and guidance to managers within the system.</p> <p>Regulatory and policy bodies in alignment to support quality product availability</p> <p>National and standardized Pharmacovigilance or a standard reporting structure for pharmacovigilance events in place, not fully functional.</p> <p>Approved (and up to date) supply chain strategic plan (contains clear roles and responsibilities, stakeholder mapping, costs).</p>	<p>The MOH leads strategic functions such as, policy formulation, quality assurance and overseeing the funds required for policy implementation.</p> <p>Ability to ensure product quality, automated drug registration process, clear/transparent importation process, robust post-market surveillance system and, track and trace regulations developed and/or in the process of implementation.</p> <p>Approved (and up to date) supply chain strategic plan (contains clear roles and responsibilities, stakeholder mapping, costs). Includes risk mitigation plan.</p>

Figure B5. Category: Strategic Information

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Data, Surveillance, Monitoring & Evaluation	Overall HMIS reporting rate (CY 2018)	<60%	60-69%	70-79%	80-89%	90%+
	Element specific reporting rate: “Confirmed malaria cases among children under 5” (CY 2018)	<60%	60-69%	70-79%	80-89%	90%+
	HMIS data quality assurance and quality control	Few standards exist for data collection, assembly, & analysis. Data quality reviews and audits are ad hoc for specific data needs. No data-quality assurance plan and national coordinating body exist.	Standards used for data collection, assembly & analysis in limited settings. Some electronic tools used for data quality review and audit. Data-quality assurance plan is available.	Standards defined and implemented for data collection, assembly, analysis, and used nationally. Data quality reviews and audits scheduled and include a remediation process to address identified issues. SM&E staff are seconded to NMCP	Data reviews and audits are integrated in strategic plans, conducted on a regular schedule. Regular meetings held by national data-quality governing body; issues identified are addressed through an established remediation process.	Continuous review and auditing through automated and manual processes, to ensure defined levels of data quality. Data quality metrics are used for continuous improvement. The data-quality assurance plan is reviewed periodically by a national coordinating body and appropriate stakeholders.

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Reporting Systems	Data collection tools are not standard, and procedures are not consistently followed; data are collected and stored in an unstructured format. NMCP does not have access to malaria data from HMIS.	Data systems support longitudinal health data (clinical, surveillance, M&E) in limited settings. The data are available for centrally mandated reporting. A parallel malaria reporting system may exist.	Most data platforms/applications ensure data availability at all levels for decision support and M&E for authorized users. No parallel malaria reporting system exists. NMCP has access to malaria data from HMIS.	The data systems in use ensure reliable and appropriate access to data at all levels for authorized users. Changes in reporting requirements are accommodated with minimal disruption to data availability. Data systems support secondary use of data and NMCP has access.	Data availability is monitored for continuous improvements and to meet emerging health sector needs. Reporting is available from private facilities and community-level providers and can be disaggregated.
	Data collection	Data collection is not done at the most peripheral level (CHWs) and is irregular and inaccurate at rural and more central health facilities. System is entirely paper based, but registers may be absent	Data collection is well managed at HF level, but incomplete at community level (CHWs); most collection is paper-based, and aggregation is paper based; registers generally available; timeliness and completeness remain challenges	Data collection is well managed at HF level and at community level (CHWs); most collection is paper based, aggregation is electronic; registers available; timeliness and completeness >80%, feedback to collectors limited	Data collection at all levels); collection is electronic and sometimes paper based, aggregation is electronic; registers include all program-critical data; timeliness and completeness >80%, feedback to collectors is standardized	Data collection occurs at all levels, is transmitted in real time with timely feedback to those collecting and those using the data; data checks exist at point of collection; electronic transmission is the norm, including to data collectors

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Data use	Activities (analysis, interpretation, visualization) to ensure data use are rarely implemented	Limited data use activities are implemented (bulletin has been developed but analysis and interpretation for decision- making needs to be strengthened)	Country conducts regular data use activities (review meetings, bulletin at least quarterly, at least at the central level).	Country conducts regular data use activities at all levels (review meetings, bulletins, dashboard at least quarterly).	Country has developed their own high- quality dashboard to facilitate data use, and data-informed decision making is evident at all levels, on a frequent basis.
OR/PE	PMI in-country OR experience	No previous PMI OR experience in country	PMI team has prepared concept notes (CNs) but has not completed protocols or conducted OR	PMI team has completed protocols and received approval for OR; studies in planning, underway, or recently completed	PMI team and/or other country partners have completed a OR study and prepared and shared reports	Multiple OR studies completed in country that address malaria program implementation bottlenecks with publication and sharing of results, with involvement from MOH co-investigators
	Country mechanisms for OR/PE review	No in-country process for research review, determination or IRB processes	Limited in-country processes for research review, determination and IRB oversight	Processes in place for research and IRB review with federal-wide assurance approval; no previous PMI in-country OR experience	Processes in place for research and IRB review with federal-wide assurance approval; previous PMI in-country OR experience	Full complement of research review, approval, oversight processes including data safety and monitoring boards and systems for results sharing
	In-country partnerships for OR	No in-country partners (academic, NGO, or other) with OR experience	1-2 in-country partners with OR experience, but no malaria specific experience	3+ in-country partners with OR experience; 1+ with some malaria expertise; no current PMI-linked OR work	3+ in-country partners with OR experience; 1+ with malaria expertise; current or recent work with PMI OR	Multiple in-country partners with specific malaria experience in PMI OR, including completed past work and reporting on malaria OR

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Conceptualization of problems needing scientific evaluation	No experience	Some but limited experience in identifying programmatic problems and prioritization	Experience with identifying program problems and prioritizing PE and OR	Experience with identifying problems needing PE or OR and developing study approaches with partners	Extensive experience with problem identification, prioritization, proposal development and conducting PE or OR

Figure B6. Category: Support Systems

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
SBC	National Malaria SBCC Strategy used to guide design and implementation of malaria SBC activities	No strategy exists.	Strategy exists but there is no evidence that it has been used to guide design or implementation.	Strategy exists and is used from time-to-time to guide design and implementation, but is of poor quality and does not include any of the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template.	Strategy is used from time-to-time to guide design and implementation, but lacks alignment with the broader National Malaria Strategy and only incorporates a couple of the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template.	Strategy is well aligned with the broader National Malaria Strategy, includes the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template, and is used to guide design and implementation.
	SBC Technical Working Group coordinates effectively	No technical working group exists.	The SBC Technical Working Group exists on paper, but has not been operationalized.	The SBC Technical Working Group has significant resource and staffing gaps and does not have clear pathways for coordination.	The SBC Technical Working Group lacks some needed resources/staff and generally only coordinates at the national level only.	The SBC Technical Working Group is well resourced and staffed and engages in regular coordination at both the national and sub-national level.

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	High-quality formative assessments used to inform intervention design	No high-quality, formative assessment conducted in the last five years.	Formative assessment conducted, but significant quality issues in the design and no evidence that data was used to inform intervention design.	High-quality, formative assessment conducted, but no evidence that data was used to inform intervention design.	Data from prior projects used exclusively to guide intervention design; no new data collected.	High-quality, formative assessment conducted, and data used to inform intervention design.
Elim (relevant only for countries actively pursuing elimination)	Elimination planning to implementation	No elimination or pre-elimination targets in the national strategic plan	Risk stratification conducted using latest incidence data and interventions targeted	Readiness assessment/capacity inventory conducted	Capacity built and systems in place to initiate elimination activities	Elimination activities implemented fully in targeted areas
	Surveillance system readiness to track all cases	Monthly, aggregate data from public sector only	At least monthly, aggregate data from public, private, and community levels	Case-based reporting initiated	Real-time, case-based surveillance inclusive of all sectors and levels in targeted areas	Real-time, case-based reporting and response activities implemented
General Infrastructure	Staffing	No staff	Manager and a few technical staff; not all intervention areas are covered	Manager and technical staff for each intervention area; many staff have limited training and experience ; limited program support staff	Full staffing of program areas and support systems but some staff need further training to optimize their effectiveness; limited plans and opportunities for such training	Fully staffed with personnel with relevant training and experience; complete plan for professional development

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Office space, transport	No office space or transport	Office space exists but is insufficient for staff; Transport available at intervals but limited for program needs	Office space adequate for current staff but no growth possible; office not well positioned for access to MOH leadership. Transport available but not covering all needs and not well managed/maintained	Office space adequate for current staff and some technical areas (e.g., lab) but not fully adequate for growth and all technical services. Transport covers most needs.	Office space is fully adequate for current staff and technical needs (lab, insectary, meeting space, etc.) and some growth and well positioned in the MOH; Transport is fully available for needed purposes -- trucks and 4-wheel drive vehicles where needed - all maintained and managed..
	Internet connectivity	No Internet connectivity	Intermittent connectivity; poor bandwidth; challenging maintenance; very little budget	Mostly connected with some outages; ok but not ideal bandwidth; irregular maintenance; modest budget	Generally stable connections, adequate bandwidth for most work, fair to good maintenance and sufficient budget	Fully connected, maintained, good bandwidth for all needs, and sufficient budget including all needed hardware and software
	NMCP placement within Ministry of Health	NMCP exists but is barely visible in the MOH structure	NMCP is visible in the MOH structure but NMCP manager reports to supervisor who is still low in the MOH system	NMCP is visible and manager reports to high level leader in MOH (e.g., Director of Public Health or Permanent Secretary for Health)	NMCP (or NMEP) is highly visible and reports at a high level in MOH and has some access to other ministry leadership (e.g., education, agriculture, community development)	NMCP (or NMEP) is highly visible within MOH and with all other relevant ministries and has ready access to country leadership (e.g., the president/prime minister; and parliament)