This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2019 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.

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U.S. PRESIDENT'S MALARIA INITIATIVE

PRESIDENT'S MALARIA INITIATIVE

Sierra Leone

Malaria Operational Plan
FY 2018 & FY 2019

TABLE OF CONTENTS

ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
ASAQ	Artesunate-amodiaquine
CDC	U.S. Centers for Disease Control and Prevention
CHW	Community health worker
CRS	Catholic Relief Service
DDMS	Directorate of Drugs and Medical Supplies
DFID	U.K. Department for International Development
DHAPQ	Dihydroartemisinin-piperaquine
DHIS2	District health information system-2
DHMT	District health management team
DHS	Demographic and Health Survey
DMO	District medical officer
DPPI	Department of Policy, Planning, and Information
EPI	Expanded program on immunization
EVD	Ebola virus disease
FETP	Field Epidemiology Training Program
FY	Fiscal year
Gavi	Gavi, the Vaccine Alliance (Global Alliance for Vaccines and Immunization)
GHI	Global Health Initiative
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoSL	Government of Sierra Leone
HFS	Health Facility Survey
HMIS	Health management information system
HSS	Health systems strengthening
iCCM	Integrated community case management
IPTi	Intermittent preventive treatment for infants
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LMIS	Logistics management information system
MCH	Maternal and child health
MDA	Mass drug administration
MICS	Multiple Indicator Cluster Survey
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MoHS	Ministry of Health and Sanitation
MOP	Malaria Operational Plan
NMSA	National Medicine Supplies Agency
NHSSP	National Health Sector Strategic Plan
NMCP	National Malaria Control Program
NMSP	National Malaria Strategic Plan
NPPU	National Pharmaceutical Procurement Unit
PHU	Peripheral health unit
PMI	President’s Malaria Initiative

RA	Resident advisor
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SARA	Service Availability and Readiness Assessment
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
TBA	Traditional birth attendant
TES	Therapeutic efficacy study
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

I. EXECUTIVE SUMMARY

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

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

In 2017, consistent with an increase in annual appropriations, PMI again launched new country programs in Cameroon, Côte d'Ivoire, Niger, and Sierra Leone, and expanded an existing program in Burkina Faso to PMI focus country status. With the addition of these new focus countries, PMI now has programs in 24 countries in sub-Saharan Africa, in addition to two bilateral programs and targeted support in the Greater Mekong Subregion in Asia.

Sierra Leone began implementation as a PMI focus country in FY 2017.

This FY 2018 and FY 2019 Malaria Operational Plan presents a detailed implementation plan for Sierra Leone, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Sierra Leone, describes progress to date,

identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2018 and FY 2019 funding.

The proposed FY 2018 PMI budget for Sierra Leone is $15 million, and the proposed FY 2019 budget is $15 million. PMI will support the following intervention areas with these funds:

Entomological monitoring and insecticide resistance management: Key pillars within NMCP's vector control strategy are to strengthen capacity in entomology surveillance, conduct insecticide resistance monitoring, and evaluate vector bionomics. In order to achieve maximum impact, PMI is helping equip the NMCP with the knowledge and skills to implement an informed and evidence-based vector control program. With FY 2017 funding, PMI assisted the NMCP in building entomological capacity by establishing entomological and insecticide resistance monitoring programs at eight and four sentinel sites (respectively), refurbishing the insectary and establishing a colony of susceptible *An. gambiae*, recruiting and training entomological staff, supporting a review of the national insecticide resistance monitoring and management plan, and beginning laboratory analyses of collected specimens. With FY 2018 and FY 2019 funding, PMI will support continued entomological and insecticide resistance monitoring programs at all established sentinel sites (with the possibility of adding two new sites in a high-prevalence district), training of entomological staff, and laboratory analyses of collected specimens. Additionally, PMI will assist in establishing the malaria vector control and integrated vector management technical working groups, support a review of the national integrated vector management guidelines, and create an entomological monitoring database. Finally, with FY 2018 funding, PMI will provide entomological technical assistance to assist with training and monitor planning and implementation of vector control activities.

Insecticide-treated nets (ITNs): The NMCP supports universal access to free long-lasting ITNs for all households primarily through mass campaigns conducted every three years and reinforced through routine distribution channels – at the first antenatal care (ANC) visit for pregnant women and at the third expanded program on immunization (EPI) visit for children. The NMCP has conducted four rounds of mass ITN distribution campaigns (2006, 2010, 2014, and 2017), and plans to conduct a fifth campaign in June 2020. Despite high household ownership of ITNs, the overall proportion of pregnant women and children under five years using an ITN in all households has remained low for both groups (44 percent, MIS 2016), although more recent data following the 2017 mass campaign are not yet available. With FY 2017 funding, PMI procured approximately 675,000 ITNs to contribute to the annual net need for routine distribution channels, began ITN durability monitoring of nets distributed during the 2017 mass campaign, and supported strengthening of SBCC for ITN use. With FY 2018 and FY 2019 funding, PMI will support procurement of approximately 2.3 million ITNs for the 2020 mass campaign as well as continued procurement and distribution of 500,000 ITNs for routine distribution, ITN durability monitoring, and strengthening of SBCC for ITN use. Additionally, PMI will support a pilot of school-based ITN distribution for primary school children in Classes 1 and 4. Results from both the insecticide resistance monitoring (described in the section above) and the ITN durability monitoring will contribute to ITN procurement decisions.

Indoor residual spraying (IRS): The NMCP's IRS strategy is evidence-based and is a part of their integrated vector management strategy. The NMCP carried out a pilot IRS study in 2010-12 in four districts. The goal of the pilot was to assess the feasibility and community acceptability and to generate the evidence required for the scale up of IRS. However, due to lack of resources, no additional IRS activity has taken place since then. With FY 2017 funding, PMI supported insecticide resistance

monitoring (described in the section above) to gather evidence for future spray operations. With FY 2018 and FY 2019 funding, PMI will support continued insecticide resistance monitoring and insecticide procurement. Additionally, PMI will support environmental compliance clearance ahead of IRS implementation as well as special SBCC considerations in Sierra Leone's post-Ebola era. IRS implementation is expected to begin with one cycle in each of two districts in 2021.[1] Finally, with FY 2019 funding, PMI will support one technical assistance visit to assist with training and monitor planning and implementation of IRS activities.

Malaria in pregnancy (MIP): The NMCP supports the WHO multi-pronged approach toward MIP with the provision and use of an ITN during pregnancy, intermittent preventive treatment during pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP), and prompt and effective case management of malaria and anemia. The NMCP adopted the 2012 WHO policy recommendations which ensure pregnant women receive IPTp-SP doses starting early in the second trimester of pregnancy (13 weeks) and continue to receive IPTp-SP until delivery with a minimum interval of one month between doses. ITNs and IPTp are provided to pregnant women as part of the antenatal care package of services at health facilities aimed at making pregnancy safer. With FY 2018 and FY 2019 funding, PMI will support the NMCP with updating the national policy and guidelines in line with the WHO IPTp policy recommendations and assist the NMCP and Division of Reproductive and Child Health (DRCH) in establishing a national MIP working group for addressing technical issues and challenges. To ensure health providers are familiar with the new guidelines, PMI will support the NMCP's plan to train peripheral health providers including health facility staff, community health workers, midwives, and public and private sector hospital staff on the updated MIP policy and guidelines.

Case management: The NMCP aims for all suspected malaria cases to receive confirmatory diagnosis and all malaria cases to receive effective treatment. Annual ACT and rapid diagnostic test (RDT) needs are primarily covered by the Global Fund, but PMI will contribute to the national quantification gap, in addition to procuring severe malaria drugs. To help reduce malaria burden, with FY 2018 and FY 2019 funding PMI will focus on intensive supportive supervision and mentoring of health care workers, as well as improving the quality of malaria diagnosis and case management practices in public health facilities and at the community level with a particular emphasis on severe malaria management. Additionally, PMI will support the NMCP in a pilot for rectal artesunate implementation.

Social and behavior change communication (SBCC): The NMCP's goal is for at least 80 percent of the population to practice correct malaria prevention and treatment measures by 2018 and beyond. The NMCP and PMI are aligned in their goals to implement quality SBCC activities that target behaviors such as consistent and correct use of ITNs, ANC attendance and IPTp uptake and delivery, prompt care-seeking for fever and for more severe disease symptoms, adherence to prescribed treatment, and overall knowledge about the cause of malaria. With FY 2018 and FY 2019 funding, PMI will play a critical role in improving coordination activities that regularly employ systematic, competency-based assessments of institutional SBCC capacity as a means to inform design of activities and to measure their impact. This will include the development of an implementation plan for the Malaria Elimination Behavior Change Communication Strategy 2017-2022. Activities will also encourage health-seeking behavior at the community level, facilitate linkages between households and service facilities and, finally, strengthen providers to serve as a channel for behavior change.

[1] IRS implementation through PMI was originally expected to begin in 2020, but was delayed until 2021 in order for PMI to accommodate the procurement of ITNs for the 2020 mass campaign instead.

Surveillance, monitoring, and evaluation (SM&E): The NMCP's SM&E strategic objective is to strengthen surveillance, monitoring, evaluation, and operational research for effective program management. Data reporting and use are key priorities, and the NMCP aims for at least 95 percent of health facilities to be routinely reporting on malaria program performance by 2020, while further decentralizing data management down to the chiefdom level. With FY 2018 and FY 2019 funding, PMI will focus on improving malaria data quality and timeliness by strengthening the capacity and infrastructure at the district and chiefdom levels, including appropriate use of data for decision making, and supportive supervisions from districts to health facilities. At the national level, PMI will support the NMCP SM&E team and Department of Policy, Planning, and Information in conducting supportive supervision to the peripheral level.

Operational research (OR): The NMCP aims to establish strong collaborative research initiatives with national and international research and academic institutions. In June 2018, the NMCP, in collaboration with several academic institutions and other partners, defined their first malaria operational research agenda for the period 2018-2023. With FY 2019 funding, PMI will support efforts to improve discussions and coordination between the NMCP and its partners to develop an OR study to understand the impact of housing modifications on the reduction of malaria transmission. Unlike the core-funded OR study on housing modification using eave tubes in East Africa, this project will focus exclusively on using screening in a West African context. The housing structure (large, rectangular, open eaves, several families living in a single structure) together with the challenges facing bednet use (despite bednet access) in Sierra Leone provide the ideal setting to test the use of screens (on ceilings, eaves, windows, and/or doors) to prevent mosquito entry in homes. The NMCP is strongly supportive of this project and Peace Corps Sierra Leone has indicated interest in partnering as well.

Other health systems strengthening: The NMCP prioritizes strengthening core MoHS-wide management systems that are essential for effective delivery and management of malaria services, such as strengthening procurement and supply chain management of malaria commodities and supporting coordination and partnerships in malaria. Currently antimalarial commodities are distributed through a separate distribution system. However, the NMCP, PMI, and other donors share the goal of an integrated pharmaceutical management system, and with FY 2018 and FY 2019 funds PMI will contribute strengthening the logistics management information system (LMIS). PMI will also continue to support Peace Corps education and health volunteers to work in malaria prevention and control and to assist the NMCP to identify and address programmatic gaps in community malaria interventions.

II. STRATEGY

1. Introduction

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

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2. Malaria situation in Sierra Leone

Sierra Leone is located on the west coast of Africa, bordered on the north and east by Guinea, on the south by Liberia, and on the west by the Atlantic Ocean. Sierra Leone is divided formally into regional bodies referred to as "districts" (Table 1). The country has a tropical climate with temperatures ranging from 21˚C to 32˚C and a mean daily temperature of 25˚C. It has two major seasons: wet season (May to October) and dry season (November to April) with heavy rains in July/August. It has an average annual rainfall of approximately 320cm. Relative humidity is high ranging from 60-90 percent.

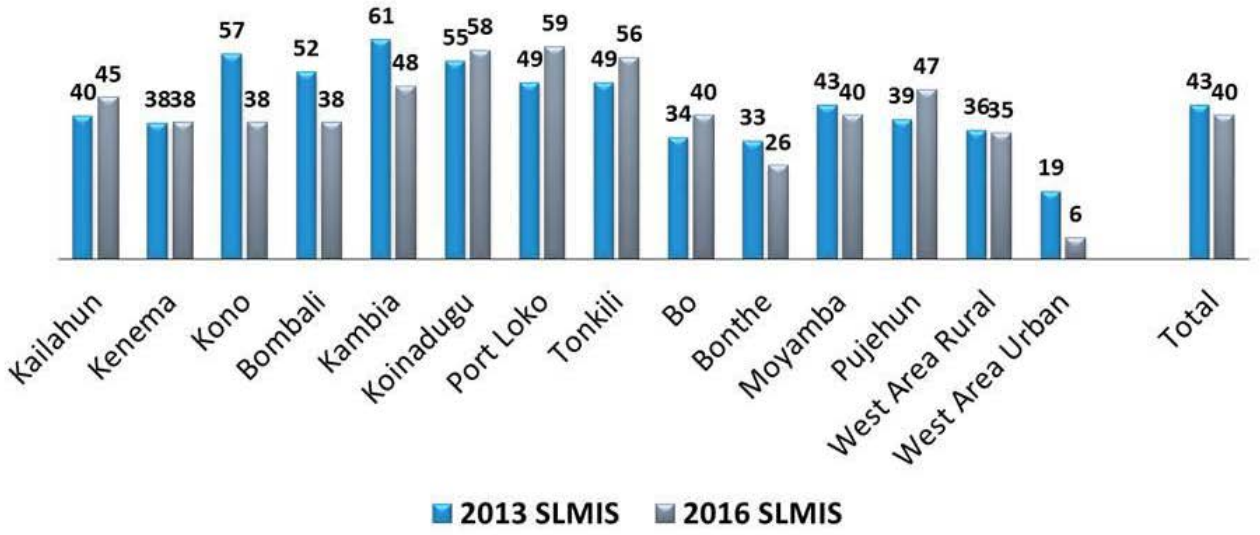
The country has a varied terrain, ranging from coastline swamps, inland swamps, and rainforests to one of the highest mountains in West Africa, Bintumani, at 2,200 meters. The vegetation is mainly secondary palmbush interspersed with numerous swamps, which are mostly cultivated for rice. These swamps provide ideal breeding places for the Anopheline vectors of malaria. All geographic areas of Sierra Leone are favorable to malaria transmission, which is stable and perennial. The major vectors for malaria are *Anopheles gambiae* s.s., *An. funestus*, and *An. melas*. The peak biting period is between 10 p.m. – 2 a.m. Malaria transmission has two peaks, one that begins during the rainy season in May and the second towards the end of the season in October/November. The major parasite species are *Plasmodium falciparum* (>90 percent), *P. ovale*, and *P. malariae.* An estimated 2,240,000 outpatient visits are due to malaria every year, of which about 1,000,000 patients are children under five years of age. Pregnant women and children under five constitute 4.4 percent and 17.7 percent of the total population, respectively, and are the most vulnerable groups.[2] Malaria is also considered a major impediment to socio-economic development, leading to poverty.

The most recent reported entomological studies were carried out prior to and during the civil war (1990-1994), which reported annual Entomological Inoculation Rates (EIR) ranging from 6 to 884. For national malaria incidence data, routine data systems have seen an improvement in data completeness, but due to low data quality and the fact only public health facilities are reporting regularly into DHIS2, the ability to capture the true malaria burden by routine channels remains limited. Multiple national household surveys have been conducted in the past several years, including the Multiple Indicator Cluster Survey (MICS), Demographic and Health Survey (DHS), and Malaria Indicator Survey (MIS). Figure 1 below shows parasitemia from the MIS 2013 and MIS 2016. According to the MIS 2016, parasitemia ranges from 6 percent in Western Urban to 58 percent in the northeastern district, Koinadugu, among children 6-59 months of age. Table 1 summarizes malaria parasitemia and severe anemia by district based on the MIS 2016 data.

[2] National Malaria Strategic Plan 2016-2020, National Malaria Control Program. Ministry of Health & Sanitation. 2015

Figure 1. Prevalence of Malaria Parasitemia in Children aged 6-59 Months, by District, Sierra Leone 2013 and 2016 MIS

Percent of children 6-59 months with a positive malaria microscopy test



The malaria parasitemia prevalence estimates in children under five years of age were 46 percent and 53 percent according to 2013 and 2016 MIS using RDT and 43 percent and 40 percent using microscopy. Figure 2 shows the geographic distribution of malaria by district. MIS 2016 showed that one in ten children under the age of five had severe anemia (<8g/dL). Prevalence of severe anemia was highest in Koinadugu (20 percent) and lowest in Kono (3 percent) and Western Area Urban (2 percent).

Although the 2017 MICS is the most recent national survey, results from that survey are not reported here because the survey was conducted concurrently with the 2017 mass ITN distribution campaign. Due to this unfortunate timing, data concerning ITN access and use are likely artificially inflated, as they showed extreme improvements over the 2016 MIS survey data, and not representative of the usual national norms. It is likely that many of the malaria-specific indicators from the 2017 MICS may also be artificially inflated for the same timing reason, so for consistency, we have reported data from the 2016 MIS throughout this MOP (Table 1).

Figure 2: Geographic Distribution of Malaria Parasitemia in Children 6-59 months, by District, Sierra Leone 2016 MIS

Percent of children 6-59 months with a positive malaria microscopy test

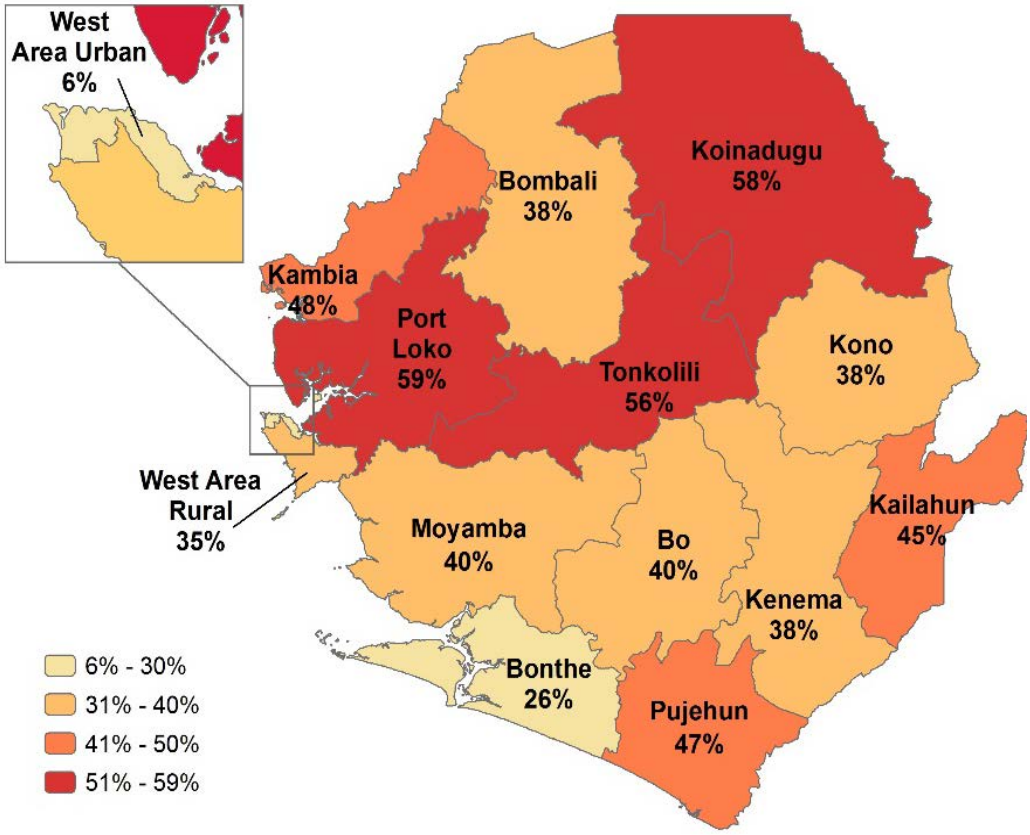


Table 1: Sierra Leone by Districts and Key Malaria and Anemia Indicators based on 2016 Malaria Indicator Survey

Region	District	2015 Census	Children Under Five Parasitemia* MIS 2016	Children Under Five Severe Anemia ** MIS 2016	U5 ITN Use^ MIS 2016	ITN-1 Ownership^^ MIS 2016
Eastern	Kailahun	525,372	45%	13%	58%	76%
	Kenema	609,837	38%	8%	66%	76%
	Kono	505,767	38%	3%	46%	58%
Northern	Bombali	606,183	38%	8%	43%	54%
	Kambia	343,686	48%	11%	49%	68%
	Koinadugu	408,097	58%	20%	40%	62%
	Port Loko	614,063	59%	11%	34%	51%
	Tonkolili	530,776	56%	13%	34%	60%

Southern	Bo	574,201	40%	10%	65%	76%
	Bonthe	200,730	26%	7%	54%	73%
	Moyamba	318,064	40%	10%	50%	61%
	Pujehun	345,577	47%	13%	48%	67%
Western Area	Rural	442,951	35%	13%	26%	42%
	Urban	1,050,301	6%	2%	26%	40%
National Total / Average		**7,075,641**	**40%**	**10%**	**44%**	**60%**

*Percent of children 6-59 months tested positive for malaria via microscopy testing
**Percent of children 6-59 months old with severe anemia (hemoglobin < 8.0 g/dl)
^Percentage of children under five years of age who slept under an ITN the night before the survey among all households
^^Percent of households with at least one long lasting insecticide treated mosquito net

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

As part of the public sector reforms, which started in 2003, the Ministry of Health and Sanitation (MoHS) is organized into two main divisions at the central level: medical services and management services. The core functions of the MoHS remain as "policy formulation; standards setting and quality assurance; resource mobilization; capacity development and technical support; provision of nationally coordinated services, e.g. epidemic control; co-ordination of health services; monitoring and evaluation of the overall sector performance and training."[3] The districts' responsibilities include implementation of national health policies; planning and management of district health services; provision of disease prevention, health promotion, curative and rehabilitative services; health education; ensuring provision of safe water and environmental sanitation; health data collection, management, interpretation, dissemination and utilization.

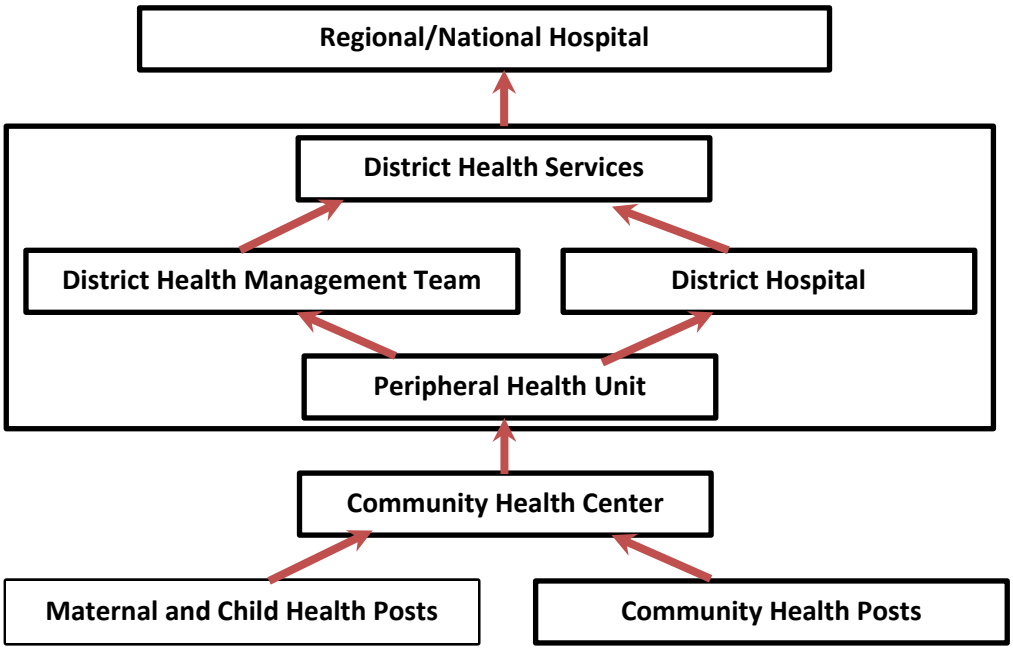
Sierra Leone's health service delivery system is pluralistic with the Government, faith-based missions, non-governmental organizations, and the private sector all providing services. There are public, private for profit, private non-profit and traditional medicine practices. The private sector is underdeveloped compared to other countries in the sub-region and involves mainly curative care for inpatients and outpatients on a fee-for-service basis. Private health facilities operate under the authority of individual owners and/or boards of directors and are mainly found in urban areas. Traditional healers and Traditional Birth Attendants (TBAs) are reported to provide a significant amount of health care, with TBAs attending almost 90 percent of deliveries at the community level (BPEHS 2015-2020).

Sierra Leone's public health delivery system comprises three levels (see Figure 3). District health services form the core component of primary health care. They are composed of a network of peripheral health units (PHUs), the district hospital (DH), and the District Health Management Team (DHMT). The DHMT is responsible for the overall planning, implementation, coordination, monitoring and evaluation of the district health services under the leadership of the District Medical Officer (DMO).[4]

[3] Government of Sierra Leone, Basic Package of Essential Health Services 2015-2020

[4] Government of Sierra Leone, Ministry of Health and Sanitation. National Health Sector Strategic Plan 2017 - 2021. 2017

Figure 3: Health Facility Structure



The PHUs are the first line of health services, and are further sub-classified into three levels. The maternal and child health posts (MCHPs) are situated at village level and cater to populations of up to 5,000. They are staffed by maternal and child health (MCH) aides who are trained to provide a range of services: antenatal care, supervised deliveries, postnatal care, family planning, growth monitoring and promotion for under-five children, immunization, health education, management of minor ailments, and referral of cases to the next level. The MCH aides are supported by community health workers (CHWs) who are community-based and play a complementary role in health promotion and counselling of caregivers to improve health status and access to care. The CHW is an essential part of the continuum of care from the community to health facility and referral level, and for counter referrals.[5] Community health posts (CHPs) are at 'small town' level with populations between 5,000 and 10,000 and are staffed by state-enrolled community health nurses and MCH aides. In addition to the services provided at the MCHPs, CHPs include services relating to prevention and control of communicable diseases, such as vaccination programs, and rehabilitation. They refer more complicated cases to the next level.

Community health centers (CHCs) located at Chiefdom level typically have a catchment population of between 10,000 and 20,000 people. They are staffed with a community health officer (CHO), state-enrolled community health nurses, MCH aides, an endemic disease control unit assistant and an environmental health assistant. CHCs provide all the services provided at the CHP level in addition to environmental sanitation and supervise the CHPs and MCHPs within the Chiefdom.

The district hospital is a secondary level referral facility for the PHUs. It provides the following services: outpatient services for referred cases from PHUs and the population living within its immediate environs, inpatient and diagnostic services, accidents and emergencies, and technical support to PHUs.

[5] Government of Sierra Leone, Ministry of Health and Sanitation. Policy for Community Health workers in Sierra Leone. June 2012

While there are public and private hospitals in each district, only the capital, Freetown, has hospitals that are considered to be true tertiary level facilities – Connaught Hospital, Ola During Children's Hospital, Princess Christian Maternity Hospital, Lakka, Kissy Mental Hospital, and Jui. Some of these facilities provide a limited range of primary care services. For example, Princess Christian Maternity Hospital runs a routine antenatal care (ANC) clinic for women who live in close proximity to the hospital and for whom the hospital is the nearest healthcare facility. The revised 2015-2020 Basic Package of Essential Health Services and National Health Sector Strategic Plan will upgrade the skill level, supply chain, and services available throughout the health system, including building a true tertiary level of care through the University Teaching Hospital Complex. The distribution of health facilities per each district is shown in Table 2.

Table 2. Number of Health Facilities by District as of July 2015

Organization unit*	MCHP	CHP	CHC	Government Hospital	Private Clinic[6]	Private Hospital	Total
Bo	69	24	28	1	2	3	127
Bombali	55	32	15	1	5	3	111
Bonthe	15	26	14	1	4	2	62
Kailahun	18	42	14	1	1	1	77
Kambia	40	15	13	1	2	1	72
Kenema	60	33	26	1	2	2	124
Koinadugu	43	18	10	1	2	0	74
Kono	44	25	16	1	1	0	87
Moyamba	55	26	18	1	2	1	103
Port Loko	70	21	15	2	1	2	111
Pujehun	49	14	13	1	0	0	77
Tonkolili	75	15	12	1	1	2	106
Western Area	39	28	39	11	22	10	149
Total	632	319	233	24	45	27	1280

*In 2018, two new districts were created: Karena and Fala.
Source: Government of Sierra Leone, Basic Package of Essential Health Services 2015-2020

Impact of the Ebola Virus Disease Epidemic on the Health System in Sierra Leone

The epidemic of Ebola Virus Disease (EVD) which peaked in Sierra Leone from June 2014 to November 2015 impacted negatively on all aspects of the nation and its people. The health system was ill-equipped to cope with the massive increase in need for effective health promotion, preventive, diagnostic, and therapeutic services for EVD and other endemic diseases like malaria. The effect of the EVD epidemic on malaria was significant, largely because the two diseases have similar symptoms and signs, and posed great demand on the weak health system. Prior to the EVD outbreak, access, and utilization of malaria treatment services at facility and community levels averaged 85 percent and 50 percent, respectively (HMIS, 2013). The findings of a health facility survey conducted by UNICEF in October 2014 to assess the impact of EVD outbreak on health system in Sierra Leone showed that

[6] "Private" includes all non-governmental entities, including not-for-profit (NGO), for-profit, and faith-based institutions.

routine services provided through health facilities were affected across all districts. However, the extent of the impact was not even across all districts.

The observed drop in facility utilization has been attributed to several factors including the widespread avoidance of formal testing and treatment by patients due to Ebola-phobia as well as precautionary measures taken by health care workers in the face of inadequate infection prevention and control measures. Based on WHO guidance, MoHS temporarily suspended malaria testing to minimize exposure to blood, blood products and other body fluids and recommended presumptive treatment during this period. In the post-Ebola period, efforts are underway to re-establish "test-treat-and-track" as the standard best practice. The long-term impact of the EVD crisis on health services and malaria control efforts in Sierra Leone is largely unknown at this time.

To reduce malaria transmission and reduce the number of febrile cases which otherwise would have been suspected as EVD, the MoHS in collaboration with its partners (WHO, UNICEF, MSF-Spain, the Global Fund, RBM partners, and other stakeholders) carried out a mass drug administration (MDA) campaign using first-line antimalarial medicine (three-day course of artesunate-amodiaquine [ASAQ]). Two rounds of MDA were carried out in December 2014 and January 2015, in EVD hotspots areas as recommended by the WHO.

Government of Sierra Leone Health Sector Plans

Sierra Leone has the National Malaria Strategic Plan (NMSP) 2016-2020 and the National Health Sector Strategic Plan (NHSSP) 2017-2021 to address critical challenges in the health system and disease control programs. The NMSP 2016-2020 outlines priority interventions, strategic direction, and investments required to achieve and sustain universal coverage with high impact control measures to achieve the 2020 national goals. The 2016-2020 strategic plan has similar goals and objectives as the previous plan but with the addition of consideration for malaria elimination as a long term goal and coordination with the NHSSP. In the NHSSP 2017-2021, the Ministry of Health and Sanitation MoHS captures its vision for Sierra Leone as "a well-functioning national health system that delivers efficient and high-quality healthcare and ultimately contributes to the socioeconomic development of the country." The NHSSP envisages achieving goals through the following eight pillars to increase access to quality, affordable health services for all Sierra Leoneans:

1. Strengthen leadership and health governance focusing on health planning, policy reforms on private sector engagement, coordination between donors and NGOS, and strengthen the Health Management and Information System (HMIS) to support informed decision making;
2. Increase funding allocation to health and sanitation from 10 percent to 15 percent as required by the Abuja Declaration;
3. Improve Human Resource) development;
4. Expand and improve the management of the Free Health Care Initiative;
5. Strengthen disease prevention and control surveillance;
6. Improve access to service delivery;
7. Strengthen Health Security and Emergency response;
8. Ensure community engagement and health promotion.

A notable area of alignment between the current NMSP and the NHSSP is the inclusion of epidemic and emergency preparedness as a key intervention for the NMCP. In addition, malaria control and mass distribution of insecticide-treated nets (ITNs) are priorities for the NHSSP, as well as community-based health service delivery with a commitment to support CHWs to be a more effective link between health

facilities and households. CHWs will play an important role in health promotion and community surveillance in addition to their existing roles in direct basic service delivery. Successful implementation of the community system strengthening strategy should improve community case management of malaria, and boost efforts by government to integrate health service delivery at community level and to scale-up integrated community case management (iCCM). The NHSSP will leverage the support of several development partners. The CHW Hub manages the program at the national level, led by the Director of Primary Health Care and the National CHW Coordinator. They work together with the National TWG and CHW Program Steering Committee. Regional Coordinators supervise and coordinate districts within their regions. The DHMTs are responsible for implementation of the program within their districts, each with a focal person who reports to the District Medical Officer.

4. National malaria control strategy

The NMSP 2016-2020 supports improvement of the health status of the population and the fight against poverty by reducing the burden due to malaria. The NMCP's overall vision is "access to malaria control interventions for all" with the mission to "direct and coordinate efforts towards a malaria-free Sierra Leone through effective partnerships."

Goal: By 2020, reduce malaria morbidity and mortality by at least 40% compared with 2015.

Objectives:

Objective 1a: All suspected malaria cases should have access to confirmatory diagnosis

Objective 1b: All malaria cases to receive effective treatment

The MoHS endorses parasitological confirmation of malaria as part of good clinical practice to improve the quality of care of patients. Before treatment is instituted, confirmation should be done using microscopy or rapid diagnostic tests (RDTs) and prompt and effective treatment with ACTs with an enhanced role for CHWs to expand delivery. MoHS and partners have trained more than 14,000 CHW volunteers and peer supervisors in 2018 as part of national implementation of iCCM. NMCP seeks to strengthen the capacity of health workers both in the public and private health sectors to implement the new test-treat-and-track (T3) strategy by strengthening capabilities in prompt and targeted malaria case management; integration of quality assurance and quality control systems; incorporating malaria in pregnancy into the maternal and child health strategy; improving the procurement and supply chain for the commodities for malaria prevention and treatment; proactive engagement of the private sector in malaria control, as well as community participation in diagnosing, treating and reporting malaria cases. NMCP conducted a therapeutic efficacy study (TES) in four Districts in 2016/17 and plans on conducting regular TESs.

Objective 2a: Provide access to 100% of the population at risk with preventive measures by 2017

Objective 2b: To protect at least 80 % of pregnant women and children under one year with IPTp3 by 2020

The strategic plan proposes to use three vector control strategies: ITNs, indoor residual spraying (IRS), and larval source management. Mass distribution campaigns will be repeated every three years and continuous ITN distribution through ANC and expanded program on immunization (EPI) outlets will be done nationwide to maintain high levels of coverage during the entire period of the strategic plan. A long-lasting ITN mass distribution campaign for universal coverage was conducted in June 2017 with another planned for 2020. The NMCP has proposed conducting district-wide IRS campaigns in up to four districts -- Bo, Bombali, Kono, and Western Rural - beginning in 2021. These districts have been selected because longitudinal entomological surveillance and insecticide susceptibility testing has been instituted within all four. Strengthened public-private partnerships will serve as an opportunity for resource mobilization to scale up implementation of IRS as recommended by WHO. For example, prior to the EVD outbreak, there were discussions between the Government of Sierra Leone (GoSL) and private mining companies regarding the potential for IRS implementation. The NMCP has expressed an interest in exploring this possibility again although no further discussions have taken place at this time. Reduction of larval sources through larviciding and environmental management nominally remains an option described in the NMSP, there are no current plans to pursue implementation.

IPTp is provided as part of the focused antenatal care package using the recommended drug (SP). ANC clinic and other health providers have been trained on and begun implementing the current policy recommending at least three doses of IPTp. The NMCP has also incorporated the 2010 WHO recommendation of Intermittent Preventive Therapy for Infants (IPTi) using SP into the national strategy, which has been approved for use in areas of year-round, moderate to high transmission and where resistance to SP is not high.[7] The intervention calls for the administration of a full dose of SP for infants at intervals corresponding to routine EPI vaccination activities at health facilities, specifically the second and third doses of Penta/DTP and measles/yellow fever vaccination (at 10 weeks, 14 weeks, and 9 months of age, respectively). The NMCP endorsed a pilot study of IPTi activities in four districts (Kambia, Pujehun, Kenema, and Western Area Rural) which commenced in 2017, and findings from the pilot informed the national scale-up that was completed in 2018. CDC Sierra Leone supported ICAP to conduct an external evaluation of the IPTi pilot in Kambia district and final results are expected in early 2019. The IPTi pilot study and scale-up received technical and financial contributions including SP procurement from non-PMI partners and donors.

Objective 3: To provide knowledge to the population such that at least 80% of the population practices malaria prevention and treatment measures by 2018.

The strategic plan recognizes that the implementation and coordination of this multi-sectoral malaria control strategy by the MoHS will require a more vibrant social and behavior change communication (SBCC) approach. The NMCP aims to engage Civil Society Organizations and Community Based Organizations to empower and encourage community demand for services, increase communities' knowledge about their health rights, and require accountability from change agents.

The NMCP supports activities that seek to reduce malaria morbidity and related mortality by motivating every Sierra Leonean to take recommended actions to prevent, diagnose, and treat malaria and to bring about sustainable social and individual behavioral change. It acknowledges challenges in the areas of

[7] Areas with high resistance to SP defined as having more than 50% prevalence of pfdhps 540 mutations associated with resistance in the *P. falciparum* parasite.

prevention and vector control, malaria in pregnancy, malaria in infants and case management and proposes strategies for effective communication with relevant stakeholders.

Objective 4: By 2020, at least 95% of health facilities report routinely on malaria program performance.

The NMCP aims to achieve at least 95% of health facilities reporting routinely on malaria program performance. All districts are expected to report routinely on malaria program performance through the District Health Information System-2 (DHIS2) with the support of district monitoring and evaluation officers. At the district level, all data from the lower level health centers, in addition to the data on community-level health services delivered, are compiled and entered into the health database using DHIS2 software which is electronically transmitted to the national level. Most of the implementation of routine interventions takes place at the district level where activity reports are collected. As such, partners implementing at district level should also generate reports and submit them to the district. The district structures will be strengthened to ensure that all health management information system (HMIS) data and activity reports are collected, collated and analyzed. The DHIS2 platform was fully functional in 2017 and malaria program indicators are now being reported nationally from all public health facilities. NMCP reports 98 percent data completeness and over 90 percent timeliness in the most recent quarter but concedes that the current data quality is poor. To monitor the progress attained and aid planning, regular monitoring through program reviews and surveys will be given a high priority.

Objective 5: By 2020, maintain and strengthen capacity for program management, coordination and partnership to achieve malaria program performance at all levels.

The NMCP is expected to have more challenging issues that will need to be addressed during this period 2016-2020. Some of these include new innovative tools in diagnosis, treatment, and vector control that may be introduced during this period. The strategic plan provides a common framework for the accelerated nationwide scale-up of evidenced-led malaria reduction interventions by the government, its development partners, the private sector and all other stakeholders. A key addition to the strategic plan is the introduction of intermittent preventive treatment in infants (IPTi). Another key change in the revised NMSP which is informed by lessons learned from the control of EVD is the institution of measures to enhance preparedness for prompt and efficient intervention during epidemics and complex emergencies. All malaria policies will be guided by coordinated operational research on malaria.

Other Interventions Supported by the NMCP:

- **Mass Drug Administration (MDA)**
    - In December 2014, MDA for malaria with ASAQ was implemented as a response to the EVD epidemic, primarily to reduce the number of febrile illness that could be misdiagnosed as EVD at health facilities. The emergency intervention targeted approximately 3 million people over 6 months of age in selected chiefdoms of Bombali, Kambia, Koinadugu, Moyamba, Port Loko, Tonkolili, and the Western Area Urban and Western Area Rural districts. A second cycle of MDA was administered in January 2015. The WHO and NMCP conducted a rapid impact assessment of MDA on malaria morbidity at selected health facilities during the intervention period. The results indicate that the number of suspect malaria cases tested was reduced, but that within a few weeks

returned to pre-MDA levels.[8] Neither the NMCP nor PMI have current plans to support another MDA campaign.

5. Updates in the strategy section

- There have been no major changes to the national malaria control strategy since the previous MOP.

6. Integration, collaboration, and coordination

The NMCP chairs the RBM partners' meeting and plays a critical role in leading and coordinating the malaria control efforts in Sierra Leone. All partner activities are integrated into the national strategy and overseen by the program manager. According to a recent partner mapping exercise, 28 partners and stakeholders participate in malaria prevention and control activities in Sierra Leone.

The Global Fund has been the primary donor for malaria control activities in Sierra Leone since 2004. Recently, GoSL's primary funding for malaria control activities has been from a Global Fund malaria grant (approximately US $30 million) that ran from July 2016 to July 2018, with the NMCP and Catholic Relief Service (CRS) as principal recipients. A new Global Fund grant for malaria activities was recently awarded for $24.2 million covering June 2018 to July 2021.The NMCP is responsible for commodity procurement (ITNs, ACTs, and RDTs) and distribution[9] across the entire country, and CRS is responsible for SBCC in about 2,000 communities (out of approximately 16,000 communities) in all districts. CRS, with the Global Fund support, commissioned and conducted (along with other partners) the MIS 2016.

The Global Fund provides funding for health system strengthening (HSS) through a separate HSS grant (approximately US$19 million) that supports the CHW activities ($7 million), the establishment of a new warehouse (US$6-7 million) and provides 13 trucks for distribution of health commodities to the districts. With EU funding, UNICEF has also rehabilitated/constructed district medical stores in 13 out of the 14 districts.

The United Kingdom Department for International Development (DFID) supported commodity procurement, particularly for routine ITN distribution at PHUs. DFID covered 50 percent of the ITN needs for the 2017 mass campaign. While Global Fund supports ACTs and RDTs and SP for IPTp, there was little support for supplies for management of severe malaria before FY 2017 PMI support. DFID has reduced their donor support for malaria control in Sierra Leone beginning in 2018.

UNICEF is a key partner for procurement and distribution of commodities through funding support from both DFID and the Global Fund, for national health campaigns, maternal and child health weeks, as well as routine distribution of ITNs. In addition, UNICEF conducted a geo-mapping of the 14,622 CHWs in Sierra Leone. Of these, about 6,000 are community-based promoters that have been trained to work and focus on malaria control. To date, these volunteers are provided incentives through the various partners

[8] Aregawi M, Smith SJ, Sillah-Kanu M, Seppeh J, Kamara AR, Williams RO, et al. Impact of the mass drug administration for malaria in response to the Ebola outbreak in Sierra Leone. *Malar J.* 2016;15:480.

[9] This does not cover severe malaria commodities.

and projects. In February 2017, the MoHS launched a CHW policy that details clear terms of reference, training packages and minimum qualifications as well as a formalized incentive plan for the CHWs. The goal is to have all CHWs implementing a comprehensive package that includes malaria control as one of several components. The community-based promoters are fully integrated into the CHW program to provide services according to the revised CHW policy (i.e., Reproductive, Maternal, Neonatal, and Child Health, iCCM, and related interventions). MoHS and partners have trained over 14,000 CHWs and their peer supervisors in 2018.

WHO provides the NMCP with technical assistance on malaria policies and guidelines. WHO also funded the NMCP to conduct an IRS pilot in 2010-2012 in four districts.[10] Sprays were conducted with Lambda-cyhalothrin and insecticide monitoring data indicated that there was little resistance to the insecticide used. Due to lack of resources, IRS was not continued.

In October 2018, China organized a consultative meeting on malaria and other health areas with the Sierra Leone MOHS and its partners to explore potential collaboration. USAID Sierra Leone offered an outline of PMI's planned investments and activities.

Several MoHS directorates play critical roles in malaria control activities in Sierra Leone. The Department of Policy, Planning, and Information (DPPI) is responsible for implementing and supporting the DHIS2. The DPPI coordinates with the NMCP to ensure that necessary malaria indicators are captured and reported thorough DHIS2. The Directorate of Drugs and Medical Supplies (DDMS) is responsible for the logistics management information system (LMIS), including quantification. In 2012, the parastatal National Pharmaceutical Procurement Unit (NPPU) was created to cover the procurement, storage, and distribution of medical drugs and supplies. The EVD crisis, among other factors, delayed the activation of the NPPU and it was dissolved in 2016. The National Medicine Supplies Agency has been constituted by GoSL as the new coordinating body for supply chain and procurement and will become functional in the future. As a result, partners will continue to use parallel systems to procure, store, and distribute pharmaceuticals from the center to the districts and PHUs until the National Medicine Supplies Agency is operational.

There are a number of partners that support *ad hoc* activities in various districts and chiefdoms, mostly in district capitals and big cities and towns. Some of the activities supported include SBCC, net distribution to private sector facilities, and community-based activities. While there are some examples of private sector collaboration, additional efforts are needed to map these activities and to ensure coordination and collaboration with the public sector. Some of the key potential areas of collaboration include malaria control efforts in rice plantations and mining areas, as well as construction and development projects involving logging and deforestation.

[10] Bombali, Bo, Western Area Rural, and Kono.

Table 3. 2019 select donor and partner coverage by District for ITN distribution, iCCM and service delivery support and entomologic and insecticide resistance surveillance.

District	Population	ITN Distribution*	iCCM and Service Delivery	Entomologic and Insecticide Resistance Surveillance
Bo	632,511	Global Fund / PMI	Global Fund / PMI	PMI
Bombali	666,611	Global Fund / PMI	Gavi	PMI
Bonthe	220,679	Global Fund / PMI	World Vision	
Kailahun	578,546	Global Fund / PMI	World Bank	
Kambia	379,712	Global Fund / PMI	Irish Aid	
Kenema	670,334	Global Fund / PMI	Global Fund	
Koinadugu	449,943	Global Fund / PMI	World Bank / PMI	
Kono	556,257	Global Fund / PMI	Gavi / Partners in Health	PMI
Moyamba	350,162	Global Fund / PMI	Global Fund	
Port Loko	676,363	Global Fund / PMI	Global Fund / PMI	
Pujehun	380,797	Global Fund / PMI	Global Fund / PMI	
Tonkolili	584,103	Global Fund / PMI	Global Fund	
Western Rural	488,299	Global Fund / PMI	Global Fund	PMI
Western Urban	1,160,615	Global Fund / PMI	Global Fund	

Source: Government of Sierra Leone, Ministry of Health and Sanitation, Jan 2019.
*Both routine and mass campaign distribution channels.

U.S. Government Partners

The U.S. Government reignited its programs in Sierra Leone in 2000, at the tail end of the 10-year civil war, with the aim of reducing threats of regional destabilization, raising awareness of the widespread atrocities that were committed during the civil war, and increasing international support for the government and the people of Sierra Leone. During the Transition Strategy from 2001-2003, the United States Agency for International Development (USAID) focused on the social and economic reintegration of war torn communities including disarmament and reconciliation, and since 2006 has supported strengthening democratic governance. USAID's Mission in Guinea provides overall coordination and oversight for the Sierra Leone program. Activities include support to enhance democratic governance, nutrition and food security and food assistance (particularly for Ebola-affected populations), family planning, maternal/child health and women's empowerment and leadership, in addition to health services and systems.

USAID and the U.S. Centers for Disease Control and Prevention (CDC) are supporting various health activities in Sierra Leone. USAID supports efforts to improve health service delivery and health system strengthening (including for HMIS and LMIS) as well as a long-term technical advisor embedded within the NMCP focusing on management and monitoring and evaluation. Other USAID health activities include support to the Global Health Security Agenda (GHSA), ending neglected tropical diseases, technical assistance for tuberculosis, and infection prevention and control training at the university level.

CDC, in addition to laboratory and human capacity building, is supporting the evaluation of the pilot of IPTi as well as implementation of the national rollout of IPTi. CDC provides technical assistance and funding through implementing partners and directly to MoHS to core GHSA areas of surveillance, workforce development (including FETP), emergency management, immunizations, and antimicrobial resistance. USAID and CDC also collaborate to strengthen capacity for effective laboratory services and disease surveillance, including HIV/AIDS. Under the GHSA, both USAID and CDC are improving national laboratory capacity and disease surveillance (animals and human) to prevent, detect, and respond to human and animal infectious diseases threats. In addition, USAID is supporting the establishment of the One Health Platform, the revision and update of preparedness and response plans, as well as the Ebola Host Project that looks into potential reservoirs of EVD (and other zoonotic diseases) and investigates human behavior and interaction with animals.

Peace Corps re-established its programs in 2000 in the post-civil war period, but there was a gap in programming during the EVD outbreak. The program has now returned and will increase its presence with 87 health and education volunteers serving in-country in 2018.

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

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

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80% reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40% from 2015 levels.
3. Assist at least five PMI-supported countries to meet the World Health Organization's (WHO) criteria for national or sub-national pre-elimination.[11]

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

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

[11] http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

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

- Proportion of households with at least one ITN
- Proportion of the population with access to an ITN. [Please see http://www.malariasurveys.org/documents/Household%20Survey%20Indicators%20for%20Malaria%20Control.pdf for a description of this indicator.]
- Proportion of children under five years old who slept under an ITN the previous night
- Proportion of pregnant women who slept under an ITN the previous night
- Proportion of the population that slept under an ITN the previous night
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs
- Proportion of women who received two or more doses of IPTp for malaria during ANC visits during their last pregnancy
- Proportion of women who received three or more doses of IPTp for malaria during ANC visits during their last pregnancy

8. Progress on coverage/impact indicators to date

Table 4: Evolution of Key Survey Based Malaria Indicators in Sierra Leone from 2008 to 2017

Indicator	[2008, DHS]	[2013, DHS]	[2013, MIS]	[2016, MIS]	[2017, MICS]*
% Households with at least one ITN	37%	64%	62%	60%	71%
% Population with access to an ITN	15%	15%	17%	16%	33%
% Children under five who slept under an ITN the previous night	61%	49%	69%	71%	78%
% Pregnant women who slept under an ITN the previous night	70%	53%	76%	75%	83%
% Population that slept under an ITN the previous night	NA	42%	39%	39%	53%
% of population using LLINs among those with access	NA	NA	62%	63%	72%

% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	NA	72%	84%	88%	70%
% Children under five with fever in the last two weeks who had a finger or heel stick	NA	39%	NA	51%	50%
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	6%	77%	84%	97%	NA
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	10%	45%	62%	71%	69%
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	NA	NA	NA	31%	27%
Under-five mortality rate per 1,000 live births	140	156	NA	NA	94
% children under five with parasitemia (by **microscopy,** if done)	NA	NA	43%	40%	NA
% children under five with parasitemia (by **RDT**, if done)	NA	NA	46%	53%	NA

* The 2017 MICS was conducted between May-August 2017 and overlapped with the 2017 ITN mass distribution campaign in June 2017. Since the MIS surveys are planned for every 2 years (with the next one scheduled for 2019), PMI will reference the MIS surveys for trends in intervention coverage unless otherwise noted.

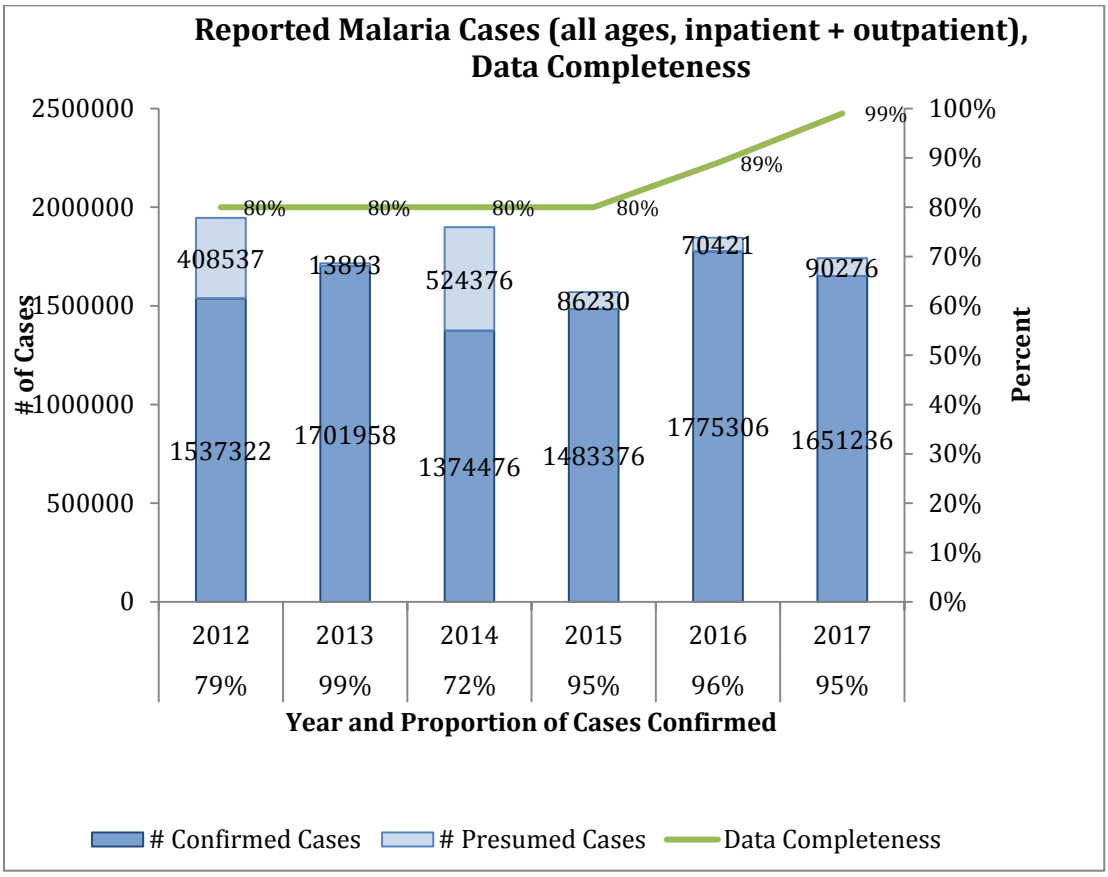
Table 5: Evolution of Key Malaria Indicators Reported through Routine Surveillance Systems in Sierra Leone from 2012 to 2017

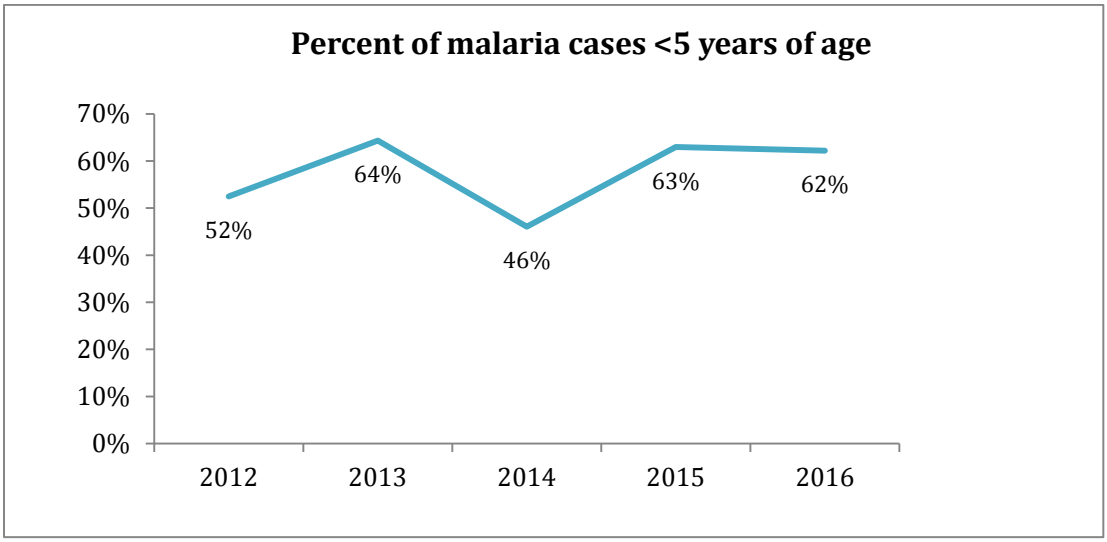
	2012	2013	2014	2015	2016	2017
Total # Cases (Confirmed and Presumed) [1]	1,945,859	1,715,851	1,898,852	1,569,606	1,845,727	1,741,512
# Confirmed Cases [2]	1,537,322	1,701,958	1,374,476	1,483,376	1,775,306	1,651,236
# Presumed Cases [3]	408,537	13,893	524,376	86,230	70,421	90,276
Total # <5 Cases [4]	1,020,878	1,104,001	874,786	988,612	1,147,956	1,093,244
Total # Malaria Deaths [5]	3,611	4,326	2,848	1,107	1,345	1,298
Data Completeness	80%	80%	80%	80%	89%	99%

(%) [6]						
Test Positivity Rate (TPR) [7]	73%	68%	65%	61%	56%	53%

[1]Total # cases: Total number of reported malaria cases. All ages, outpatient, inpatient, confirmed and unconfirmed cases.
[2]# confirmed cases: Total diagnostically confirmed cases. All ages, outpatient, inpatient.
[3]# presumed cases: Total clinical/presumed/unconfirmed cases. All ages, outpatient, inpatient.
[4]Total #<5 cases: Total number of <5 cases. Outpatient, inpatient, confirmed, and unconfirmed.
[5]Total # Malaria Deaths Reported: All ages, outpatient, inpatient, confirmed, and unconfirmed
[6]Data 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)
[7]Test Positivity Rate (TPR): Number of confirmed cases (#2 above)/Number patients receiving a diagnostic test for malaria (RDT or microscopy)

Figures 4 and 5: Trends in Key Malaria Indicators Reported in Routine Surveillance Systems





9. Other relevant evidence on progress

Health facility surveys (HFSs) can provide useful information on the performance of malaria control activities at health facilities, including availability of malaria commodities and quality of case management. In 2014, a total of 1,185 health facilities, representing 100 percent of all health facilities in Sierra Leone, were surveyed looking at facility registers to assess data quality, availability of malaria commodities, and observation of malaria case management. In 2013, HMIS data showed that the number of under-five children treated for malaria had increased by 20 percent during the rainy season. However, from May to September 2014, the number of under-five children treated for malaria declined by 39 percent and remained at lower levels until January 2015 (HFS 2014). Also, during the same period, the number of ITNs distributed during ANC visits dropped by 63 percent nationally due at least in part to the fact that the number of antenatal visits declined by 27 percent (HFS 2014). Results from the 2014 HFS were discouraging but expected due to the EVD outbreak

The MoHS in collaboration with partners conducted the Service Availability and Readiness Assessment (SARA) of health facilities in 2017, with support from the Global Fund and DFID. The Sierra Leone SARA survey was the first health services census to be implemented in the country. The use of standard, tested tools allowed the SARA to provide information on the availability of health services at the facility level, the availability of inputs needed to deliver the basic package of essential health services, and the readiness of health facilities to provide health services. The major findings included the following. There is need for significant infrastructural investment to bring all health facilities in compliance with the norms and standards for the basic package of essential health services (SARA 2017). There is a need for planned investment to increase the health workforce across all cadres. The GoSL policy position taken should advocate for and establish an enabling environment to attract and retain staff in rural settings (SARA 2017). There are major limitations in laboratory diagnostic services throughout health services.

The MoHS is planning to conduct a number of new household surveys during the coming years. The NMCP plans the MIS every two to three years; the next MIS is scheduled for 2019 with funding programmed through its Global Fund malaria grant. Key donors and the MoHS proposed support of the DHS in 2018 but due to delays in funding commitments, it now tentatively planned for 2019 although

sufficient funding remains a concern. The NMCP contends that the MIS is needed in 2019 because it is unlikely that the DHS will be conducted during the malaria transmission season.

III. OPERATIONAL PLAN

The FY 2018 and FY 2019 MOP supports key evidenced-based malaria interventions and is aligned with the NMCP's national strategic plan. The MOP emphasizes vector control (building entomological monitoring capacity, IRS, and support of ITNs), building district and sub-district monitoring and evaluation capacity, and strengthening improved case management practices, including improving severe malaria case management.

1. Vector control

NMCP/PMI objectives

Sierra Leone's 2016-2020 National Malaria Strategic Plan (NMSP 2016-2020) includes the three vector control interventions: insecticide treated nets (ITNs), indoor residual spraying (IRS) and larval source management (LSM). The strategy states that these interventions will be deployed according to the current risk stratification context in Sierra Leone. Although larval source management is part of the current malaria control strategy in Sierra Leone, it has never been implemented.

Key pillars within NMCP's vector control strategy are to strengthen capacity in entomology surveillance, to conduct insecticide resistance monitoring, and to evaluate vector behavior. This strategy will equip the NMCP, partners, and districts with knowledge and skills to implement an informed and evidence-based vector control program in order to achieve maximum impact. According to the strategy, there are four regional sites that are intended to provide annual information on vector composition, vector behavior, inoculation rates, and vector susceptibility to insecticides as well as information on ITN durability (attrition, physical integrity, and insecticide effectiveness/longevity).

NMCP plans to ensure universal ITN access through mass campaigns conducted every three years, following WHO guidelines of one net for every two people, with up to three nets per household, using WHO Pesticide Evaluation Scheme (WHOPES)-recommended nets. Currently, mass campaigns are the main distribution method, reinforced by routine distribution of nets to pregnant women during their first ANC visit and to children during their Penta-3 EPI visit. To promote proper ITN use, the NMSP supports SBCC efforts on the use and maintenance of nets in households, which are conducted prior to the mass campaigns and continuously for routine distribution. The NMCP has conducted four rounds of mass ITN distribution campaigns (2006, 2010, 2014, and 2017). In 2006, the NMCP distributed 1.1 million nets in a mass campaign for children under one year of age alongside a measles vaccination campaign. In 2010, the NMCP distributed a total of 3,264,927 ITNs for scaling-up to achieve universal coverage. In 2014, the NMCP distributed a total of 3,523,873 ITNs to maintain and achieve universal coverage as part of the malaria response to the Ebola Virus outbreak. In 2017, the NMCP distributed a total of 4,186,517 ITNs for scaling-up to achieve universal coverage. The next mass ITN campaign is scheduled for 2020 and the NMCP estimates approximately 4.6 million nets will be needed to ensure universal coverage.

The NMCP also continued to distribute nets through the routine channels during all four of the mass distribution campaigns. In spite of the ITN mass campaigns and routine distribution, some key challenges remain to achieving and maintaining universal coverage, including periodic stockouts of ITNs for the routine distribution channels. According to the MIS 2016 results, 60 percent of households owned an ITN, 37 percent of the population has access to at least one ITN and 39 percent of the

population used an ITN. Only 16 percent of households owned enough ITNs (defined as at least one ITN for every two people) to cover all household members. While overall ITN-access appears to be low, ITN-use appears to be high in households with at least one ITN. The percentage of children and pregnant women sleeping under an ITN (in households with an ITN) was 71 percent and 75 percent respectively (MIS 2016). Similar results were reported in the DHS 2013. While 64 percent of households owned an ITN, 69 percent of children under five years of age and 76 percent of pregnant women used an ITN (in households with at least one ITN). However the national percentages of ITN use among children under five years and pregnant women in all households (with and without an ITN) remain low at 44 percent for both groups. According to the MIS 2016, the primary distribution channels that households reported having received an ITN was through a mass campaign (77 percent) and at ANC (11 percent).

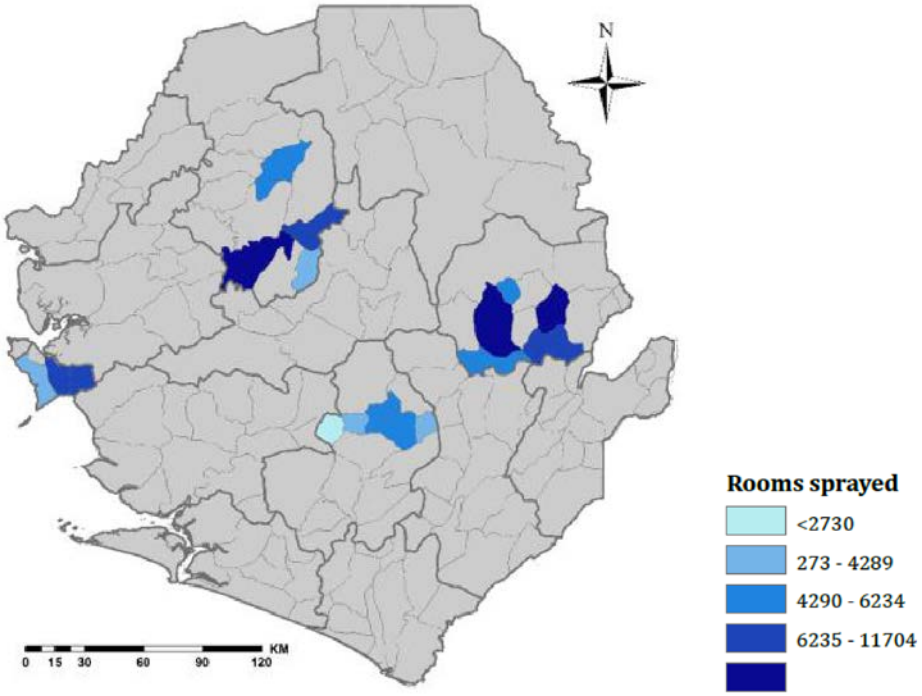
The NMCP supports the procurement of WHOPES-recommended nets. Under the Global Fund malaria grant and with support from DFID, the NMCP contracted with UNICEF to procure and distribute all ITNs to the district medical stores for the 2017 mass campaign as well as for routine channels nationwide. For the 2020 mass campaign, NMCP is planning for a similar arrangement with the Global Fund procured nets. Upon arrival in country, all ITNs are pre-positioned at the district level. For the routine channels, health facilities are responsible for transporting the nets from district warehouses and distributing to pregnant women and fully immunized children at ANC and EPI.

Sierra Leone has a history of IRS trials from as early as 1940 and a modest IRS program that was carried out until the 1950s. More recently, a WHO-funded pilot of IRS was conducted in selected Chiefdoms of four districts (Bo, Bombali, Kono, and Western Rural). [12] Figure 6 illustrates the districts which received IRS in 2010-2012 using Lambda-cyhalothrin.[13] The aim of this pilot in the four districts was to assess feasibility and community acceptability and to generate evidence for scaling up IRS in Sierra Leone as a key component of the NMCP's IVM strategy. Spraying was carried out by the NMCP and the Department of Environmental Health and Sanitation of Sierra Leone, with the involvement of the four districts. The IRS pilot project was implemented in two phases. The first phase was initiated in December 2010 and covered planning, community perception of IRS, and collection of baseline entomological data (using window traps and pyrethrum spray catches) from randomly selected homes/sites in three to four sentinel villages/chiefdoms. Based on the focus group meetings held in all four IRS pilot villages, community perception and acceptance of IRS was positive and people in the houses sprayed appreciated the broad-spectrum effect of the insecticide on other insects such as cockroaches. No incident of chemical reaction to or poisoning involving operators was reported.[2] The spraying with lambda-cyhalothrin was carried out during the second phase in May to June 2012; insecticide was applied only once to selected homes and the entomological impact was not evaluated. After the spraying, a total of 76,393 rooms were covered, protecting approximately 380,862 people. There have been no IRS activities implemented by the NMCP or the private sector following this pilot.

[12] Implementation of Indoor Residual Spraying to Assess Feasibility In Sierra Leone: Final Report: WHO, Regional Office for Africa, Brazzaville 2015 (http://www.who.int/iris/handle/10665/205918)

[13] National Malaria Control Programme (2012). The implementation of IRS in Sierra Leone in 2010-2012. Ministry of Health and Sanitation, Government of Sierra Leone, 2012.

Figure 6. Chiefdoms covered with IRS with Lambda-cyhalothrin in 2010-2012



Source: National Malaria Control Programme (2015). Sierra Leone: A Profile of Malaria Control and Epidemiology, December 2015

a. Entomological monitoring and insecticide resistance management

Progress since PMI was launched

With FY 2017 funding, PMI assisted the NMCP in building entomological capacity by establishing entomological and insecticide resistance monitoring programs at eight and four sentinel sites (respectively), refurbishing the insectary and establishing a colony of susceptible *Anopheles gambiae* s.l., recruiting and training entomological staff, supporting a review of the national insecticide resistance monitoring and management plan, and beginning laboratory analyses of collected specimens.

Vector bionomic monitoring began with PMI support in May of 2018 at eight sentinel sites, with two sites (one peri-urban and one rural) being monitored in each of four districts. (One site in each of the four districts was also selected for insecticide resistance monitoring, as described below.) Routine collection for bionomic monitoring includes use of pyrethrum spray catches (PSCs) to collect indoor resting mosquitoes, human landing catches (HLCs) to collect indoor and outdoor host seeking mosquitoes, and CDC light traps to collect indoor host seeking mosquitoes. Results from the PSCs between May and August indicate that 75 percent of mosquitoes were *Anopheles gambiae* s.l. and 1 percent were *Anopheles funestus*, with a peak in density in June, the majority of which were bloodfed, in both peri-urban and rural sites. Results from the HLCs in June demonstrated that indoor host-seeking mosquitoes peaked at 20 bites per person per night between 1-2 AM and again between 5-6 AM, while outdoor host-seeking mosquitoes peaked at 15 bites per person per night from 1-2 AM and remained at that level until 5-6 AM. Data from CDC light traps are not yet available. Although laboratory analysis (including sporozoite testing, molecular species identification, bloodmeal analysis, and molecular

mechanisms of resistance) of collected samples is planned, no results are available yet, as there is no laboratory in-country with these capabilities and a suitable regional laboratory which could perform the analyses is being identified. Given funding constraints, less than 2 percent of the collected mosquitoes will be tested, although as start-up entomological monitoring costs stabilize, it is anticipated that a greater proportion of funds may become available to test a higher percentage of specimens. Unfortunately, high-quality laboratory analysis across a variety of applications and disciplines remains a challenge throughout Sierra Leone, therefore, it is not expected that a laboratory of sufficient quality will be available in-country in the very near-term to test entomological specimens. Nevertheless, PMI remains optimistic that the overall health systems strengthening and capacity-building efforts that are being implemented as part of the overall strategy will result in Sierra Leone being able to eventually install, use, and maintain their own national entomological laboratory.

The NMCP conducted insecticide resistance testing in 2010 using the WHO tube test, by assessing *Anopheles gambiae* s.l. mortality 24 hours post-insecticide exposure. Mosquitoes from the four IRS pilot districts were tested using six different insecticides recommended by WHOPES to evaluate their potential use in IRS operations, before the IRS pilot began in 2010. Results (Table 6) indicated that *Anopheles gambiae* s.l. were susceptible to three pyrethroids (permethrin, deltamethrin, and lambdacyhalothrin), one carbamate (bendiocarb), and one organophosphate (fenitrothion) but were developing resistance to one organochlorine (DDT). Subsequent insecticide resistance testing by the NMCP in 2016 (Table 6) from one site in each of the same four districts using the same methodology demonstrated that *Anopheles gambiae* s.l. had developed resistance to the organochlorine (DDT) and the four pyrethroids (permethrin, deltamethrin, lambdacyhalothrin, and cyfluthrin) that were tested. It also showed that *Anopheles gambiae* s.l. were developing resistance to the tested carbamate (bendiocarb), but were generally susceptible to the tested organophosphate (fenitrotion). The most recent insecticide resistance testing conducted with PMI support in 2018 (Table 6) using the same methodology in one site from each of the same four districts demonstrated that *Anopheles gambiae* s.l. remained resistant to the organochlorine (DDT) and the six pyrethroids (permethrin, deltamethrin, lambdacyhalothrin, alphacypermethrin, cyfluthrin, and etofenprox) that were tested. It also showed that *Anopheles gambiae* s.l. were either resistant or developing resistance to the tested carbamate (bendiocarb). Finally, although data were not available in all districts for the three organophosphates (pirimiphos-methyl, fenitrothion, and malathion) tested, the results showed susceptibility to at least one of the tested insecticides. Assays conducted in December 2018 on multiple pyrethroid insecticides from all four sentinel locations indicated that the intensity of insecticide resistance was high. Using five times the diagnostic dose of multiple pyrethroid insecticides failed to bring mosquito mortality above 90 percent in all locations except one (and only with alphacypermethrin). Using ten times the diagnostic dose of multiple pyrethroid insecticides brought mosquito mortality above 90 percent in all locations, yet still failed to restore complete susceptibility (mortality above 98 percent). Findings from tests conducted between October 2018 and February 2019 in all four monitoring locations (representing all four regions) showed that the addition of the synergist PBO improved mosquito mortality after exposure to multiple pyrethroid insecticides. Results from the findings using deltamethrin both alone and with PBO pre-exposure from all four monitoring locations are shown in Table 7. Although mosquito mortality was not restored to full susceptibility with the addition of PBO, at the pyrethroid diagnostic dose, mortality nevertheless increased at least three-fold with the addition of the PBO synergist. At five times the pyrethroid diagnostic dose, the addition of PBO did restore full susceptibility. Tests of the “NextGen” neonicotinoid insecticide, clothianidin, and the pyrrole insecticide, chlorfenapyr, were completed between October and November of 2018 and showed that mosquitoes were fully susceptible (100 percent mortality) to both insecticides.

The national insectary was refurbished with PMI support and a colony of susceptible *Anopheles gambiae* s.l. was being established in September 2018. This susceptible strain will be used for cone bioassay testing in the future. Additionally, PMI supported capacity-building activities including training of 12 district health management staff and 2 NMCP staff in-country and 1 NMCP staff attended an international malaria entomological monitoring training in Cote d'Ivoire for 2 weeks. Additionally, PMI supported training of 64 community health workers on PSC and HLC. Finally, PMI is supporting the review of the national insecticide resistance monitoring and management plan and an entomological data review meeting.

Key challenges for strengthening NMCP capacity in entomology include availability of skilled staff with prior entomological training, obtaining the necessary supplies for intensity and synergist bioassays, identifying laboratory capacity in-country to perform the required analyses, and testing sufficient numbers of collected samples.

Table 6. Percent mortality of *Anopheles gambiae* s.l. to 11 insecticides (24 hours post-exposure) in 2010, 2016, and 2018 in 4 districts of Sierra Leone, using the WHO tube test.

Insecticide Class	Insecticide	District	% Mortality			2018: Not Resistant
			2010	2016	2018	
Pyrethroid	Permethrin	Bombali	100	50	30	
		Kono	100	60	10	
		Bo	98.3	27	16	
		Western Rural	100	66	17	
	Deltamethrin	Bombali	100	57	10	
		Kono	100	58	18	
		Bo	100	49	46	
		Western Rural	100	38	30	
	Lambdacyhalothrin	Bombali	100	53	8	
		Kono	100	51	23	
		Bo	100	43	24	
		Western Rural	100	32	15	
	Alphacypermethrin	Bombali	N/A	N/A	11	
		Kono	N/A	N/A	8	
		Bo	N/A	N/A	12	
		Western Rural	N/A	N/A	14	
	Cyfluthrin	Bombali	N/A	50	19	
		Kono	N/A	77	21	
		Bo	N/A	43	14	
		Western Rural	N/A	36	18	
	Etofenprox	Bombali	N/A	N/A	26	
		Kono	N/A	N/A	43	
		Bo	N/A	N/A	12	
		Western Rural	N/A	N/A	14	
Organochlorine	DDT	Bombali	97	31	22	
		Kono	97	48	12	
		Bo	93	28	21	
		Western Rural	97	7	8	
Carbamate	Bendiocarb	Bombali	100	91	95	*
		Kono	100	93	40	
		Bo	100	91	98	*
		Western Rural	100	91	83	
Organophosphate	Pirimiphos-Methyl	Bombali	N/A	N/A	98	*
		Kono	N/A	N/A	99	*
		Bo	N/A	N/A	100	*
		Western Rural	N/A	N/A	97	*
	Fenitrothion	Bombali	100	99	96	*
		Kono	100	99	89	
		Bo	100	100	99	*
		Western Rural	100	94	84	
	Malathion	Bombali	N/A	N/A	N/A	N/A
		Kono	N/A	N/A	N/A	N/A
		Bo	N/A	N/A	100	*
		Western Rural	N/A	N/A	N/A	N/A

Source: Government of Sierra Leone, Ministry of Health and Sanitation, National Malaria Control Program: Insecticide Resistance Monitoring and Management Plan, 2016 and NMCP personal communication 2018

Table 7. Percent mortality of *Anopheles gambiae* s.l. to 0.05% deltamethrin alone and with PBO pre-exposure in four districts of Sierra Leone, between October 2018 and February 2019, using the WHO tube test.

District (Region)	% mortality alone	% mortality with PBO pre-exposure	% difference
Bo (Southern)	15	58.9	43.9
Bombali (Northern)	17.5	70.3	52.8
Kono (Eastern)	12.8	61.3	48.5
Western Rural (Western Area)	20	64.7	44.7

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
With FY 2018 and FY 2019 funding, PMI will support continued entomological and insecticide resistance monitoring programs at all established sentinel sites (with the possibility of adding two new sites in a high-prevalence district), training of entomological staff, and laboratory analyses of collected specimens. Additionally, PMI will support establishing new malaria vector control and integrated vector management technical working groups, a review of the national integrated vector management guidelines, and creating an entomological monitoring database. PMI will provide technical assistance and support to the NMCP on entomology, including technical support visits in FY 2018.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

b. Insecticide-treated nets

Progress since PMI was launched

With FY 2017 funding, PMI procured approximately 675,000 ITNs to contribute to the annual net need for routine channels and support their distribution in 2019. The NMCP also conducted ITN durability monitoring of nets distributed during the 2017 mass campaign at sentinel sites in the same four districts where entomological monitoring is being conducted (Bo, Bombali, Kono, and Western Rural). In order to measure net attrition approximately 12 months post-distribution, a semi-structured household questionnaire was administered to determine the number of nets that a household received during the campaign and whether any of them have since been lost (and if lost, the reasons for the loss). Additionally, one randomly selected net from each household was collected (and replaced with a new net) in order to measure the physical integrity of the net by counting the number and size of the holes. No baseline data was collected during the 2017 mass campaign and monitoring activities are not ongoing. The mean net attrition in all four districts was 19%, indicating that 81% of nets distributed during the campaign were still present. For the physical integrity assessment, 63% of nets were found to either have no holes or be in good condition, 25% were damaged but still usable, and 12% were considered unusable. The factors contributing to diminishing physical integrity were the presence of rats in the home and the type of sleeping material used for the bed. Cone bioassays to measure the insecticide effectiveness and longevity have not yet begun, since a susceptible colony was being established in September 2018, but testing should begin by October 2018. Finally, PMI supports strengthening of SBCC for ITN use, which is described in the SBCC section.

Commodity gap analysis

As indicated in Table 8, the NMCP estimates approximately 4,601,419 million ITNs (calculated for procurement purposes using the ratio of one net for every 1.8 persons in the target population) are needed for the 2020 mass distribution campaign and more than 600,000 ITNs are needed annually to support the routine distribution channels (estimating that 4.4 percent of the population consists of pregnant women and that 4 percent of the population consists of fully immunized infants). For the mass campaign, the Global Fund malaria grant, covering the period of June 2018 – July 2021, supports half of the net procurement and distribution needs for the mass campaign in 2020. There is a remaining gap of 50 percent for both procurement and distribution of ITNs for the 2020 campaign. To fill the gaps going forward, PMI plans to procure the remaining 50 percent of the ITNs for the 2020 mass campaign (approximately 2.3 million nets) as well as to procure and distribute ITNs (approximately 500,000 nets) for pregnant women and fully immunized children at ANC and EPI services. In support of the NMCP's strategy, PMI will also pilot a school-based ITN distribution channel in one district, which will provide nets to children in grades one and four. Based on the results of this pilot, PMI and NMCP may consider scaling up this approach in other districts.

Table 8. ITN Gap Analysis

Calendar Year	2018	2019	2020
Total Population[1]	7,776,871	8,025,731	8,282,554
Continuous Distribution Needs			
Channel #1: ANC (pregnant women = 4.4% of population)*	342,182	353,132	364,432
Channel #2: EPI (children under one year = 4% of population)**	253,837	261,960	270,343
Channel #3: School-based distribution pilot ***		8,000	
Estimated Total Need for Continuous	596,019	623,092	634,775
Mass Distribution Needs			
2020 mass distribution campaign	0	0	4,601,419
Estimated Total Need for Campaigns	0	0	4,601,419
Total Calculated Need: Routine and Campaign	**596,019**	**623,092**	**5,236,194**
Partner Contributions			
ITNs carried over from previous year	0	112,403	364,311
ITNs from MOH	0	0	0
ITNs from Global Fund (mass + routine)	708,422	0	2,300,710
ITNs planned with PMI funding (mass + routine)****	0	875,000	2,606,966
Total ITNs Available	708,422	987,403	5,271,987
Total ITN Surplus (Gap)	112,403	364,311	35,792

[1] Based on 2015 Population Census and a growth rate of 3.2%.
*Channel #1 - 4.4% national population pregnant in a given year.
**Channel #2 - 4% national population children fully immunized; 80% EPI attendance plus 1.6% returning defaulters.
***Channel #3 – School-based distribution pilot in one district targeting school children in grades 1 and 4.
**** In 2019, 675,000 routine ITNs coming from FY 2017; 200K routine ITNs from FY 2018. In 2020, 2,306,966 campaign ITNs coming from FY 2018; 300K routine ITNs from FY 2019.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
With FY 2018 funding, PMI will procure approximately 2.3 million ITNs for the 2020 mass campaign, contributing to the remaining estimated quantities of nets needed for the universal ITN coverage campaign. With FY 2018 and FY 2019 funding, PMI will procure and distribute approximately 500,000 ITNs in 2019 and 2020 through routine channels provided to pregnant women at ANC and fully immunized infants at EPI. Based on findings from tests conducted between October 2018 and February 2019 in all four monitoring locations as described above, the use of the PBO synergist will improve

mosquito mortality and therefore, PMI will attempt to procure only ITNs with a combination of deltamethrin plus the PBO synergist. PMI will also support ITN durability monitoring and strengthening of SBCC for ITN use. Additionally, PMI will implement a pilot of school-based ITN distribution for children in grades one and four in support of the NMCP strategy. PMI will provide technical assistance and support to the NMCP on ITNs, including technical support visits to support activities such as the school-based distribution pilot, the mass ITN campaign, and technical assistance for durability monitoring.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

c. Indoor residual spraying

Progress since PMI was launched

As mentioned in the NMCP/PMI objectives section above, there have been no IRS activities in Sierra Leone since a small pilot was conducted in 2012. With FY 2017 funding, PMI supported insecticide resistance monitoring (described in the entomological monitoring section above) to gather evidence for future spray operations. As shown in Table 6, the most recent insecticide resistance testing conducted with PMI support in 2018 indicated that at least one organophosphate insecticide and multiple "NextGen" insecticides would be suitable for IRS use.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:

With FY 2018 and FY 2019 funding, PMI will support continued insecticide resistance monitoring and plan for insecticide procurement. PMI will also support environmental compliance clearance ahead of IRS implementation, which is expected to begin with one cycle in each of two districts in 2021, protecting approximately 1.2 million people.[14] Additionally, PMI will ensure SBCC messages for IRS in Sierra Leone are included, given the traumatic response that communities now exhibit in the post-Ebola era as a result of seeing workers wearing full-body PPE and spraying chemicals in their homes. Sierra Leone is the only country out of the three countries from the 2014 West African Ebola Virus outbreak that PMI Is supporting for IRS use, and special sensitivity surrounding this issue has already been identified by the implementing partner (while conducting PSCs for entomological monitoring) and it should not be underestimated. With FY 2018 and FY 2019 funding, PMI will provide technical assistance and support to the NMCP on IRS, including a technical support visit in FY 2019.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

[14] IRS implementation through PMI was originally expected to begin in 2020, but was delayed until 2021 in order for PMI to accommodate the procurement of ITNs for the 2020 mass campaign instead. Proposed IRD budgets are based on estimations and will be revisited and revised as more data becomes available. PMI will continue to work closely with the NMCP and other donors to ensure that sufficient malaria prevention and control intervention gaps are filled and coordinated.

2. Malaria in pregnancy

NMCP/PMI objectives

The NMCP supports the WHO multi-pronged approach toward MIP with the provision and use of an ITN during pregnancy, intermittent preventive treatment during pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP), and prompt and effective case management of malaria and anemia. The NMSP (2016-2020) aims to protect at least 80% of pregnant women with three doses of IPTp-SP by 2020. The NMCP supports the full integration of MIP within the MoHS's Directorate of Reproductive and Child Health (DRCH). The NMCP is responsible for updating guidelines and job aids on IPTp, orienting health workers on updated IPTp guidelines, producing integrated data collection tools for MIP, procuring SP for the public and private sector and mobilizing communities on antenatal care attendance in collaboration with the DRCH. PMI is supporting the NMCP with establishing the national MIP task force to ensure regular meetings and coordination of MIP efforts.

Progress since PMI was launched

In 2014, the NMCP adopted the 2012 WHO policy recommendations which ensure pregnant women receive IPTp-SP doses starting early in the second trimester of pregnancy (13 weeks) and continue to receive IPTp-SP until delivery with a minimum interval of one month between doses (Table 9). In 2017, the MOH adopted the 2016 WHO ANC Guidelines including the recommended eight ANC contacts during pregnancy. IPTp is provided as part of the ANC package of services at health facilities aimed at making pregnancy safer. With the updated ANC guidelines, the MOH recommends an additional contact early in the second trimester (between 13 to 16 weeks) to administer SP as early as possible (Table 10). Other components of the ANC package include use of ITNs, Tetanus Toxoid immunization, effective and prompt malaria treatment, the treatment and prevention of anemia including sound nutritional guidance, provision of iron-folate, de-worming, and prevention of mother to child transmission of HIV. Pregnant women receive combined iron and folate daily supplements (30 mg iron and 0.4 mg folic acid) at ANC. Facility-based outreach services are another channel to deliver the minimum antenatal package closer to households including IPTp and ITNs to pregnant women. As an extension of health facility services, the NMCP has also trained traditional birth attendants (TBAs) to administer IPTp at the community level and to identify danger signs in pregnancy and promote early referrals. This activity has been scaled up to all districts and communities in Sierra Leone. To date, the NMCP has trained a total of 1,213 PHU staff and 1,814 TBAs in MIP. Both Global Fund and PMI support the NMCP in achieving its MIP program objectives, including the procurement of SP for IPTp (by Global Fund) and ITNs for ANC (by PMI).

ITNs are provided for free to pregnant women at first ANC visit and to the fully immunized child through EPI. The national treatment policy for the treatment of uncomplicated malaria cases during pregnancy is oral quinine plus clindamycin in the first trimester and an ACT in the second and third trimesters.

According to the MIS 2016, IPTp2 and IPTp3 coverage is 71 percent and 31 percent, respectively. The MIS 2013 reported IPTp2 at 62 percent, which indicates an increase in IPTp2 uptake over the last three years. ANC attendance is generally high; the 2013 DHS reported 97 percent of women attended at least one ANC visit during their pregnancy and 76 percent completed all four recommended ANC visits. The recent MICS 2017 survey results indicated similar intervention coverage including IPTp2 and IPTp3 coverage at 69 percent and 27 percent respectively. ANC attendance was also high; the MICS 2017

reported 97 percent of women attended at least one ANC visit during their pregnancy, 78 percent completed four ANC visits and 25 percent completed eight ANC visits. Use of an ITN by pregnant women is high in households with at least one ITN; In 2016, 75 percent of pregnant women in households with an ITN reported sleeping under an ITN (MIS 2016) and in 2017, 83 percent of pregnant women in households with an ITN reported sleeping under an ITN (MICS 2017).

The NMCP recognizes key challenges remain in supporting MIP implementation including the need to train all health facility staff and TBAs in the updated ANC and IPTp policy guidelines, occasional SP stockouts at peripheral health facilities due to poor supply chain management practices, the lack of private sector engagement in MIP and IPTp administration, and inadequate monitoring and supervision of IPTp at the community level. Furthermore, during the 2014-2015 EVD outbreak, MIP services were impacted by weakened referral systems, strained health workers, and declines in hospital and ANC clinic attendance because of public fears over contracting EVD. Health facility staff and TBAs were unable to perform outreach and community activities during this period. In addition, some health facilities were converted into holding centers for EVD patients, thus further limiting access to ANC services.

MIP data is collected through two major sources: the routine HMIS system and national surveys (i.e., DHS and MIS). Health facility staff are responsible for collecting MIP monitoring data in the mother and neonate registers, ITN registers, health facility summary forms, and TBA registers. Monthly reports from the districts on the quantity of ITNs distributed and IPTp-SP administered are sent to the HMIS as well as the NMCP. Quarterly monitoring and supervision is conducted from the national level to districts using an integrated supervisory checklist. The HMIS was updated to capture IPTp3 but has not been updated to capture more than four ANC visits. However, the current maternity record card for pregnant women collects information on eight ANC visits and monthly administration of SP for IPTp.

Table 9. Status of IPTp policy in Sierra Leone

Status of training on updated IPTp policy		**Number and proportion of HCW trained on new policy in the last year if training on new policy is not yet completed**	**Are the updated IPTp guidelines available at the facility level?**	**ANC register updated to capture 3 doses of IPTp-SP**	**HMIS/ DHIS2 updated to capture 3 doses of IPTp-SP**
Completed/Not Completed	**Date (If training completed, when, if not completed, when expected)**				
Completed	2014	1,213 health facility staff and 1,814 TBAs trained in 2017 (represents at least one staff per facility trained).	At least one copy per PHU was distributed	Yes	Yes

Table 10. Status of ANC guidelines in Sierra Leone

Status of 2016 WHO ANC guidelines adoption		Number and proportion of HCWs trained in new ANC guidelines in the last year	Are the updated adopted ANC Guidelines available at the facility level?	Additional IPTp contact added to ANC schedule at 13 weeks?	ANC register updated to capture 8-9 ANC contacts?	HMIS/DHIS2 updated to capture 8-9 ANC contacts
Started/Completed/ Not completed	Date completed (or expected to be completed)					
Completed	2017	1,213 health facility staff and 1,814 TBAs trained in 2017 (represents at least one staff per facility trained).	Limited distribution/ not all facilities received updated guidelines	Yes	Yes	Not yet but in process; currently only 4 or more ANC visits are captured

Commodity gap analysis

Table 11. SP Gap Analysis for Malaria in Pregnancy

Calendar Year	2018	2019	2020
Total Population (Population Growth Rate estimated at 3.2%)	7,776,871	8,025,731	8,282,554
SP Needs			
Total number of pregnant women	342,182	353,132	364,432
Total SP Need (in treatments)**	845,190	872,236	900,148
Partner Contributions			
SP carried over from previous year	0	2,414,810	2,313,193
SP from MoHS	0	770,620	0
SP from Global Fund through UNICEF	3,260,000	0	0
SP from Other Donors	0	0	0
SP planned with PMI funding	0	0	0
Total SP Available	3,260,000	3,185,430	2,313,193
Total SP Surplus (Gap)	2,414,810	2,313,193	1,413,045

*NMCP estimates pregnant women comprise 4.4% of the total population.
** NMCP estimates SP need based on 97% ANC1, 90% ANC2, 40% ANC3, and 20% ANC4.

The NMCP quantifies the annual IPTp-SP need for approximately 342,182 pregnant women (estimated at 4.4% of the total population with a 3.2% growth rate per year) who will receive SP at least three times during their pregnancy (Table 11). With MOH and Global Fund SP procurements in 2018 and 2019, the NMCP has planned sufficient quantities of SP treatments to support all annual IPTp needs for pregnant women provided at ANC and in the community by trained TBAs.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
While MOH national policies have been updated to reflect the 2012 WHO IPTp policy and 2016 WHO ANC guidelines, the dissemination of guidelines to the peripheral level has not been fully implemented. Although NMCP has trained health facility staff and TBAs on the updated guidelines, not all ANC staff received training so that coverage of trained staff remains variable across public and private sector facilities. With FY 2018 and FY2019 funding, PMI will support the NMCP's plan to ensure updated MIP policies and guidelines are available in all facilities and peripheral health providers have been trained in their use including health facility staff, community health workers, midwives and public and private sector hospital staff. PMI will support integrated supportive supervision visits in focus districts to ensure the quality of service delivery as well as support the implementation of the NMCP's approach to on-the-job training, through mentoring and coaching of staff for improving IPTp coverage. PMI will continue to support a national MIP working group co-chaired by the NMCP and DRCH for addressing technical issues and challenges. PMI will also support SBCC activities for improving a priority set of standard MIP messages focused on early initiation of ANC visits, uptake of IPTp and early and continuous ITN use by pregnant women.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

3. Case management

NMCP/PMI objectives
The revised 2016-2020 Malaria Control Strategic Plan highlights two key case management objectives: (1) all suspected malaria cases should receive confirmatory diagnosis, and (2) all malaria cases should receive effective treatment. The malaria test-treat-and-track (T3) policy was introduced in 2010, with a focus on RDT use in most health facilities and in the community. Additionally, the 2015 Guidelines for Case Management of Malaria and the 2016-2020 National Quality Assurance Management Plan both outline NMCP objectives to improve the coverage and quality of case management practices, in addition to improving the training, supervision, and quality control to accompany those practices at the facility and community levels. National policy requires quarterly supervision visits from the national to district level, monthly from district to the PHU, and monthly from the PHU to CHW.

The national malaria policy of Sierra Leone recommends that all cases of suspected malaria should have a parasitological test conducted with either microscopy or RDT before administering antimalarial treatment for patients that test positive. According to 2017 HMIS data, 95 percent of all malaria cases in Sierra Leone were parasitologically confirmed. RDTs are used across all levels of the health system, including at the community level by CHWs. Microscopy capacity primarily exists at the hospital level and, in the 2017 HMIS data, accounted for around 4 percent of all confirmed malaria cases. There are currently 10 microscopists and 30 laboratory technicians trained in malaria microscopy in Sierra Leone in the public sector. A National Laboratory Manual for Malaria Diagnosis was updated and published in

2012 and includes guidance on laboratory management, quality control and assurance, and supervisory checklists. However, the country currently lacks a national slide bank for malaria microscopy, as well as adequate capacity for supervision, training, and quality control. Because of other post-EVD laboratory strengthening efforts, the public health system in general is supplied with operational microscopes, slides, etc. The NMCP is interested in integrating and building on the diagnostic infrastructure and capacity of existing TB microscopy to benefit malaria diagnostics.

National policy also states that antimalarial treatment should be limited to cases with positive tests, and that patients with negative test results should be reassessed for other conditions and treated appropriately. According to the policy, treatment based solely on clinical suspicion should only be considered when parasitological diagnosis is not possible. The 2015 Guidelines for Case Management of Malaria (Table 12) outline that for uncomplicated malaria, the recommended first-line drug is artemether-lumefantrine (AL), except for pregnant women in their first trimester who should receive oral quinine-clindamycin. The recommended second-line drug is artesunate-amodiaquine (ASAQ). For severe malaria, the preferred initial treatment of all cases is parenteral artesunate (intravenous or intramuscular). When artesunate is not available, parenteral artemether or quinine (in that order of preference) may be used. If a severe case is recognized and requires referral to a higher level facility, the first dose of intramuscular artesunate or rectal artesunate (particularly at the community level) should be administered. As of December 2018, a national guideline revision is being drafted in the form of an appendix to alter policy reflecting that rectal artesunate should only be administered to those under 6 years, per WHO.

Another strategic objective of the NMCP is to scale up and strengthen community case management of malaria (CCMm), with the intention to participate in an integrated (or iCCM) platform. The NMCP strategy states that they will contribute to CCMm by producing training materials for CHWs, coordinating supervision efforts of CHWs with trained NMCP staff, implementing partners, DHMTs, and PHU staff, and ensuring adequate supply of RDTs, ACTs, equipment, registers, treatment algorithms, and job aids in partnership with other partners. This aligns with PMI's objective to strengthen and improve the quality of community-based efforts in malaria case management, specifically through standardized training and supervision.

Data from the MIS 2016 show that healthcare seeking in the public sector among children under five with a fever increased to 63 percent in the public sector. The NMCP has identified a gap in accessing reliable data on the number of cases hospitalized for severe malaria in the public sector. Gathering information on general malaria case management in the private sector also remains a challenge. In 2010, the GoSL instituted the Free Health Care Initiative which eliminated user fees for under-fives and pregnant women, and in 2012 this was expanded to include everyone for diagnosis and treatment of malaria in the public and private sectors. However, some private facilities and clinics do not comply with the policies and guidelines on management of malaria, particularly those that have not signed a memorandum of understanding with the MoHS.

Table 12. Status of Case Management Policy and Implementation in Sierra Leone

Status of Case Management Policy in Sierra Leone according to Guidelines for Case Management of Malaria, 2015		**Currently being implemented (yes/no)? Are there plans to modify the recommendations?**
What is the first-line treatment for uncomplicated *P. falciparum* malaria?	artemether-lumefantrine	Yes
What is the second-line treatment for uncomplicated *P. falciparum* malaria?	artesunate-amodiaquine	Yes
What is the first-line treatment for severe malaria?	parenteral artesunate (intravenous or intramuscular)	Yes
In pregnancy, what is the first-line treatment for uncomplicated *P. falciparum* malaria in the first trimester?	oral quinine-clindamycin	Yes
In pregnancy, what is the first-line treatment for uncomplicated *P. falciparum* malaria in the second and third trimesters?	artemether-lumefantrine	Yes
In pregnancy, what is the first-line treatment for severe malaria?	parenteral artesunate (intravenous or intramuscular)	Yes
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	intramuscular artesunate or rectal artesunate	Yes
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	rectal artesunate	No; PMI plans to support a pilot to inform roll-out, procurement pending revision of national policy for age group.
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administrating to those ≥ 6 years)	Current written policy is for all ages.	No; Policy is currently being revised to reflect WHO guidelines limiting administration to those < 6 years

Progress since PMI was launched

In 2013, staff across all 1,200 PHUs received a refresher training in malaria case management. The next refresher training took place in 2017, with one health care worker per PHU receiving the training. National policy requires quarterly supervision visits from the national to district level, monthly from district to the PHU, and monthly from the PHU to CHW. However, one significant gap identified by the

NMCP is the need for more intensive supportive supervision and mentoring of health care workers. PMI will support these activities in four districts using FY 2017 funds.

A national scale-up of the CHW program commenced in 2017 through support of various donors (Global Fund, DFID, GAVI and World Bank). As a result, there are currently 14,538 CHWs in the country trained and equipped in iCCM. In theory, this amounts to around 1 CHW per 200-250 people within areas where a PHU is within a 3km distance, and 1 CHW per 100-150 people within areas where a PHU is farther than a 3km distance[15]. The national policy to expand CHWs was launched in 2012 with the aim to support the Basic Package of Essential Health Services, which included CCMm as part of an iCCM platform covering pneumonia and diarrheal disease. For malaria services, CHWs are to be equipped with RDTs, ACTs, rectal artesunate suppositories for pre-referral treatment of severe malaria, SBCC materials, and basic patient registers and reporting forms, and should be supplied, trained, and supervised by their respective PHUs. A national CHW database will keep track of all trainings, status, and assigned health center. The current CHW program data flows into the HMIS and will continue to do so under program expansion. Implementation also includes plans for paid incentives with support from Global Fund, UNICEF, and DFID, with incentives being based on hard to reach or easy to reach areas. A CHW Task Force has also been established to assist in coordinating efforts among partners and other MoHS sectors. One key challenge noted by the NMCP is the distribution of RDT kits among CHWs, which can result in RDT shortages at the PHU level and misuse caused by sharing of the RDT kit buffer.

Data suggest that availability of ACTs in Sierra Leone is relatively high, and the LMIS shows lower frequencies of ACT stockouts in the health facilities compared to stockouts of other essential medicines. The 2016 MIS indicated that 97 percent of under-five children with a fever and offered some form of treatment were administered an ACT. Although these indicators are encouraging, more investigation is needed on patient adherence to drug therapy and other aspects of malaria treatment. Additionally, due to lack of donor investment, management of severe malaria is an area where both commodity availability and health worker training are in need of strengthening. There are frequent stockouts of injectable artesunate at health facilities, and although a part of training and pre-referral treatment protocol for severe malaria, rectal artesunate is not currently distributed or purchased in Sierra Leone. In 2012, the International Rescue Committee conducted a Quality of Care Assessment of CCM in Kono district. The study found that only 50 percent of CHWs were able to correctly classify a child with a danger sign that needed artesunate suppositories as pre-referral treatment. With FY 2017 funds, PMI is supporting the NMCP in the development of a rectal artesunate pilot protocol to be implemented in 2019.

In private sector facilities, there are additional concerns on quality of care and data reporting plague. However, in 2018 there were 35 private facilities with signed MOUs with the MoHS. From around 800 registered pharmacy outlets, 160 private sector workers were trained in malaria RDT use. With FY 2017 funds, PMI will assist the NMCP in improving the engagement of the private sector by focusing on case management training and data collection and reporting.

To date, there have been three antimalarial therapeutic efficacy studies (TESs) conducted in Sierra Leone (in 2003[16], 2011[17], and 2016[18]). The 2016 TES (results presented in Table 13) was led by WHO

[15] Communities located in areas where people are less than 3km in distance are referred to as easy to reach areas while those greater than 3km are referred to as hard to reach.

[16] F. Checchi et al. *Evidence basis for antimalarial policy change in Sierra Leone: five in vivo efficacy studies of chloroquine, sulphadoxine-pyrimethamine and amodiaquine.* American Journal of Tropical Medicine. 2005

and looked at efficacy and safety of AL, ASAQ, and dihydroartemisinin-piperaquine (DHAPQ) across four sentinel sites, and incorporated K13 genotyping. There is a TES scheduled for 2020 to be funded and led by WHO in the same four sites, with plans for k13 genotyping.

Table 13. PMI-funded TESs

Completed TESs			
Year	**Site name**	**Treatment arm(s)/PCR-corrected efficacy**	**Plans for k13 genotyping**
2016	Makeni	ASAQ & DHAPQ/100%	Conducted; no *Pfk13* mutations found to be associated with artemisinin resistance.
	Freetown	(Assessed AL, but did not achieve sufficient sample size.)	
	Bo	ASAQ & DHAPQ/100%	
	Kenema	AL/100%	
Ongoing TESs			
Year	**Site name**	**Treatment arm(s)**	
N/A			
Planned TESs (funded with previous or current MOP)*			
Year	**Site name**	**Treatment arm(s)**	
N/A			

*Next TES planned for 2020, with planned supported by WHO.

Commodity gap analysis

Global Fund is the primary contributor of ACTs and RDTs in Sierra Leone. PMI aims to contribute some resources to filling national quantification gaps for RDTs (Table 14) and ACTs (Table 15).

[17] F. Sahr et al. *Assessment of the Therapeutic Efficacy of Two Artemisinin-Based Combinations in the Treatment of Uncomplicated Falciparum Malaria among Children Under 5 Years in Four District Hospitals in Sierra Leone*. Sierra Leone Journal of Biomedical Research. 2013

[18] NMCP Report. *Efficacy and Safety of ASAQ, AL, and DHAPQ for the Treatment of Uncomplicated Plasmodium falciparum Malaria*. 2018

Table 14: RDT Gap Analysis

Calendar Year	2018	2019	2020
RDT Needs			
Total country population [1]	7,776,871	8,025,731	8,282,554
Population at risk for malaria	7,776,871	8,025,731	8,282,554
PMI-targeted at-risk population	7,776,871	8,025,731	8,282,554
Total number of projected fever cases [2]	7,876,035	8,038,156	8,211,867
Percent of fever cases tested with an RDT	65%	65%	65%
Total RDT Needs [3]	**5,119,423**	**5,224,801**	**5,337,714**
Partner Contributions			
RDTs carried over from previous year		*0*	*544,546*
RDTs from Government			
RDTs from Global Fund	3,090,675	4,182,814	4,221,262
RDTs from other donors			
RDTs planned with PMI funding		1,586,533	733,934
Total RDTs Available	**3,090,675**	**5,769,347**	**5,499,742**
Total RDT Surplus (Gap)	**(2,028,748)**	**544,546**	**162,028**

[1] National quantification, based on 2015 Population Census and a growth rate of 3.2%.

[2] Calculation of projected fever cases were quantified based on the following assumptions: According to the 2015 Population Census, the under 5 age group represents 13.23% of the population and it is assumed that this group will experience an average of 2 fever episodes annually. For the remaining population, one fever episode per year is assumed. The quantification also takes into account a gradual reduction in fever episodes over time (9.6% in 2018, 10.6% in 2019, and 11.5% in 2020, respectively).

[3] Use of microscopy is estimated at 15%. Healthcare utilization is estimated at 90%; Public health system use is estimated at 90%.

Table 15: ACT Gap Analysis

Calendar Year	2018	2019	2020
ACT Needs			
Total country population	7,776,871	8,025,731	8,282,554
Population at risk for malaria	7,776,871	8,025,731	8,282,554
PMI-targeted at-risk population [1]	7,776,871	8,025,731	8,282,554
Total projected number of malaria cases [2]	3,071,654	3,134,881	3,202,628
Total ACT Needs [3]	**3,378,819**	**3,448,369**	**3,522,891**
Partner Contributions (to PMI target population if not entire area at risk)			
ACTs carried over from previous year	0	289,078	290,387
ACTs from Government	0	0	0
ACTs from Global Fund	3,667,897	2,639,678	2,664,225
ACTs from other donors	0	0	0
ACTs planned with PMI funding	0	810,000	881,939
Total ACTs Available	3,667,897	3,738,756	3,836,551
Total ACT Surplus (Gap)	289,078	290,387	313,660

[1] National quantification, based on 2015 Population Census and a growth rate of 3.2%.
[2] 60% positivity rate based on DHIS2 (see RDT table).
[3] Additional 10% to account for negative cases treated, presumptive treatment, and buffer.

Quantification of microscopes

PMI plans to procure microscopes and laboratory reagents to supply the regional/district-level hospitals, specifically those receiving training in malaria laboratory diagnostics. Final quantification will based on assessed need once service delivery partner is established.

Quantification of IV artesunate

For severe malaria drug quantification, it was assumed that around 5% of uncomplicated malaria cases progress to severe disease (around 150,000 annually). Taking into account the need for injectable artesunate at the facility level, PMI plans to contribute to the national annual commodity pool. The average number of 60mg vials needed for children under 5 is 3 vials; children between 5 and 14 years is 6 vials, and for persons over the age of 14 is 9 vials. Considering a shipment of around 550,000 from Global Fund in 2018 and expected arrival of 600,000 vials in 2019 from PMI using FY 2017 funding, PMI plans to procure around 300,000 vials of injectable artesunate to be used at health facilities in FY 2018 and 300,000 vials in FY 2019. PMI Sierra Leone will continue discussions in country to monitor the national quantification needs for injectable artesunate and how PMI investments can complement the procurements of other donors.

Quantification of rectal artesunate

The current national policy supports use of rectal artesunate for pre-referral treatment in peripheral health facilities and at the community level but is currently not being utilized in Sierra Leone. With FY

2017 funds, PMI plans procurement of 6,000 100mg suppositories for pre-referral treatment, supplying a pilot at community/facility level in a defined area (to be determined). This procurement is current pending the draft revision of the national policy from all age groups to those under six years of age. PMI will also support the protocol development and implementation of the pilot. PMI will await the results of the rectal artesunate pilot and assist through the quantification working group to assess the true quantification need for nationwide rollout for any future procurements. No procurements are currently planned with FY 2018 and FY 2019 funds.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
With FY 2018 and FY 2019 funding, PMI will procure quantities of ACTs, RDTs, and injectable artesunate to contribute to national commodity needs, complementing Global Fund investments. Building on the current support to plan and develop protocols, FY 2018 funds will support implementation of a rectal artesunate pilot (area to be defined) and those results will inform future donor funding to scale up the implementation.

PMI aims to complement CDC laboratory strengthening efforts by focusing on malaria diagnostics and microscopy at the national reference laboratory level and the district level which will include the continued development of a national slide bank. PMI will also develop a nationwide microscopy training to support 1 microscopist from each of the 14 districts, with supplemental procurement of microscopes and laboratory supplies to support the capacity building of the National Reference Laboratory and training for district microscopists.

At facility-level, PMI will fund supportive supervision/mentoring efforts of health care workers in diagnostics and treatment, with emphasis on management of severe malaria, in four districts. At community-level, PMI will collaborate with other donors in the same four districts to support the planned scale-up of the iCCM program through the contribution of resources for training and supervision of CHWs.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

4. Cross-cutting and other health systems strengthening

In order to successfully implement the aforementioned activities, PMI Sierra Leone supports a suite of activities that cut across and benefit insecticide- and drug-based prevention and case management activities. For example, availability of high-quality commodities is necessary to ensure high ITN coverage and effective case management, and health-seeking behavior of individuals and communities is necessary to improve coverage of all interventions. In addition, the gains achieved in malaria control in Sierra Leone can only be sustained if there are strong health systems and local capacity. Hence, systems strengthening and capacity building are intrinsic in all PMI intervention-specific activities previously mentioned (e.g., training and supervision of health workers, technical assistance for planning and monitoring interventions, etc.). Non-intervention specific or cross-cutting health systems strengthening activities are described below.

a. Pharmaceutical management

NMCP/PMI objectives

Under the MoHS, the Directorate of Drug and Medical Supplies (DDMS) is responsible for pharmaceutical management activities. The primary drug regulatory body is the Pharmacy Board of Sierra Leone, which oversees quality and pharmacovigilance activities. Building off of previously published documents on procurement practices (ex. 2012 National Medicines Policy and the 2010 Sierra Leone LMIS Standard Operating Procedure Manual), in 2016 a Malaria Procurement and Supply Management Plan was developed in close collaboration with the Pharmacy Board of Sierra Leone and the TB and HIV/AIDS national programs. Established in 2012, the National Pharmaceutical Procurement Unit (NPPU) was to be responsible for procurement, storage and distribution of general health commodities. The NPPU was to take on that full responsibility in 2014, however a number of challenges, including the EVD outbreak, have prevented that from happening. After a series of challenges and concerns regarding transparency and accountability, the NPPU underwent a reform which involved both the macro-level governance, as well as technical pharmaceutical supply management. In August 2017, an act was signed to form the National Medical Supplies Agency (NMSA), a new body to replace the NPPU. To date, the National Medicine Supplies Agency is still not functional and likely will not be operational until 2019. In the meantime, DDMS has been performing all of the supply chain functions. Until the GoSL system is formally established, the Free Health Care Initiative drugs and supplies, as well as malaria commodities, are distributed by UNICEF and supported through donor funding. The supply chain in Sierra Leone currently reflects an informed "push system" although progress is being made to improve the reliability of data and to move information from the LMIS into the HMIS.

Progress since PMI was launched

After the initiative was launched in Sierra Leone, PMI procured its first orders of commodities for Sierra Leone, including ACTs, RDTs, injectable artesunate, and ITNs for routine distribution. The commodities are on order and expected to arrive in the first half of 2019. With FY 2017 funding, PMI is also supporting technical assistance in supply chain strengthening.

A national quantification exercise was conducted during the Global Fund grant writing process earlier in 2018 while PMI partners were not yet in country. PMI supported a two-week malaria commodity quantification training and exercise in August/September 2018, which was attended by NMCP, DDMS, a District Health Team member, and pharmacists from health facilities in Freetown. This was the first meeting of the Malaria Commodity Quantification technical working group (TWG). All participants participated in the overview of forecasting and supply planning and then NMCP and DDMS staff were trained on the use of Quantimed (forecasting) and PipeLine (supply planning) tools. This core team conducted the quantification. The assumptions and final forecast were reviewed by the broader NMCP team and DDMS. The quantification exercise also highlighted the challenges with the consumption data. The data reported through the LMIS (a combination of mSupply and Channel) is unreliable and even when it is reported it is often not used. Given the importance of coordinating NMCP and donor efforts for supply chain, future Malaria Commodity Quantification TWG meetings will involve relevant stakeholders to inform and plan donor and domestic procurements.

With FY 2017 funding, PMI also supported a warehouse assessment for the four warehouses storing malaria products. The assessment found challenges in real-time inventory tracking, poor temperature management at warehouses, and need for training at district and PHU level in inventory management. The MOH's long term plan is for all health commodities to be housed in one warehouse constructed

with Global Fund support. In the meantime, the assessment highlighted some short term improvements that can be used to help ensure the quality of the malaria commodities, such as integrating mSupply with an enterprise resource planning (ERP) tool, installation of ambient temperature monitoring instruments, and holding a network and inventory optimization workshop for DDMS operations staff.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
In collaboration with Global Fund, CHAI, UNICEF and other partners, PMI will work to strengthen the supply chain management in Sierra Leone. PMI will participate in the Malaria Commodity Quantification TWG to ensure coordination among stakeholders and donors on malaria commodity procurements and review updated forecasts and supply plans to ensure continued availability of annual malaria commodities in Sierra Leone. The TWG will enable Global Fund and PMI to coordinate their procurement orders and ensure there are no stockouts and similarly avoid overstock situations to avoid the risk of product expiries.

One of the biggest challenges for the supply chain in Sierra Leone is the unreliable malaria commodity consumption data. Although central level commodity stocks are generally available, the peripheral level health facilities sometimes experience stockouts due to poor stock management reporting practices. PMI will collaborate with CHAI and other partners to strengthen the collection and use of malaria commodity consumption data in an effort to address the stock management issues. With CHAI focused on rollout of mSupply at the central level and some district medical stores, PMI will complement efforts by supporting the district health management teams and public health facilities with improvements in data reporting, review and use of the LMIS data. PMI will also support routine ITN distribution from the central level to district health stores and health facilities (see ITN section), as well as warehousing and distribution costs for PMI's procurements of ACTs, RDTs, and severe malaria drugs.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

b. Social and behavior change communication

NMCP/PMI objectives

Social and behavior change communication (SBCC) falls under one of the core objectives in Sierra Leone's 2016-2020 national strategy. This objective seeks to provide knowledge to the population such that at least 80 percent practice correct malaria prevention and treatment measures by 2018 and onwards. In 2017, through support through the Global Fund, the NMCP developed a Malaria Elimination Behavior Change Communication Strategy 2017-2022. The goal of the strategy is to serve as a guide for the design and implementation of malaria SBCC interventions at national, state, LGA and to other malaria donors, partners and stakeholders.

Critical to achieving the goals of the strategic plan is the willingness and capacity of partners to dedicate resources towards the development and implementation of succinct, accurate, and effective behavior change activities through a variety of channels. The NMCP chairs a national malaria SBCC task force comprised of many stakeholders and public and private sector partners implementing SBCC activities. As a part of the iCCM platform, SBCC messaging is also an important component of CHW trainings.

The NMCP and PMI are aligned in their goals to provide quality SBCC activities that target behaviors such as consistent and correct use of ITNs, ANC attendance and IPTp uptake and delivery, prompt care-seeking for fever and for more severe disease symptoms, adherence to prescribed treatment, and overall knowledge about the cause of malaria (Table 16).

Table 16. Behavioral and Communication Objectives for Key Malaria-Related Behaviors

Behavioral Objective 1	**Baseline**	**Target**
Maintain and deepen high knowledge of malaria prevention and treatment practices	85%*	100%**
Communication Objective (s)	**Baseline**	**Target**
1. Increase proportion of targeted audience[19] who name only mosquito bites as the cause of malaria	94%*	100%**
2. Increase proportion of targeted audience who feel that consequences of malaria are serious	NA	
3. Increase proportion of targeted audience who know that the correct treatment for malaria is ACTs	85%*	100%**
Behavioral Objective 2	**Baseline**	**Target**
Individuals consistently[20] sleep inside an ITN	39%*	80%**
Communication Objective (s) – CO	**Baseline**	**Target**
1. Maintain the proportion of targeted audience who know that sleeping inside an ITN prevents malaria	90%*	+3%
2. Increase proportion of targeted audience who believe in the efficacy and safety of ITNs to prevent malaria	NA	
Behavioral Objective 3	**Baseline**	**Target**
Pregnant women take at least three or more doses of intermittent preventive treatment of malaria (IPTp) during ANC visits	26.8%***	80%**

[19] Audience categories require finer-grained segmentation

[20] Consistent use is defined as sleeping under a treated bed net, every night, all night long, and all year round.

Communication Objective (s) – CO	**Baseline**	**Target**
1. Increase proportion of targeted audience who know that IPTp protect mother and baby from malaria in pregnancy	NA	80%**
2. Increase proportion of targeted audience who believe they can go to ANC as soon as they think they might be pregnant[21].	46.4%***	80%**
Behavioral Objective 4	**Baseline**	**Target**
Caregivers seek prompt[22] and appropriate care for signs and symptoms of malaria	50%*	80%**
Communication Objective (s) – CO	**Baseline**	**Target**
1. Increase proportion of target audience with knowledge that early presentation for malaria treatment leads to better outcomes	NA	
2. Increase proportion of target audience with improved perceptions of facility and/or community based malaria treatment services	NA	
Behavioral Objective 5	**Baseline**	**Target**
Caregiver seeks appropriate malaria treatment for child when sick.	71%*	80%**
Communication Objective (s) – CO	**Baseline**	**Target**
1. Increase proportion of target audience who get the appropriate treatment for the child when s/he has malaria	71%*	80%**
PROVIDER BEHAVIOR		
Behavioral Objective 1	**Baseline**	**Target**
Providers adhere to national malaria case management (diagnosis and treatment) guidelines	74.5%****	100%
Communication Objective (s) – CO	**Baseline**	**Target**
1. Increase proportion of providers who know the only way to accurately diagnose malaria is with a test (rapid diagnostic test [RDT] or microscopy)	NA	
2. Increase proportion of providers who trust/belief in the efficacy of RDT to diagnose malaria	NA	
Behavioral Objective 2	**Baseline**	**Target**
Providers adhere to national malaria in pregnancy guidelines	NA	
Communication Objective (s) – CO	**Baseline**	**Target**
1. Increase proportion of providers who know the national guidelines for IPTp dosing (timing and frequency)	NA	
Notes		
* Source: Sierra Leone MIS 2016 ** Source: Sierra Leone Malaria Control Strategic Plan 2016-2018. ***Source: Sierra Leone MICS 2017 ****Source: Sierra Leone SARA, 2017		

Status since PMI was launched

Findings from household surveys indicate that there is a relatively high level of awareness of malaria prevention and control at the community level. Of women interviewed between the ages of 15 and 49,

[21] This is defined as women who attend ANC during the first trimester.

[22] Prompt care is defined as care sought within 48 hours from onset of fever.

for example, 94 percent reported knowledge that mosquito bites led to malaria and 90 percent reported knowledge that treated mosquito nets could help prevent malaria (MIS 2016). Despite high awareness regarding ITNs, there are still gaps in improved practice on indicators such as ITN use and IPTp uptake. Additionally, given the high disease burden and case fatality seen due to malaria, there is a need to further encourage prompt care-seeking behavior and recognition of severe disease, especially in small children. The EVD outbreak also affected the health system and community structures, and influenced social and community norms, including timely malaria care-seeking practices during the outbreak.

To date, the majority of malaria-specific SBCC activities in Sierra Leone have utilized interpersonal communication channels through health facilities, CHWs, street theater via local drama groups, and community leaders. In addition, community and school-based health clubs (2,236 and 780, respectively) have been supported by the Global Fund malaria grant, focus on face-to-face communication activities within a given community and are tied to nearby PHUs, where they are to receive training in malaria prevention and control. In addition, mass media has been utilized in the form of radio broadcasts (with 39 participating stations) and billboard signs (in all 14 districts).

The interfaith community in Sierra Leone has also played an important role in malaria SBCC. Between 2011 and 2016, the Tony Blair Faith Foundation engaged religious leaders, both imams and pastors, in training on malaria prevention and control, Approximately 700 faith leaders were trained to offer messaging during religious services and interactions, and 20,000 “faith champion volunteers” visited households providing interpersonal communication. Messages focused on treatment-seeking behaviors, use of IPTp, and ITN use. The project closed in September 2016 and evaluation results are pending. The NMCP is currently looking for opportunities to continue this work through faith-based organizations and in particular will ask faith leaders to assist with mobilizing the community during the 2017 mass ITN campaign.

In 2016, a partner mapping exercise was conducted by the NMCP and CRS/Global Fund to identify how many partners are working in the field, where they are concentrated, and what types of malaria interventions they are focusing on. A total of 28 partners were identified as conducting malaria activities in Sierra Leone, with each district having between 8 and 17 total partners present. The results of this exercise suggested that 22 of the 28 partners implement malaria SBCC activities, raising concern that with the roll-out of multiple methodologies and messages, there is a lack of cohesiveness in key communication and mobilization efforts.

Following the partner mapping exercise, the Global Fund conducted a qualitative malaria-specific assessment and barrier analysis in January – February 2017. The assessment objectives were to

- review the existing communication strategies used by Global Fund partners and other institutions in the country in order to identify those messages that are most efficient and effective;
- identify behavioral biases and non-behavioral determinants that may be the reason for the continuing high malaria prevalence;
- suggest other communications and behaviorally informed strategies that could be more effective and culturally appropriate; and
- make specific recommendations to improve behavior change strategies conducted by partners to sustain behavior change.

The assessment took place in eight districts across the four regions (Koinadugu, Bombali, Pujehun, Bo, Kailahun, and Kenema) and were selected based on malaria prevalence rates in the 2016 MIS. Focus

groups and key informant interviews were conducted to further understand barriers to uptake of SBCC implementation, drivers of behaviors and gaps. Results from the assessment showed that while knowledge on malaria prevention messages remains high, uptake of prevention, care and treatment practices remain a challenge. For example, some focus group participants in Pujehun reported that they do not always have the intention to seek care within 24 hours and in some cases, will give medications at home before taking a child to the hospital. Similarly, participants reported knowing that ACTs should be taken to treat malaria; however, they indicated they would discontinue medications when they and/or their child is feeling better. Some responses from key informant interviews indicated some communities have enacted by-laws or imposed fines for individuals who used ITNs for purposes other than sleeping inside it as a method to improve net use.

Given the findings included in the report, there is urgent need for better coordination of partners and innovative strategies to improve uptake of priority malaria behaviors. Those behaviors include: (1) sleeping inside an Insecticide Treated Net (ITN) by children less than five years of age, (2) sleeping inside an ITN by pregnant women, (3) uptake of at least three doses of IPTp, (4) and care seeking within 24 hours when a child less than five years of age has a fever[23]. Based on the findings of the assessment, the Global Fund supported the NMCP in the development of the Malaria Elimination Behavior Change Communication Strategy 2017-2022.

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
PMI plans to support the NMCP, other partners (government and non-government) and other institutions in delivering high-quality, targeted SBCC programming. Given the multiple partners implementing malaria SBC activities, PMI will play a critical role in improving coordination activities that regularly employ systematic, competency-based assessments of institutional SBCC capacity as a means to inform design of activities and to measure their impact. For example, PMI will coordinate with the Global Fund to support monitoring and evaluation efforts (e.g., implementation of a Malaria Behavior Survey) for SBCC in addition to ongoing monitoring of program output activities.

Capacity strengthening activities will address the unique needs of structures and personnel at the national and sub-national levels and include the development of an implementation plan for the Malaria Elimination Behavior Change Communication Strategy 2017-2022 with FY2018 funds. With FY 2019 funds, will be used to provide technical assistance and capacity building to the NMCP and district level for implementation activities. PMI will support SBCC for control activities that include the following objectives: (1) maintain and deepen high knowledge of malaria prevention and treatment practices; (2) consistent ITN use; (3) increased uptake for IPTp (3+ doses); and (4) prompt and appropriate care seeking.

PMI will support SBCC activities in up to four districts and ensure close collaboration between SBCC and service delivery partners to coordinate demand- and supply-side efforts and improve the quality of SBCC strategies that are culturally acceptable within the context of health services. Given the plan to pair behavior change activities with service provision activities, it was determined, that the district-level SBCC activities would take place in the same four districts as the service delivery activities. However, at the national level, SBCC activities will work to build capacity of NMCP and other SBCC stakeholders. Activities will encourage health-seeking behavior at the community level, facilitate linkages between households and service facilities and, finally, strengthen providers to serve as a channel for behavior

[23] These behaviors were identified as priority by the NMCP together with CRS/Global Fund.

change. To encourage health-seeking behavior at the community level, PMI will support a malaria behavior survey to assess prevention behaviors in order to improve program activities. Provider activities will focus on two factors that influence provider behavior - opportunities and motivations – where the evidence indicates behavior can be influenced. Technical assistance visits will also be supported by PMI in FY 2018 and FY 2019.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

c. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The Sierra Leone NMCP's SM&E strategic objective is to strengthen surveillance, monitoring, evaluation and operational research for effective program management. The NMCP aims for at least 95% of health facilities reporting routinely on malaria program performance by 2020. To achieve this objective, the NMCP supports the following key strategies:

- Improve on malaria data collection and reporting through HMIS (public and community);
- Improve on data demand and use at all levels;
- Conduct regular malaria surveys/evaluations;
- Strengthen routine epidemiological, parasitological and entomological capacity for malaria surveillance; and
- Develop and implement an Operational Research Agenda to generate evidence for decision making.

The NMCP's SM&E strategy is coordinated with the national SM&E strategy and is currently supported by the Global Fund, with UNICEF and WHO providing technical and material assistance (Table 17). The Global Fund, in particular, is focusing on strengthening the overall SM&E system by providing resources to the DPPI to train staff on DHIS2 software and to engage the University of Oslo in providing on-going technical support. The Global Fund is also providing resources to train SM&E officers at the district level, but their efforts are across the entire health program and not specific to malaria.

Table 17. Surveillance, Monitoring, and Evaluation Data Sources

Data Source	Survey Activities	Year								
		2012	2013	2014	2015	2016	2017	2018	2019	2020
Household surveys	Demographic Health Survey (DHS)		X						(X)*	
	Malaria Indicator Survey (MIS)		X			X			(X)	
	Multiple Indicator Cluster Survey (MICS)						X			
Health Facility surveys	Service Provision Assessment (SPA)								(X)	
	Service Availability Readiness Assessment (SARA) survey						X			
Malaria Surveillance and Routine System Support	Support to parallel malaria surveillance system						X	X	(X)	(X)
	Support to HMIS						X	X	(X)	(X)
	Support to Integrated Disease Surveillance and Response (IDSR)						X	X	(X)	(X)
	Support to LMIS						X	X	(X)	(X)
Therapeutic efficacy monitoring	*In vivo* efficacy testing					X				(X)
Entomology	Entomological surveillance and resistance monitoring							X	(X)	(X)

*Planned for 2019 with some support from PMI from FY 2017; however, there remains a donor funding gap and implementation is currently delayed.
(X) – Planned activities, any funding source

Progress since PMI was launched

Routine Data:
In 2008-2009 Sierra Leone began to roll out the DHIS2 software as part of a pilot facilitated by WHO and the Health Metrics Network (HMN). The software went through many cycles of improvements in order to be able to function in Sierra Leone. Until the end of 2016, NMCP reporting was vertical, hosting a customized DHIS2 at NMCP to enhance completeness, timeliness and reporting. Full integration of the software began in 2017 and it is currently used in all 13 districts and is managed by DPPI. Each health facility captures daily data on several registers, and at the end of the month, register information is summarized on nine monthly summary forms (PHU1 – PHU9). These forms are then sent to the district SM&E officer by the fifth of the month. Upon receipt of the forms, the district SM&E officer and data entry clerk have ten days to input the information into DHIS2 by the fifteenth of the month. In spite of the fully integrated system, there are significant delays in data processing as well as data quality challenges, which are due to several factors including a high workload.

A quick review of the DHIS2 reporting completeness (98 percent) and timeliness (90 percent) data show there have been marked improvements since 2016 where completeness ranged from 0 to over 90 percent in some districts along with other improvements (Table 18 snapshot of indicators[24]). While the

[24] Additional indicators not included in the table include # of ITNs distributed through mass campaigns; # of ITNs distributed through continuous distribution; proportion of children under one year attending EPI services who received SP for IPTi for malaria.

performance indicators are high, there is reason to believe data quality is low although completeness and timeliness have improved. DQAs will help to understand the extent to which the data reported through HMIS is of quality. DPPI's strategy is to further decentralize HMIS data management down to the chiefdom level (there are a total of 149 chiefdoms in the country), with a goal of having PHUs submit their monthly PH forms to the chiefdom instead of to the districts for compiling and data entry. As part of this effort, electronic data entry at the chiefdom level by PHU In-Charges is currently being pilot tested[25] in Bo and Kenema.

In addition to HMIS, there is a functioning WHO-supported Integrated Disease Surveillance and Response (IDSR) system in Sierra Leone[26], which includes malaria as one of the notifiable diseases. This surveillance system, which produces both weekly and monthly summaries, is based on HMIS data, serves as a secondary source for routine malaria data, and is supported by DPC.

[25] By shifting data entry activities to the chiefdom level, district level staff (SM&E officer, malaria focal persons) will have time to focus their efforts on data quality, analysis and use, and supportive supervision.

[26] IDSR is support by the Disease Prevention and Control Unit within the Ministry of Health.

Table 18: Programmatic Performance January – June 2017 and 2018*

Indicator	January - June 2017			January - June 2018		
	Target	Verified Result	Achievement	Target	Unverified Result	Achievement
CM-1a: Proportion of suspected malaria cases that receive a parasitological test at public sector health facilities	100% (2,411,413)	98% (1,464,068/1,494,963)	98%	100% (2,483,106/2,486,100)	100% (1,465,664/1,468,788)	100%
CM-1b: Proportion of suspected malaria cases that receive a parasitological test in the community	100% (232,864)	96% (302,893/315,805)	96%	100% (249,216/249,216	98% (380,202/386,401)	98%
CM-2a: Proportion of confirmed malaria cases that received first-line antimalarial treatment according to national policy at public sector health facilities	100% (1,219,911)	101% (849,133/842,145)	101%	100% (1,132,493/1,132,493)	98% (803,234/816,808)	98%
CM-2b: Proportion of confirmed malaria cases that received first-line antimalarial treatment according to national policy in the community	100% (117,680)	100% (216,239/216,201)	100%	100% (113,862/113,862)	96% (254,564/265,272)	96%
CM-3a: Proportion of estimated malaria cases (presumed and confirmed) that received first line antimalarial treatment at public sector health facilities	95% (1,215,512/1,279,486)	97% (849,133/871,938)	103%	97% (1,164,022/1,200,023)	101% (819,223/832,752)	101%
SPI-1: Proportion of pregnant women attending antenatal clinics who received three or more doses of intermittent preventive treatment (IPTp) for malaria	65% (95,121/146,339)	4% (5,253/146,339)	6%			

*Data source: NMCP: DHIS2. Data in 3 out of the 4 green boxes have percentages higher than 100 due to underestimations made during forecasting of targets for respective indicators. Actual verified results were higher in 2017. The actual results for 2018 are in process of being verified by NMCP.

Surveys:

The last nationwide DHS was conducted in 2013. PMI has provided some financial support for a planned 2018 DHS; however, there remains a donor-funding gap for full implementation. Data collection for the 2016 MIS occurred from July through August 2016. As a whole, the country reported a 3 percent decrease in malaria prevalence measured by microscopy in children age 6-59 months (43 percent in 2013; 40 percent in 2016) (Figure 1). Among the districts, the highest malaria prevalence was in Port Loko (59 percent) and the lowest in Western Area Urban (6 percent). Results also indicated a 9 percent increase in the percent of pregnant women who received at least two doses of SP (IPTp2+) compared to 2013 (62 percent in 2013; 71 percent in 2016). In 2017, Statistics Sierra Leone (SSL) conducted a MICS[27] with survey findings released in August 2018.

[27] The last MICS was conducted in 2010.

In 2017, the Ministry of Health implemented the first health services census, the SARA. This was made possible through support from DFID, the Global Fund and the National Social Security and Insurance Trust (NASSIT) and included a data quality review (DQR) and a quality of care survey (QoC). The current master facility list (MFL) was used as the default inclusion list (i.e., total sample size) for the SARA. The sample size for the DQR and QoC was 150 facilities, representing 10 percent of all health facilities and stratified to include facilities that offer malaria treatment, TB care, HCT, ANC and delivery services. The survey indicated that 74.5 percent of the suspect malaria cases were tested (RDT or microscopy) and treated appropriately, with test positive cases receiving the appropriate dose of ACT, and test negative cases receiving no antimalarial. The Northern and Eastern regions had the lowest proportion of suspect malaria cases receiving appropriate treatment (less than 70 percent).

Plans and justification for proposed activities with FY 2018 and FY 2019 funding:
The NMCP SM&E plan (2016–2020) is currently integrated and financed by the Global Fund and the GoSL, with additional activities supported by WHO. PMI support to the NMCP's SM&E strategy will complement Global Fund support and will help provide key malaria data (e.g., diagnostics, treatment, prevention) for monitoring malaria program implementation. The NMCP SM&E capacity includes four SM&E staff and three data clerks. This is sufficient to manage the current level of work, with part time assistance coming from embedded long term technical assistance.

Improving HMIS (DHIS2) data reporting and use are key priorities for the NMCP. The Global Fund is providing resources for the NMCP and DPPI to work at the national level to strengthen DHIS2 through training and technical assistance. Since the Ebola outbreak, donors have invested significantly in SM&E in Sierra Leone, particularly through the Global Fund's health systems strengthening grant. The Global Fund is also providing resources at the district level for SM&E training (across all health programs). As described previously, DPPI's strategy is to further decentralize data management down to the chiefdom level. Therefore, PMI will support the collection, reporting, and use of routine malaria data at the district and chiefdom levels through capacity building of malaria focal persons, SM&E teams, and community health officers. Additionally, PMI will help ensure that sufficient capacity exists to collect, analyze and report quality malaria data using DHIS2 through the training of personnel. Trainings and workshops will include content on use of tools for better data quality assessment (standard paper and electronic data capture) and data management and analysis. District level efforts will also strengthen data from the supply chain to ensure that commodity consumption is reported and to minimize stock-outs. The activity will provide technical assistance to malaria focal persons at districts who will provide mentoring for district and chiefdom level staff, assist with analysis and dissemination of malaria data, and participate in supervision and training of lower level staff.

As a follow-up to the 2017 health facility survey that used the SARA tool to examine all health facilities in the country, PMI will support a HFS in 2019 to assess changes in health facility malaria indicators including quality and practice of case management. The 2019 HFS will not be a census, but a sample of health facilities.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

d. Operational research

NMCP/PMI objectives

Under the NMSP-2016-2020, NMCP plans to strengthen its capacity for implementing an evidence-based malaria control program. This includes plans to establish strong collaborative research initiatives with national and international research and academic institutions. In June 2018, the NMCP, in collaboration with several academic institutions and other partners, defined their first malaria operational research agenda for the period 2018-2023. The Malaria Research Agenda's main purpose is to create a framework that can (1) document current evidence; (2) identify the research needs; (3) prioritize future research; and (4) use research to influence policy. The NMCP intends to work with its RBM partners to mobilize the required funding for the research agenda.

Progress since PMI was launched

According to a 2015 Malaria Control review[28] conducted with DFID support, several studies were undertaken in the past five years whose findings are key to policy and decision making for malaria control efforts in Sierra Leone. A summary of such studies follows.

A 2013 study on presumptive treatment of self-diagnosed malaria by Ansumana et al, found that that the majority of febrile illnesses in Bo district are self-diagnosed without clinical examination or laboratory testing. More than half of these illnesses are suspected malaria cases, which are subsequently treated presumptively with no clinical diagnostics.

In November 2010, Sierra Leone distributed over 3 million ITNs with the goal of providing protection from malaria to individuals in all households in the country. A 2012 study conducted by Bennett, et al.[29] found that of 4,620 households with equal representation in each of the 14 districts was undertaken to measure household possession and use of ITNs in Sierra Leone six months after a national mass distribution campaign. The study showed that 87.6 percent of households were found to own at least one ITN and 36 percent of households were found to possess at least one ITN per two household members. Rural households were more likely than urban households to have one ITN per every two household members, but there was no difference by socioeconomic status or household head education. Among individuals in households possessing one ITN, 76.5 percent slept under an ITN the night preceding the survey. The study concluded that the mass distribution campaign was effective at achieving high coverage levels across the population, notably so among rural households where the malaria burden is higher. These important gains in equitable access to malaria prevention will need to be maintained to produce long-term reductions in the malaria burden.

As an emergency response to the EVD epidemic, the GoSL and its partners implemented a large-scale mass drug administration (MDA) with ASAQ covering more than 2.5 million people. The MDA was conducted between December 2014 and January 2015 and focused in the districts hardest hit by EVD and with high malaria transmission. An evaluation of the impact of the MDA on malaria morbidity and the number of EVD alerts at health facilities was conducted by the NMCP and WHO. The study revealed that starting one week after the first MDA, the number of suspected malaria cases tested with RDT decreased by >42 percent (95 percent CI) and RDT-positive cases decreased by >46 percent. In the

[28] Sierra Leone: A Profile of Malaria Control and Epidemiology 2015 funded by DFID

[29] Bennett A, Smith SJ, Yambasu S, Jambai A, Alemu W, et al. (2012) Household Possession and Use of Insecticide-Treated Mosquito Nets in Sierra Leone 6 Months after a National Mass-Distribution Campaign. PLoS ONE 7(5): e37927. doi:10.1371/journal.pone.0037927

second week after the first MDA, the RDT test positivity rate (TPR) declined by 25 percent. The total malaria (clinical + confirmed) cases decreased by 45 percent and the proportion of confirmed malaria cases among all outpatient consultations fell significantly, by >33 percent. However, the trends of non-malaria outpatient cases did not change. The number of EVD alerts captured in districts that were covered by the MDA decreased by 30 percent in the first week and decreased further (>40 percent) in the four weeks after the second MDA. The non-MDA chiefdoms also saw moderate but significant changes in key malaria indicators, but EVD alerts increased during the same periods. The study concluded that MDA implementation as a temporary measure helped in reducing malaria morbidity and febrile cases that would have potentially been diagnosed as suspected EVD cases. The intervention also helped reduce the case-load to health facilities that were overloaded at the peak of the EVD outbreak. However, the effect of the MDA waned in a matter of weeks, after which malaria intensity returned to pre-MDA levels. Hence, the MDA was found to be an appropriate, albeit short-term public health intervention in the context of the EVD epidemic.

Plans and justification

No PMI-supported OR is planned for FY 2018. In FY 2019 PMI will support efforts to improve discussions and coordination between the NMCP and its partners to develop an OR study to understand the impact of housing modifications on the reduction of malaria transmission. Unlike the core-funded OR study on housing modification using eave tubes in East Africa, this project will focus exclusively on using screening in a West African context. The housing structure (large, rectangular, open eaves, several families living in a single structure) together with the challenges facing bednet use (despite bednet access) in Sierra Leone provide the ideal setting to test the use of screens (on ceilings, eaves, windows, and/or doors) to prevent mosquito entry in homes. The NMCP is strongly supportive of this project and Peace Corps Sierra Leone has indicated interest in partnering as well.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

e. Other health systems strengthening

NMCP/PMI objectives

The Sierra Leone health system has significant challenges, including a shortage of qualified staff at all levels of the system. The 2014/2015 EVD outbreak further stressed the system. The MoHS has prioritized human resources for health, health financing, the health management information system, and logistics management as the priorities for health systems strengthening. Based on lessons learned from the Ebola outbreak, the government and partners initiated measures and systems in the health sector to be better able to respond to both routine and emergency needs of the population. Following the Sierra Leone Health Sector Recovery Plan 2015-2016, emphasis was placed on mobilization of resources to build a strong and resilient health system that would be able to provide quality and timely health care to the population. The establishment of a Health System Unit under the Minister of Health, restructuring and strengthening of the national laboratory directorate, the medicine and commodity supply chain directorate, and the free health care policies are all evidence of this response.

To improve ownership and management of malaria activities, the NMCP's strategic plan prioritizes capacity building as a cross cutting intervention by strengthening the national and districts' capacity to deliver malaria control services at all levels. The NMCP aims to conduct capacity needs assessments to identify staffing gaps and to address infrastructure gaps (office space and equipment). The NMCP prioritizes strengthening core MoHS-wide management systems that are essential for effective delivery and management of malaria services, such as strengthening procurement and supply chain management

of malaria commodities, improving malaria data collection and reporting through HMIS, and strengthening coordination and partnerships in malaria.

Progress since PMI was launched

Since 2015, USAID has supported a long-term technical advisor embedded in the NMCP to assist with building capacity in management, leadership and governance. The advisor has developed a capacity building and training plan for key staff on SM&E, surveillance, and other technical areas to help build overall leadership and capacity at the national level. The advisor also assists with the coordination and development of Global Fund grants and concept notes including analysis of commodity gaps.

The NMCP supports districts to hold monthly coordination meetings with partners implementing malaria control activities and DHMTs where feedback is provided and key issues relating to malaria control are discussed. The NMCP also supports annual district integrated health sector planning to include key malaria interventions in their work plans, and conduct regular integrated supportive supervision.

The NMCP has targeted donor investment towards building the capacity of technicians across various areas, including support for trainings in entomology and monitoring and evaluation, but more resources are needed for these activities to improve both the quantity and quality of technicians at national and district levels. The NMCP also intends to address programmatic issues and challenges with informed evidenced-based solutions. To this end, the NMCP plans on strengthening research capacity in-country and partnering with research/academia and other national and international research institutions, and developed an operational research agenda and strategy in 2018, which PMI is helping to refine.

CDC initiated a short-term training on basic epidemiology through the Field Epidemiology Training Program (FETP). The three-month course is comprised of three workshops with two fieldwork periods. Five cohorts (103 participants) have been trained so far, and two additional cohorts will be trained in FY 2019, covering all 14 districts. The first cohort of the FETP-Intermediate (9-12 months in duration) completed its training in July 2018. The second cohort started in September 2018 and by the end of FY 2019, 26 epidemiologists will have been trained, counting toward the WHO ratio of 1 field epidemiologist/200,000 population. CDC is also strengthening laboratory capacity at the national reference laboratory in Freetown, including training laboratory technicians and providing equipment and supplies.

The U.S. Peace Corps has increased its presence in Sierra Leone post-EVD outbreak to 87 volunteers (36 starting in 2017 and 51 starting in 2018), 29 of which are health volunteers located in communities where they would be able provide key malaria messages. With FY 2017 funds, PMI is supporting $10,000 in small project grants for any health or education volunteer to utilize for malaria-related programming.

The U.S. Department of Health and Human Services through HRSA (Health Resources and Services Administration) is currently supporting two projects under a Workforce for Resilient Health Systems initiative in Sierra Leone. The award objectives include building a skilled fit-for-purpose-and-practice health workforce that increases the quantity and quality of health services through development of a Nursing and Midwifery Council and supporting continuing professional development programs for nurses and midwives.

Plans and justification for proposed activities with FY 2018 and 2019 funding:
The FY 2018 and FY 2019 MOP describes various HSS activities focused within the core technical intervention areas described above (training of health workers, supporting pharmaceutical management systems, community-level communications, etc.) that complement the existing work of other U.S. Government entities and other donors/partners. PMI will also continue to support Peace Corps education and health volunteers to work in malaria prevention and control and to assist the NMCP to identify and address programmatic gaps in community malaria interventions. PMI will work closely with Peace Corps to determine whether there are third-year volunteers available in 2020 to carry out dedicated malaria projects that might need support.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.

5. Staffing and administration

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Sierra Leone, one representing CDC and one representing USAID. In addition, one Foreign Service National works as part of the PMI team. All PMI staff members are part of a single interagency team led by the USAID Mission Director. All USAID Sierra Leone programs are coordinated and overseen by the USAID/Guinea Mission. The PMI team shares responsibility for development and implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for RA positions (whether initial hires or replacements) will be evaluated and/or interviewed jointly by USAID and CDC, and both agencies will be involved in hiring decisions, with the final decision made by the individual agency.

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

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

The two PMI RAs are physically based within the USAID office in Freetown but are expected to spend approximately half of their time with and providing TA to the NMCPs and implementing partners, including time in the field monitoring program implementation and impact. The number of locally-hired staff and necessary qualifications to successfully support PMI activities either in Ministries or in USAID will be approved by the USAID Mission Director. Because of the need to adhere to specific country policies and USAID accounting regulations, any transfer of PMI funds directly to Ministries or host governments will need to be approved by the USAID Mission Director and Controller, in addition to the U.S. Global Malaria Coordinator.

Please see Table 2 for a detailed list of proposed activities with FY 2018 and FY 2019 funding.