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Ghana

Malaria Operational Plan FY 2022

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

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

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AFRICOM	U.S. Africa Command
AGAMal	AngloGold Ashanti Malaria Control Programme
AGAMal	AngloGold Ashanti Malaria Control Ltd
AI	Active ingredient
AL	Artemether-lumefantrine
AMF	Against Malaria Foundation
AMTF	Africa Malaria Task Force
ANC	Antenatal care
API	Annual Parasite Incidence
AS-AQ	Artesunate-amodiaquine
BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
CE4MP	Community Engagement for Malaria Prevention
CHMC	Community Health Management Committee
CHN	Community Health Nurse
CHO	Community Health Officer
CHPS	Community-based Health Planning and Services
CHV	Community Health Volunteer
CHW	Community health worker
CLU	Clinical Laboratory Unit
CWC	Child welfare clinic
CY	Calendar year
DFID	Department for International Development
DHAP	Dihydroartemisinin–piperaquine
DHIMS2	District Health Information Management System 2
DHMT	District Health Management Team
DHS	Demographic and Health Survey
EIR	Entomological inoculation rate
EUV	End-user verification
FDA	Food and Drugs Authority
FETP	Field Epidemiology Training Program
FY	Fiscal year
G2G	Government-to-government
G6PD	Glucose-6-phosphate dehydrogenase
GhiLMIS	Ghana Integrated Logistics Management Information System
GHS	Ghana Health Service
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOG	Government of Ghana
GS1	Global Standards 1
HEFRA	Health Facilities Regulatory Agency

HPD	Health Promotion Division
HRP2	Histidine rich protein 2
iCCM	Integrated community case management
ICD	Institutional Care Division
ICT	Information communication technology
IDSR	Integrated Disease Surveillance and Response
IEC	Information, education, and communication
IPC	Interpersonal communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ISS	Integrated supportive supervision
ITN	Insecticide-treated mosquito net
KAP	Knowledge, Attitudes, and Practices
LMD	Last Mile Distribution
LMIS76	Logistics Management Information System
LSM	Larval source management
MaVCOC	Malaria Vector Control Oversight Committee
MBS	Malaria Behavior Survey
mCAPS	Malaria Community Action Plans
MICS	Multiple Indicator Cluster Survey
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MOH	Ministry of Health
MOP	Malaria Operational Plan
NAMRU-3	Naval Medical Research Unit three
NCAMM	National Competency Assessment for Malaria Microscopists
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NIRMOP	National Insecticide Resistance Monitoring Partnership
NMCP	National Malaria Control Program
NMIMR	Noguchi Memorial Institute for Medical Research
NMIMR	Noguchi Memorial Institute for Medical Research
NMSP	Malaria National Strategic Plan
OPD	Outpatient Department
OR	Operational research
OTCMS	Over the Counter Medicine Sellers
OTSS	Outreach Training and Supportive Supervision
PBO	Piperonyl butoxide
PE	Program evaluation
PMI	U.S. President's Malaria Initiative
PPME	Policy Planning Monitoring and Evaluation
RAS	Rectal artesunate suppositories
RDD	Research and Development Division
RDT	Rapid diagnostic test

RHA	Regional Health Authorities
RHMT	Regional Health Management Team
RMS	Regional Medical Stores
SBC	Social and behavior change
SCMP	Supply Chain Master Plan
SDP	Service delivery point
SM&E	Surveillance, monitoring, and evaluation
SMC	Seasonal malaria chemoprevention
SP	Sulfadoxine-pyrimethamine
SP-AQ	Sulfadoxine-pyrimethamine + amodiaquine
TES	Therapeutic Efficacy Studies
TPR	Test positivity rate
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Ghana to end malaria. PMI has been a proud partner of Ghana since fiscal year (FY) 2008, helping to decrease child death rates by 50 percent through investments totaling almost $361 million.

The proposed PMI FY 2022 budget for Ghana is $27 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Ghana using FY 2022 funds. Developed in consultation with the national malaria control program (NMCP) and key malaria stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the Government of Ghana as well as other donors and partners.

Malaria is endemic and perennial in all parts of Ghana, with varying transmission intensity and seasonal variations that are more pronounced in the northern regions. Malaria affects people of all ages in Ghana and is primarily caused by *Plasmodium falciparum* with the principal mosquito vectors being *Anopheles gambiae* and *Anopheles funestus*. Parasite prevalence in Ghana decreased by 48.7 percent from 2011 to 2019 and deaths attributed to malaria decreased from 9 per 100,000 in 2013 to 1.4 per 100,000 population in 2018.

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

- Vector Control
  - Entomological Monitoring: In coordination with the Global Fund, PMI will continue to support insecticide resistance monitoring at 30 national entomological surveillance sites and will support vector bionomics monitoring at six of these sites. PMI will additionally support insecticide resistance (14 sites), vector bionomics (7 sites), and insecticide residual efficacy (6 sites) monitoring within PMI-supported indoor residual spraying (IRS) districts.
  - Insecticide-treated mosquito nets (ITNs): PMI will support the procurement and distribution of piperonyl butoxide (PBO) synergist and dual active ingredient ITNs for the 2023 school-based distribution in all 16 regions, including an expansion to Indoor residual spraying (IRS) districts. PMI will also support procurement of PBO ITNs for a total contribution of 3,000,000 nets for the 2024 mass distribution campaign.
  - (IRS): PMI will continue to support implementation of IRS in nine districts in the Northern and North East regions.
- Human Health
  - Case Management: With FY 2022 funding, PMI will continue to support the NMCP, Regional Health Authorities, and District Health Management Teams to strengthen the test, treat, and track approach through malaria-specific laboratory and clinical Outreach Training and Supportive Supervision (OTSS) and Integrated Supportive Supervision, in-service trainings, job aids, coaching, mentorships, quarterly data analysis/review, and holistic assessments to improve laboratory confirmation and adherence to testing results. Support will encourage the engagement of regional and district health management and supervision teams to conduct biannual clinical OTSS visits at district hospitals and health centers, respectively, and Community-Based Health Planning and Services (CHPS) compounds. CHPS

outreach activities to the community (house-to-house) will also be strengthened. PMI will procure rectal artesunate and injectable artesunate in support of case management for severe malaria.

- Drug-Based Prevention: PMI plans to support supportive supervision and social and behavior change (SBC) activities to increase uptake of malaria in pregnancy interventions, including adherence to intermittent preventive treatment for pregnant women (IPTp) protocols and health worker responsiveness to patient needs, PMI will also support improved capture and understanding of consumption data to help align facilities to the national supply chain system and avoid stockouts of antenatal care commodities. With FY 2022 funding, PMI plans to expand support for seasonal malaria chemoprevention (SMC), including the procurement and temporary warehousing and distribution of sulfadoxine-pyrimethamine + amodiaquine and include five districts in Bono East in addition to the 16 in Northern, seven in Savannah, six in North East, and 11 in Oti. PMI will support operational costs associated with the CY 2023 SMC campaign in Northern, North East, and Savannah regions, which will be implemented by the Ghana Health Service.

- Crosscutting and Other Health Systems
  - Supply Chain: PMI will continue to provide technical assistance in malaria commodities quantification, including routine updates, and ongoing supply plan monitoring. To help improve visibility of malaria supply chain data, PMI will support the ongoing implementation and transition to the Ghana Integrated Logistics Management Information System. Support to warehousing and distribution for malaria commodities, including for ITNs will be continued by PMI, as will SMC implementation. PMI will also provide technical assistance for transitioning the last mile distribution support, and integrating ITNs into routine last mile distribution. PMI will support a review of policies to rationalize artemisinin-based combination therapy (ACT) stocking in line with recommendations from the ACT preference study, and support the implementation of the Supply Chain Master Plan.
  - Surveillance Monitoring and Evaluation (SM&E): In FY2022, PMI will continue to support SM&E activities as in previous years. PMI will provide technical assistance and support to improve data quality and ensure development and use of sub-district and facility-specific dashboards. PMI will also support implementation of E-tracker through the Policy Planning Monitoring and Evaluation to strengthen and improve malaria routine data, analysis, and evidence based decision making. In addition, PMI will support the Frontline Field Epidemiology Training Program (FETP) to train district, sub-district, and health center healthcare workers in data analysis and use.
  - Program Evaluation & Operational Research (PE & OR): PMI is not currently supporting any PE or OR and has no plans to do so in FY 2022.
  - SBC: PMI will continue to provide SBC technical assistance at the national and sub-national level in alignment with the country's national malaria control communication strategy. PMI will scale up support for community engagement for malaria prevention initiatives focused on empowering communities to develop and implement tailored community action plans based on the needs of their communities.
  - Health Systems Strengthening (HSS): PMI will maintain support for HSS activities as funded in previous years, including support for long-term training of individuals through the FETP, small grants to Peace Corp Volunteers, and building capacity of the Ghana Food and Drugs Authority. In addition, PMI will support institutional capacity strengthening of the Government of Ghana to promote and oversee the delivery of quality of health services in the public and private sectors. Support will also target improving coordination at the central level between the GHS, National Health Insurance

Authority, and Health Facilities Regulatory Agency, who are the national bodies jointly responsible for quality service delivery, *in public and private health facilities*.

PMI's investments are aligned with the National Malaria Strategic Plan 2021–2025, which outlines the country's strategy to achieve three main objectives: (1) reduce malaria mortality by 90 percent, (2) reduce malaria case incidence by 50 percent (using 2019 as the base year), and (3) achieve malaria pre-elimination in at least seven districts by 2025.

I. INTRODUCTION

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Ghana to end malaria. PMI has been a proud partner of Ghana since FY 2008, helping to decrease child death rates by 50 percent and through investments totaling almost $361 million.

The proposed PMI fiscal year (FY) 2022 budget for Ghana is $27 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Ghana using FY 2022 funds. Developed in consultation with the national malaria control program (NMCP) and key malaria stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the Government of Ghana as well as other donors and partners.

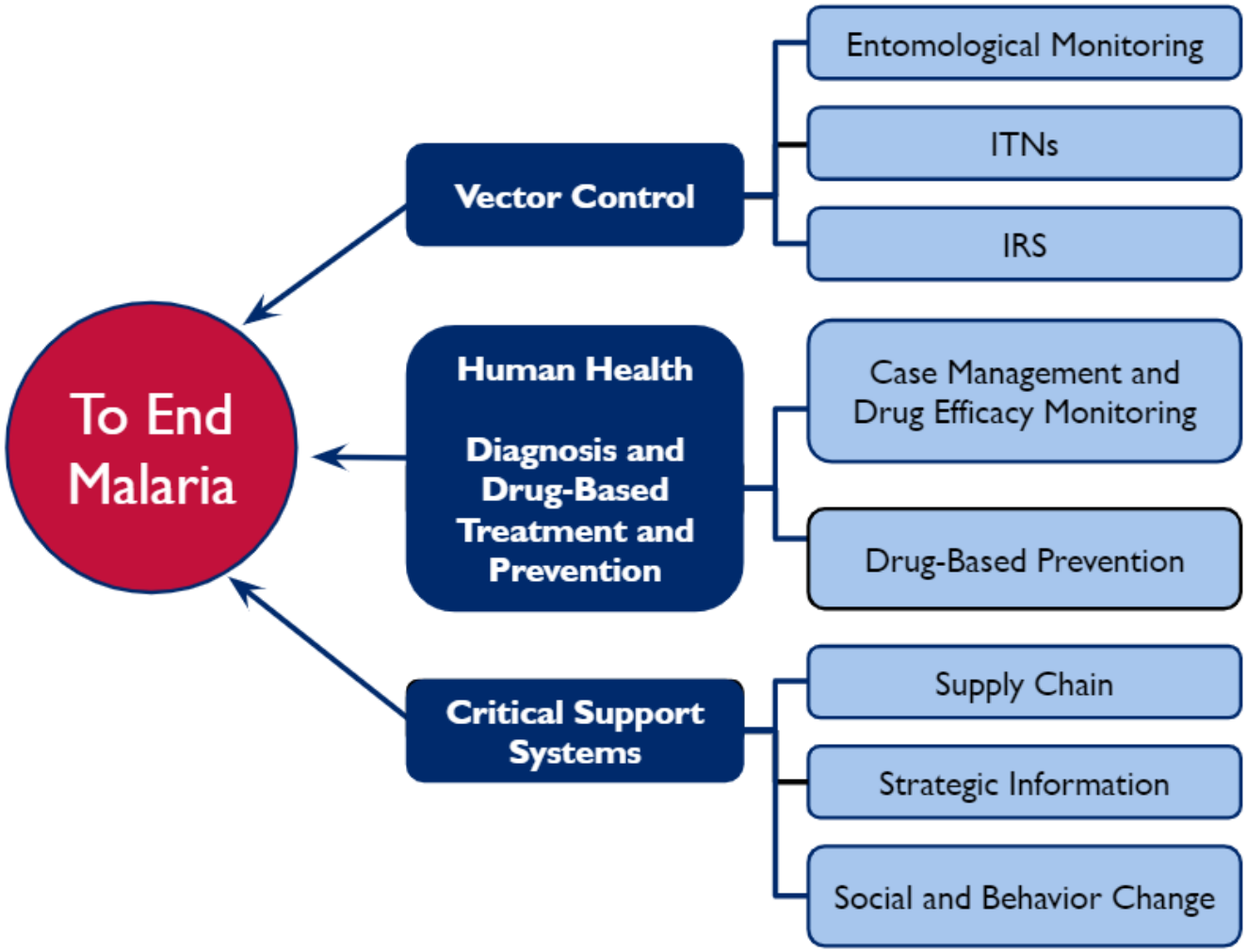
Ghana at a Glance

- **Geography:** Ghana is centrally located on the West African Coast. It has a total land area of 238,537 square kilometers, and it is bordered by three French-speaking countries: Togo on the east, Burkina Faso on the northwest, and Cote d'Ivoire on the west. The Gulf of Guinea lies to the south and stretches across the 560-kilometer coastline. Ghana is a lowland country except for a range of highlands on the eastern border. The highest elevation is Mt. Afadjato, 884 meters above sea level, found in the Akuapem-Togo ranges, west of the Volta River. Ghana can be divided into three ecological zones: the low, sandy coastal plains, with several rivers and streams; the middle and western parts of the country, characterized by a heavy canopy of semi deciduous rainforests, with many streams and rivers; and a northern savannah, which is drained by the Black and White Volta Rivers. The Volta Lake, created by the hydroelectric dam, is one of the largest artificial lakes in the world. (DHS 2014)
- **Climate and Malaria Transmission Seasonality:** Ghana has a tropical climate with temperatures and rainfall patterns that vary according to distance from the coast and elevation. The eastern coastal area is comparatively dry, the southwestern corner is hot and humid, and the north of the country is hot and dry. The average annual temperature is about 26°C (79°F). There are two distinct rainy seasons in the southern and middle parts of the country, from April to June and September to November. The North, however, is characterized by one rainfall season that begins in May, peaks in August, and lasts until September. Annual rainfall ranges from about 1,015 millimeters (40 inches) in the North to about 2,030 millimeters (80 inches) in the Southwest. The harmattan, a dry dusty desert wind, blows from the northeast and covers much of the country between December and March, lowering the humidity and visibility, and also creating very warm days and cool nights in the North. In the South, the effects of the harmattan are felt mainly in January.
- **Population in 2021:** 32,354,513 (2010 general census population with 2.4% annual increase)
- **Population at Risk of Malaria:** 100% (Ghana National Malaria Strategic Plan 2021-2025)
- **Principal Malaria Parasites:** *Plasmodium falciparum* (Ghana National Malaria Strategic Plan 2021-2025)
- **Principal Malaria Vectors:** *Anopheles gambiae* s.l. & *Anopheles funestus* (Ghana National Malaria Strategic Plan 2021-2025)
- **Malaria Case Incidence per 1000 Population:** 224.3 (World Bank Open Data 2018)
- **Under-Five Mortality Rate:** 52/1,000 live births (2017 Maternal Health Survey)
- **World Bank Income Classification and GDP:** GNI per capita $2,220 *placing Ghana among low-middle income countries* (World Development Indicators 2019)

- **Government Health Budget:** 6.7% of GDP 2019
- **Trafficking in Persons Designations, 2018-2020:** Tier 2 (Department of State, Trafficking in Persons Report, June 2020)
- **Malaria Funding and Program Support Partners Include:**
  - U.S. President's Malaria Initiative (PMI)
  - Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund)
  - World Health Organization (WHO)
  - Against Malaria Foundation (AMF)
  - Noguchi Memorial Institute for Medical Research (NMIMR)
  - AngloGold Ashanti Malaria Control Programme (AGAMal)
  - Naval Medical Research Unit three (NAMRU-3)
- **PMI Support of National Malaria Control Strategy:** Since the launching of its activities in Ghana in FY 2008, PMI supports the implementation of the 2021–2025 national malaria control strategic plan, which aims at reducing malaria mortality by 90% by 2025 using 2019 as a baseline. PMI supports NMCP's implementation of malaria preventive, curative, and systems strengthening interventions, except larval source management.
- **PMI Investments:** Ghana began implementation as a PMI focus country in FY 2008. The proposed FY 2022 PMI budget for Ghana is $27 million; this brings the total PMI investment to nearly $388 million.

PMI organizes its investments around the activities below, in line with the Ghana National Malaria Strategic Plan (NMSP) 2021-2025.

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



Building and strengthening the capacity of Ghana's people and institutions—from the central level to communities—to effectively lead and implement evidence-based malaria control activities is paramount to PMI. The majority of PMI's planned support for FY 2022, across the areas of vector control, human health, and critical support systems such as supply chain, contains elements of capacity-building and system-strengthening. PMI/Ghana will continue to rely on and engage with local partners such as the Noguchi Memorial Institute for Medical Research (NMIMR), the Ghana Health Service (GHS) and its recently established Health Promotion Division (HPD), and is expanding its local partner base to scale up the Community Engagement for Malaria Prevention (CE4MP) approach, which ensures that design and implementation of malaria prevention activities are fully owned by the community, under the facilitation of community health nurses (CHNs), led by the District Health Promotion Officers. Finally, PMI/Ghana will continue to explore private sector partnerships.

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

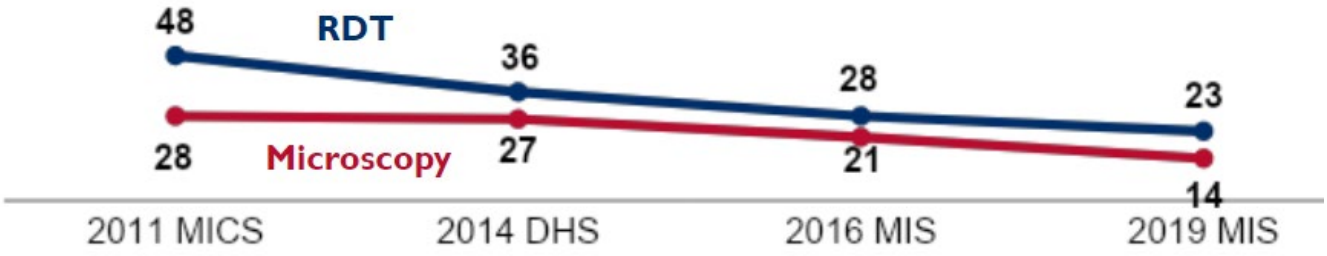
II. MALARIA SITUATION AND PROGRESS

Malaria is endemic and perennial in Ghana, with pronounced seasonal variations in the northern part of the country. The length of malaria transmission varies by geographic region in Ghana, depending on the length of the dry season (December to March), during which there is little transmission. There are two distinct rainy seasons in the southern and middle parts of the country, from April to June and September to November. The North, however, is characterized by one rainfall season that begins in May, peaks in August, and lasts until September. There is a six to seven month transmission season in a larger part of the north of the country and a shorter three to four month transmission season the upper part of the north, with the highest number of cases occurring between July and November. In the southern part of Ghana, the transmission season is nine months or more, with a small peak from May to June and a larger peak from October to November. Although Ghana's entire population is at risk of malaria infection, children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity.

Ghana has shown steady progress in malaria prevention and control over the years and has stratified malaria risk at lower levels (i.e., district and sub-district) and targeted malaria interventions based on epidemiological and entomological data. Nationwide malaria parasite prevalence in children 6 to 59 months of age (based on microscopy) declined from 28 percent in 2011 to 14 percent in 2019 (Figure 2).

Figure 2. Trends in malaria prevalence

Children 6 to 59 months of age who tested positive for malaria by microscopy and RDT (2011 - 2019)



However, large variations and significant decreases in prevalence within and between regions are noted (Figure 3). The three northern regions have shown significant declines in parasite prevalence in children under five years of age from 2011 to 2019; 44 percent to 10 percent in Upper East, 51 percent to 11 percent in Upper West, and 48 percent to 13 percent in Northern. It should be noted that following a referendum in December 2018, six new regions were created in 2019, resulting in the following changes: Northern Region was divided into Northern, North East, and Savannah Regions; Brong Ahafo Region was divided into Ahafo, Bono, and Bono East Regions; Volta Region was split into Volta and Oti Regions; and Western Region was divided into Western and Western North Regions. The Western region currently has the highest prevalence of malaria in children 6 to 59 months of age. Trends in additional key malaria indicators as measured in household surveys conducted from 2008 to 2019 (Table 1) and reported through routine surveillance systems from 2017 to 2020 (Table 2) are summarized below.

Figure 3. Malaria prevalence by geographic area

Children 6 to 59 months of age who tested positive for malaria by microscopy (2011 – 2019)

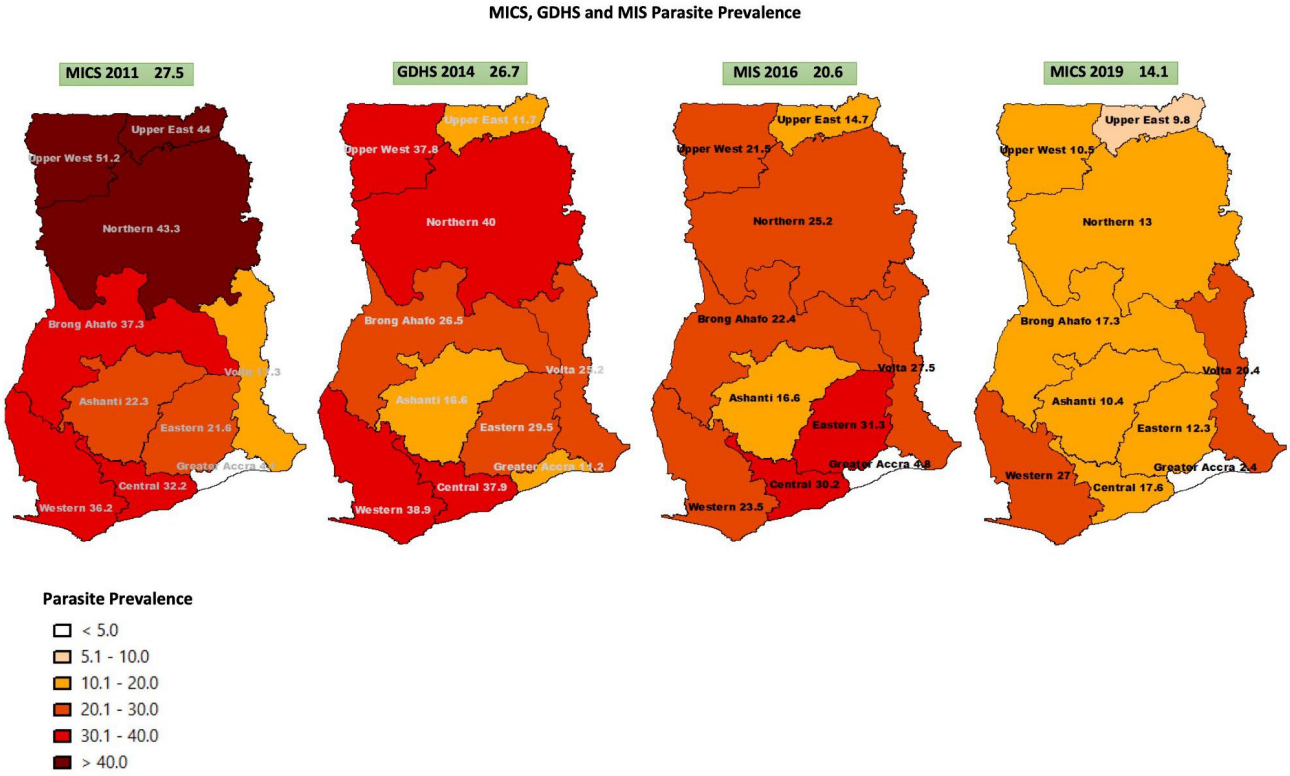


Table 1. Key indicators from Demographic and Health Surveys (DHS) and malaria indicator surveys (MIS)

Indicator	2008 DHS	2011 MICS*	2014 DHS	2016 MIS	2019 MIS
% Households with at least one ITN	42	49	68	73	74
% Households with at least one ITN for every two people	17	26	45	51	52
% Population with access to an ITN	30	38	59	66	67
% Population that slept under an ITN the previous night	21	29	36	42	43
% Children under five years of age who slept under an ITN the previous night	28	39	47	52	54
% Pregnant women who slept under an ITN the previous night	20	33	43	50	49
% Children under five years of age with a fever in the last two weeks for whom advice or treatment was sought	n/a	50	56	72	69
% Children under five years of age with a fever in the last two weeks who had a finger or heel stick	n/a	16	34	30	34
% Children receiving an ACT among children under five years of age with a fever in the last two weeks who received any antimalarial drug	12	18	37	61	46
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	44	65	68	78	80
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	28	n/a	39	60	61
Under five years of age mortality rate per 1,000 live births	80	82	60	n/a	n/a
% Children under five years of age with parasitemia by microscopy	n/a	28	27	21	14
% Children under five years of age with parasitemia by RDT	n/a	48	36	28	23
% Children under five years of age with severe anemia (Hb<8gm/dl)	19	7	8	7	4

* MICS = Multiple-Indicator Cluster Survey

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

Indicator	2017	2018	2019	2020
# Suspect malaria cases[1]	10,211,937	11,171,478	12,150,408	10,433,887
# Patients receiving diagnostic test for malaria[2]	8,911,456	10,219,893	11,388,698	9,956,501
Total # malaria cases[3]	6,133,282	6,392,973	6,703,693	5,604,746
# Confirmed cases[4]	4,893,939	5,571,453	6,115,273	5,172,803
# Presumed cases[5]	1,239,343	821,520	588,420	431,943
% Malaria cases confirmed[6]	87.3	91.5	93.7	95.4
Test positivity rate (TPR)[7]	54.9	54.5	53.7	52.0
Total # children under five years of age malaria cases[8]	1,987,385	1,960,712	2,012,352	1,637,401
% Cases in children under five years of age[9]	32.40	30.7	30.0	29.2
Total # severe cases[10]	344,213	358,538	394,027	308,887
Total # malaria deaths[11]	599	417	336	308
# Facilities reporting[12]	5,287	5,288	5,718	6,034
% Data completeness[13]	100	96.1	95	96.5

Source: District Health Information Management System 2 (DHIMS2)

[1] Number of patients presenting with signs or symptoms possibly due to malaria (e.g., fever) at OPD; [2] Rapid diagnostic test (RDT) or microscopy, all ages, outpatient **only**; [3] Total reported malaria cases; all ages, outpatient, confirmed and unconfirmed cases; [4] Diagnostically confirmed; all ages, outpatient; [5] Clinical/presumed/unconfirmed; all ages, outpatient; [6] # confirmed cases divided by total # suspected malaria cases; [7] Confirmed cases divided by # patients receiving a diagnostic test for malaria (RDT or microscopy); [8] Outpatient, confirmed and unconfirmed total #<5 cases; [9] Total # <5 cases divided by total # of malaria cases; [10] severe/complicated malaria is defined as the presence or history of fever, plus any life-threatening condition with confirmed parasitological investigation, these cases are mostly admitted;[11] All ages, outpatient, inpatient, confirmed, and unconfirmed; [12] Average Total # of health facilities reporting data into the HMIS/DHIS2 system for 12 months in that year; [13] # monthly reports from health facilities divided by # health facility reports expected.

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

Ghana's NMSP 2021-2025 aims to achieve a reduction in malaria mortality by 90 percent, reduce malaria case incidence by 50 percent (using 2019 as the base year), and achieve malaria pre-elimination in at least seven districts. The scope of the strategic plan is to consolidate the achievements gained in the last eight years and build on new interventions and strategies with inputs from a broader range of stakeholders, including health partners, community members, research community, academia, and NGOs. It defines strategies to be implemented to achieve the goal set for the NMCP in Ghana and guides its partners to re-strategize towards accelerated malaria

control and pre-elimination in targeted areas of the country. The NMSP 2021-2025 specific objectives are outlined below:

1. Protect at least 80 percent of the population at-risk with effective malaria prevention interventions by 2025
2. Provide appropriate diagnosis to all suspected malaria cases and prompt and effective treatment to 100 percent of confirmed malaria cases in accordance to treatment guidelines by 2025
3. Ensure at least 95 percent of the population will use at least one malaria preventive measure, and 95 percent of those with fever seek care within 24 hours of onset of symptoms, by 2025
4. Strengthen and maintain capacity for governance and program management to achieve programmatic objectives at all levels of the healthcare system towards malaria control and pre-elimination by 2025
5. Ensure timely and adequate supply of quality-assured malaria commodities to all service delivery points (SDPs) by 2025
6. Improve mobilization of resources and maximize the efficient use of available resources for greater public health impact by 2025
7. Strengthen malaria surveillance and M&E system towards the 2025 malaria control targets

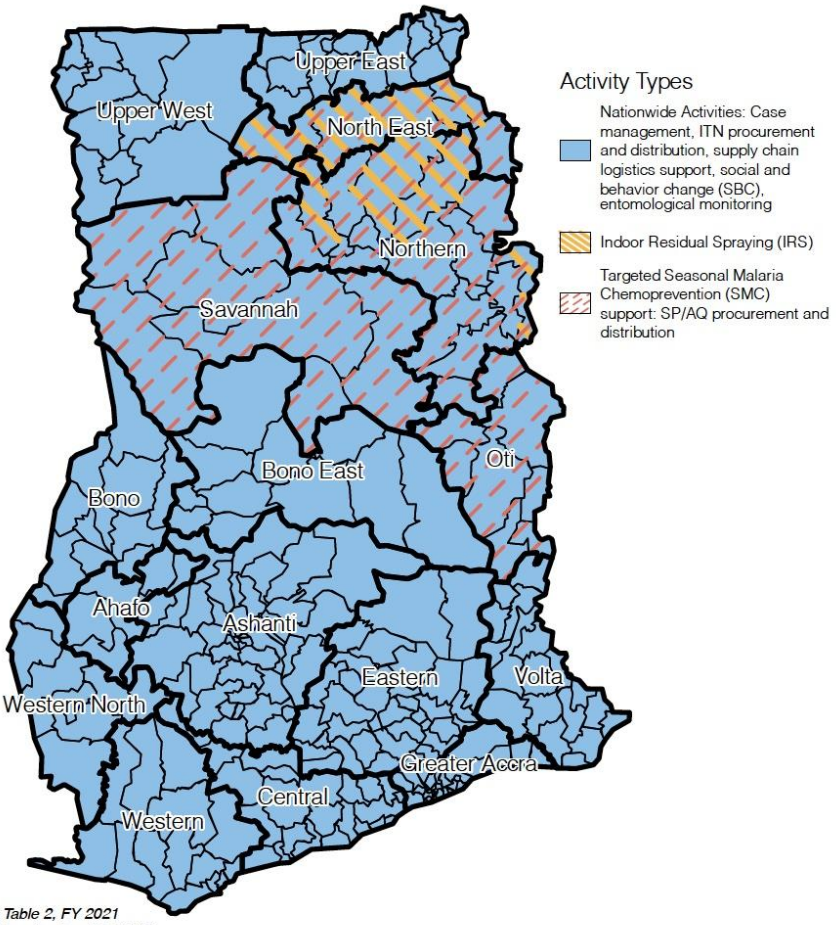
PMI and the Global Fund provide joint and coordinated support for vector control, case management, malaria in pregnancy (MIP), seasonal malaria chemoprevention, social and behavior change (SBC), supply chain management, and surveillance, monitoring, and evaluation (SM&E). PMI and Global Fund also support the procurement and distribution of malaria commodities, including drugs for the treatment of severe malaria, drugs for intermittent preventive treatment for pregnant women (IPTp) and seasonal malaria chemoprevention (SMC), malaria RDTs, insecticides for indoor residual spraying (IRS), and insecticide-treated mosquito nets (ITNs). PMI no longer procures artemisinin-based combination therapy (ACT) drugs as this has been fully covered by the Government of Ghana (GOG) and the Global Fund since FY 2018. While both PMI and the Global Fund procure ITNs for mass distribution campaigns, the Global Fund generally procures ITNs for continuous distribution through antenatal care (ANC) and child welfare clinics (CWCs), while PMI procures ITNs for school-based distribution. Other donors, such as AMF, procure ITNs for mass campaigns, as needed. PMI and the Global Fund jointly support a local research partner to conduct nationwide entomological monitoring, who also receives technical assistance from NAMRU-3 for monitoring the efficacy of antimalarials.

PMI supports nationwide malaria case management and laboratory training, malaria outreach training and supportive supervision (OTSS, as well as integrated supportive supervision (ISS), which is jointly supported with USAID/Ghana funds from the Maternal and Child Health and Reproductive Health accounts, at all levels of the health system. PMI supports MIP activities throughout Ghana through training, supportive supervision, and procurement of sulfadoxine-pyrimethamine (SP), as needed. PMI supports strengthening of the DHIMS2 with data validation, data use with wall charts, and data review meetings and implementation and expansion of an electronic tracker (e-tracker), which is an electronic patient monitoring system used in outpatient department (OPD) and ANC. PMI also supports periodic national demographic and malaria household surveys, routine surveillance, and monitoring and evaluation.

PMI and USAID/Ghana support nationwide SBC activities, including mass media and the GHS's CE4MP approach to promote preventive behaviors identified through community action plans. *PMI support for CE4MP is currently established in the Volta region and other high burden regions (Central, Eastern, and Western), and will be prioritized for expansion with the ultimate goal to reach every village.*

PMI supports targeted preventive interventions in the northern Sahelian regions of Ghana. PMI has supported IRS in the Northern and North East regions (formerly together with Savannah comprising the Northern Region) since 2008 and is currently implementing IRS in nine districts in these two regions. AngloGold Ashanti Malaria Control Ltd (AGAMal) implements IRS in all nine districts in Upper West region, three districts in the Upper East region, and one district in Ashanti region with support from the Global Fund. With support from the Department for International Development (now discontinued) and the Global Fund, the NMCP began implementing SMC in the Upper West and Upper East regions in 2015, and with additional support from PMI began implementing SMC in the Northern, North East, and Savannah regions in 2019, in Bono East and Oti in 2021.

Figure 4. Map of target areas for PMI interventions



Source: Ghana MOP Funding Table 2, FY 2021
Malaria Data Integration and Visualization (M-DIVE)

IV. PARTNER FUNDING LANDSCAPE

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

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

The tables below summarize contributions by key external partners and partner country governments in calendar years 2020-2022, providing insight into total country investments. Two new malaria grants (Ministry of Health [MOH] and AGAMal) funded through the Global Fund 2021-2023 grant cycle are just beginning. The partner country government invests substantial funding into the national-to-local infrastructure and service delivery that benefits malaria programs and many others. However, it is not always possible to attribute funding for malaria specifically from the partner country government without a standardized method. There may be similar challenges for attributing other partner funds.

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

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Crosscutting and HSS[3]	Total Per Funder
PMI	$18.2M	$1.8M	$1.5M	$1.6M	$2.4M	$2.5M	$28.0M
Global Fund	$38.6M	$7.5M	$6.9M	$3.5M	$0.9M	$1.8M	$59.2M
Total Per Category	$56.8M	$9.2M	$8.4M	$5.1M	$3.3M	$4.4M	$87.2M

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

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Crosscutting and HSS[3]	Total Per Funder
PMI	$13.3M	$4.4M	$2.1M	$2.0M	$3.1M	$3.2M	$28.0M
Global Fund	$10.1M	$5.6M	$3.2M		$2.6M	$17.2M	$38.7M
Total Per Category	$23.4M	$10.0M	$5.3M	$2.0M	$5.6M	$20.4M	$66.7M

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

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Crosscutting and HSS[3]	Total Per Funder
PMI	$13.2M	$4.5M	$2.5M	$1.6M	$1.8M	$3.5M	$27.0M
Global Fund	$8.9M	$5.9M	$3.5M		$1.2M	$10.2M	$29.7M
Total Per Category	$22.1M	$10.4M	$6.0M	$1.6M	$3.0M	$13.7M	$56.7M

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

Table 4a. Annual budget, breakdown by commodity, FY 2019/CY2020

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$3.6M	$7.7M	$5.4M			$0.01M	$0.7M		$17.4M
Global Fund[3]	$5.0M	$21.1M	$3.2M	$1.8M	$3.3M		$1.3M	$0.6M	$36.3M
Total	$8.6M	$28.8M	$7.6M	$1.8M	$3.3M	$0.01M	$2.0M	$0.6M	$53.7M

Table 4b. Annual budget, breakdown by commodity, FY 2020/CY2021

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.8M	$2.1M	$3.5M		$0.9M	$0.7M	$0.9M		$8.9M
Global Fund[3]			$2.8M	$0.5M	$2.2M				$5.4M
Total	$0.8M	$2.4M	$6.3M	$0.5M	$3.1M	$0.7M	$0.9M	$0.0M	$14.3M

Table 4c. Annual budget, breakdown by commodity, FY 2021/CY2022

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$5.1M		$4.2M		$1.3M	$0.6M	$1.0M		$12.2M
Global Fund[3]			$2.7M	$2.5M	$2.0M		$0.4M	$0.4M	$8.0M
Total	$5.1M	$0.0M	$6.9M	$2.5M	$3.3M	$0.6M	$1.4M	$0.4M	$20.2M

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

V. ACTIVITIES TO BE SUPPORTED WITH FY 2022 FUNDING

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

ANNEX A: INTERVENTION-SPECIFIC DATA

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

1. VECTOR CONTROL

NMCP Objective

In the current NMSP 2021-2025, Ghana aims to protect at least 80 percent of the population with effective malaria prevention interventions. Strategies to achieve this include; (1) universal coverage of ITNs (a net for two persons in a household through mass campaigns every three years and continuous distribution channels; (2) IRS targeting high burden areas per stratification; (3) larval source management (LSM) in targeted urban/peri-urban areas, and rural areas where breeding sites are few, fixed and findable; (4) entomological surveillance to support implementation, monitoring, and evaluation of vector control interventions; and (5) adoption of novel vector control interventions or tools approved by World Health Organization (WHO) and Ghana Food and Drugs Authority (FDA).

NMCP Approach

The National Malaria Vector Control Oversight Committee (MaVCOC) ensures safe and effective implementation and management of malaria vector control operations in Ghana and serves as the technical advisory body on vector control to the NMCP. Entomological surveillance is conducted to guide the design and implementation of vector control strategies, with the goal of collecting key indicators on insecticide resistance and vector bionomics at least one site in each of the country's 16 regions.

Per the NMSP 2021-2025 stratification, epidemiological, entomological, and other metrics were used to identify 195 (out of 260) high malaria burden districts (i.e., those with *P. falciparum* prevalence >25 percent, adjusted incidence of >250 cases per 1000 population, and under five years of age all cause mortality rate of >20 cases per 1000 population) for targeting with IRS or piperonyl butoxide (PBO) synergist or dual active ingredient (AI) nets (and SMC, if applicable). IRS is implemented with third generation insecticides according to an insecticide rotation strategy with the goal of spraying at least 90 percent of all eligible found structures in targeted areas.

Ghana's approach for deploying ITNs includes mass campaigns every three years to distribute ITNs to all households (one net for two people) in non-IRS districts, and continuous distribution of ITNs through health facilities (ANC and CWC) in all districts, and through schools in non-IRS districts (in years in between mass campaigns) to achieve high and sustained use and care. Distribution of ITNs in urban areas is targeted at communities and populations at high risk. Selection and distribution of ITNs to the district level is based on stratification and insecticide resistance data. Due to high pyrethroid resistance across the country, the NMCP does not recommend pyrethroid-only ITNs in Ghana. However, when it is not possible to uphold this recommendation, pyrethroid-only ITNs will be deployed to districts with moderate to low transmission and low-pyrethroid resistance.

LSM is implemented in Ghana to augment core interventions with application of biolarvicides in targeted areas, including urban/peri-urban areas and some rural areas where breeding sites are few, fixed, and findable. The current goal of NMCP is to map target areas and generate local data on implementation of larviciding to inform future expansion of LSM. The current LSM activities are solely supported by the GOG.

PMI Objective in Support of NMCP

PMI objectives in support of the NMCP fully align with the current strategic plan, with the exception of LSM. PMI supports the procurement and distribution of ITNs interventions through mass campaigns and continuous distribution channels, implementation of IRS in high burden areas in the North East and Northern regions, and entomological monitoring activities at the 30 national surveillance sites as well as in IRS areas. While PMI does not currently support LSM, there are plans to support a program evaluation (PE) of the LSM activity currently deployed in Ghana in FY 2021.

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Annual insecticide resistance monitoring at 30 national surveillance sites under the National Insecticide Resistance Monitoring Partnership, in coordination with the Global Fund, and at 14 additional sites in PMI-supported IRS districts
- Monthly vector bionomics monitoring at eight sites in PMI-supported IRS and unsprayed control districts in the North East and Northern regions (two of which are national surveillance sites).
- Establishment of a molecular entomology lab in Tamale for analyzing mosquito samples for the presence of *Plasmodium* sporozoites
- Identification and training of mosquito collectors at four of the national surveillance sites in Ahafo, Eastern, Oti, and Western North regions
- Distribution of over 1.2 million PBO ITNs in over 26,000 schools in 15 regions (Upper West is excluded as all districts receive IRS)
- Procurement of 4,340,000 PBO ITNs for the 2021 mass distribution campaign (supported with both FY 2019 and FY 2020 funding)
- Successful piloting of last mile distribution of ITNs in Western and Western North regions
- Technical assistance to strengthen health facility ITN distribution
- Implementation of SBC activities to promote ITN use and care in five districts in the Central region.
- Thirty-six-month ITN durability monitoring data collection
- IRS in nine districts in North East and Northern Region, spraying 329,915 structures and protecting 928,988 people
- Recruitment and training of over 2,800 seasonal workers to support IRS in nine districts in North East and Northern regions
- An increase in the number of CHNs supporting IRS from 158 to 271
- Transition from paper-based to mobile data collection tools for IRS in all nine districts
- Continued pilot spraying of animal shelters (as was initiated in 2020) in response to changing vector behaviors

PMI-Supported Planned Activities

In FY 2021, PMI will support the following activities:

- Annual insecticide resistance monitoring at the 30 national surveillance sites under the National Insecticide Resistance Monitoring Partnership (NIRMOP) and at 14 additional sites in PMI-supported IRS districts.
- Initiate monthly vector bionomics monitoring at four national surveillance sites in Ahafo, Eastern, Oti, and Western North regions.
- Monthly vector bionomics monitoring at nine sites in PMI-supported IRS and unsprayed control districts in the North East and Northern regions (two of which are national surveillance sites).
- Procure approximately 1,500,000 PBO and dual AI (where deployed during the 2021 mass campaign) ITNs for the May/June 2022 school-based distribution, including expansion to include IRS districts.
- Pilot last mile distribution of ITNs in Western and Western North regions.
- Expand implementation of SBC activities to promote ITN use and care to 13 districts in the Central region.
- Complete and publish analysis of 36-month ITN durability monitoring data.
- Provide technical assistance to strengthen health facility ITN distribution.
- Conduct IRS in nine districts in North East and Northern regions in March to May 2022.
- Complete analysis of pilot spraying of animal structures conducted in 2020 and 2021 to inform future IRS campaigns.

1.1. ENTOMOLOGICAL MONITORING

Key Goal

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

Key Question 1

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

PMI and the Global Fund jointly fund the NIRMOP, through which annual insecticide resistance monitoring is conducted in 30 sites throughout Ghana. Ghana is expanding activities in CY 2021 (once ethical approvals are obtained) to include monthly vector bionomics monitoring at all 30 national surveillance sites. PMI has been separately supporting both insecticide resistance and vector bionomics monitoring at two of the 30 sites for several years as they are located with PMI-supported IRS districts, and will expand support for vector bionomics monitoring to four additional national surveillance sites in Ahafo, Eastern, Oti, and Western North regions in CY 2021. PMI supports entomological monitoring at 14 additional sites in the IRS areas in the North East and Northern regions for a total of 16 insecticide resistance monitoring and eight vector bionomics monitoring sites (Table A-1, Table A-2). PMI supports residual efficacy monitoring of IRS insecticides in six sites.

In addition to these national surveillance sites, Ghana opened the Joint Operational Vector-borne Disease Entomology Laboratory at 37 Military Hospital in Accra with support from the U.S. Africa Command (AFRICOM) Africa Malaria Task Force (AMTF). The laboratory will establish a combined entomology research and control program to support the MOH and Ministry of Defense with mosquito surveillance, directing

insecticide applications, insecticide resistance monitoring, and mapping of potential disease-causing mosquitoes. The laboratory will also be a regional entomology hub in West Africa for other AMTF partners.

Supporting Data

Table A-1. Entomological monitoring activities

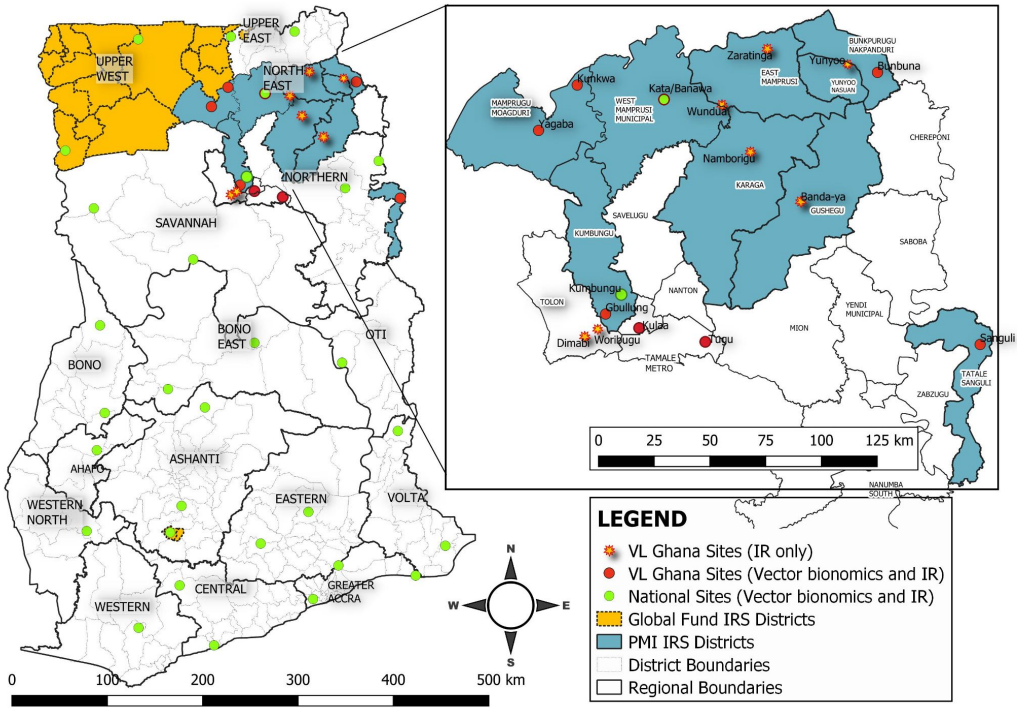
Region	Site(s)	Activities*	Supported by
Ahafo	Kenyasi	Insecticide resistance monitoring	PMI, Global Fund
Ashanti	Obuasi, Ejura, Bekwai	Insecticide resistance monitoring	PMI, Global Fund
Bono	Sunyani, Banda Ahenkro	Insecticide resistance monitoring	PMI, Global Fund
Bono East	Prang, Nkoranza	Insecticide resistance monitoring	PMI, Global Fund
Central	Cape Coast, Twifo-Ati-Nokwa	Insecticide resistance monitoring	PMI, Global Fund
Eastern	Begoro, Kade	Insecticide resistance monitoring	PMI, Global Fund
Greater Accra	Weija, Dodowa, Ada Foah	Insecticide resistance monitoring	PMI, Global Fund
Northern	Saboba, Yendi	Insecticide resistance monitoring	PMI, Global Fund
Northern	Banda-ya, Namborigu, Dimabi, Woribugu	Insecticide resistance monitoring	PMI
Northern	Gbullung, Sanguli, Kumbungu+, Kulaa, Tugu	Vector bionomics and insecticide resistance monitoring	PMI
Northern	Cheyohi, Njobilbo	Residual efficacy monitoring	PMI
North East	Wundua, Zaratinga, Binkura	Insecticide resistance monitoring	PMI
North East	Yagaba, Kata-Banawa+, Bunbuna, Kunkwa	Vector bionomic and insecticide resistance monitoring	PMI
North East	Bugyanga, Wulugu, Bunbuna, Yagaba	Residual efficacy monitoring	PMI
Oti	Kete Krachi	Insecticide resistance monitoring	PMI, Global Fund
Savannah	Sawla, Buipe	Insecticide resistance monitoring	PMI, Global Fund
Upper East	Navrongo, Zebilla	Insecticide resistance monitoring	PMI, Global Fund
Upper West	Tumu, Wecheau	Insecticide resistance monitoring	PMI, Global Fund

Region	Site(s)	Activities*	Supported by
Volta	Hohoe, Afife	Insecticide resistance monitoring	PMI, Global Fund
Western	Tarkwa	Insecticide resistance monitoring	PMI, Global Fund
Western North	Sefwi Wiawso	Insecticide resistance monitoring	PMI, Global Fund

*Insecticide resistance monitoring is conducted annually and includes insecticide susceptibility testing, as well as synergist and resistance intensity assays where appropriate. Vector bionomics monitoring is conducted monthly (March to December) to determine species composition and distribution, and measure mosquito indoor/outdoor biting rates and resting densities, parity rates, blood meal source, *P. falciparum* sporozoite rates, and EIRs. Insecticide residual efficacy monitoring is conducted monthly in IRS districts until mosquito mortality drops below 80 percent for two consecutive months.

+Denotes sites with PMI-supported IRS districts that are also national surveillance sites

Figure A-1. Entomological monitoring sites



The major malaria vectors throughout Ghana are members of the *An. gambiae* species complex, including *An. gambiae*, *An. coluzzii*, and *An. arabiensis*. In the northern part of the country where PMI supports IRS, all three species are present throughout the transmission season from March through December, but *An. gambiae* tends to be the predominant species except during the drier months at the beginning and end of the season when *An. coluzzii* is often more abundant. *Anopheles funestus* is a minor vector in some parts of the country, but generally at very low densities. The vector species are most abundant in the rural and peri-urban areas and generally bite late in the night. In the Northern and North East regions, peak vector abundance is typically June through October, but this tends to be condensed to August and September in those areas where IRS is implemented. *An. gambiae* s.l. tends to bite both indoors and outdoors, with humans being the preferred host, but data suggest that preferred resting locations for this species are outdoors with very small numbers collected inside sleeping

structures, particularly in IRS areas. An operational research study[2] conducted from 2017 to 2019 revealed that *An. gambiae* s.l. preferred to rest outside of sleeping rooms, mostly in animal shelters, in both sprayed (94.9 percent) and unsprayed (82.7 percent) areas. Mosquitoes collected from animal shelters were found to have fed predominantly on humans and over half died after being held for 24 hours, indicating previous exposure to insecticides on sprayed surfaces or ITNs. Entomological inoculation rates (EIRs) vary, ranging from 32.2 to 111.7 infectious bites per person per year in the northern parts of the country (Table A-2). This data led PMI to pilot the spraying of animal structures in five districts during the 2020 and 2021 IRS campaigns. For additional information, please refer to the most recent entomological monitoring report.[3]

Table A- 2. Distribution and bionomics of malaria vectors

Site/ District	Vector	Peak Season (months)	Preferred Biting Location	Peak Biting Time	Preferred Resting Location**	Preferred Host	Annual EIR (Mar.-Dec.)
Bunbuna/ Bunkpurugu-Nasuan	*An. gambiae* s.l.	Aug-Sept	0.53 indoor 0.47 outdoor	12:00 a.m. - 4:00 a.m.	N/A	Human	45.6
Gbullung/ Kumbungu	*An. gambiae* s.l.	July-Sept	0.42 indoor 0.58 outdoor	12:00 a.m. - 4:00 a.m.	Animal structures	Human	32.2
Yagaba and Kunkwa/ Mamprugu-Moaduri	*An. gambiae* s.l.	Aug-Oct	0.49 indoor 0.51 outdoor	12:00 a.m. - 4:00 a.m.	N/A	Human	37.0
Sanguli/ Tatale-Sangule	*An. gambiae* s.l.	June-Sept	0.58 indoor 0.42 outdoor	12:00 a.m. - 4:00 a.m.	N/A	Human	92.7
Kata-Banawa/ West Mamprusi	*An. gambiae* s.l.	July-Oct	0.49 indoor 0.51 outdoor	12:00 a.m. - 4:00 a.m.	N/A	Human	59.0
Kulaa/ Sagnerigu*	*An. gambiae* s.l.	June-Oct	0.53 indoor 0.47 indoor	12:00 a.m. - 4:00 a.m.	Animal structures	Human	97.8
Tugu/Tamale*	*An. gambiae* s.l.	June-Oct	0.49 indoor 0.51 outdoor	12:00 a.m. - 4:00 a.m.	Animal structures	Human	111.7

*Unsprayed sites; **Marked as N/A if simultaneous indoor and outdoor collections are not conducted

[2] The PMI VectorLink Project. October 2019. *Operational Research Report: Effect of Indoor Residual Spraying on Anopheles Vector Behaviors and Their Impact on Malaria Transmission in the Northern Region of Ghana*. Rockville, MD: Abt Associates Inc.

[3] The PMI VectorLink Project. March 202. *Annual Entomological Monitoring Report for Northern Ghana, March 1-December 31, 2020.* Rockville, Maryland: Abt Associates Inc.

Key Question 2

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

The primary malaria vector, *An. gambiae* s.l., is susceptible to clothianidin at all sites in IRS areas, with the exception of one non-IRS site in Ashanti region (Ejura) where possible resistance was detected in 2020 (Figure A-2). Resistance or possible resistance to pirimiphos-methyl was detected at two sites in Ashanti, one site in Upper West, two sites in Upper East, one site in Northern, and one site in North East region. (Figure A-2). Upon detection of resistance to pirimiphos-methyl at the site within the PMI-supported IRS district in the North East (Zarantinga), susceptibility testing was undertaken at two additional ad hoc sites (Yunyoo and Gupanarigu), with possible resistance detected at one (Yunyoo). The viability of pirimiphos-methyl for IRS is becoming increasingly more limited and insecticide rotation strategies for IRS in some districts may be difficult to implement moving forward or until new insecticides with different modes of action become available.

As in previous years, resistance to pyrethroids (including alpha-cypermethrin, deltamethrin, and permethrin) was detected in all national insecticide monitoring sites in 2020, with pre-exposure to the synergist PBO resulting in increased susceptibility of *An. gambiae* s.l. in some but not all sites (Figure A-3). *An. gambiae* s.l. was found to be susceptible to chlorfenapyr at most sites; resistance detected in other sites has not yet been confirmed and requires repeat testing, and at higher concentrations of the active ingredient. These data indicate that pyrethroid only ITNs are not optimal for deployment in Ghana, rather PBO or dual AI ITNs should be considered instead (Figure A-3). For additional information, please refer to the most recent entomological monitoring reports.[4,5]

[4] NIRMOP. March 2021. *Insecticide Resistance Monitoring in 28 Sentinel Sites in Ghana, January 1 – December 30, 2020.* Accra, Ghana: Noguchi Memorial Institute for Medical Research..

[5] The PMI VectorLink Project. March 2021. *Annual Entomological Monitoring Report for Northern Ghana, March 1– December 31, 2020.* Rockville, Maryland: Abt Associates Inc.

Figure A-2. IRS insecticide resistance profiles

Percent mortality of An. gambiae s.l. following exposure to insecticides used for IRS, including clothianidin (at 7 days) and pirimiphos-methyl (at 24 hours).

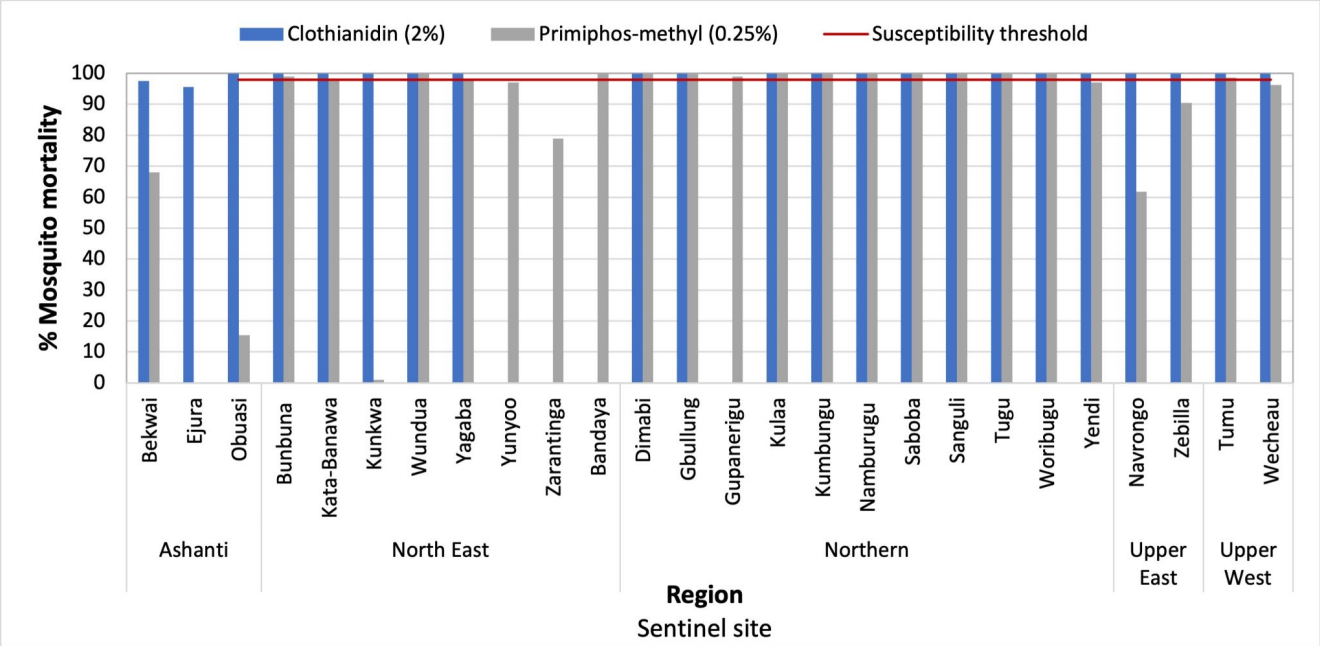
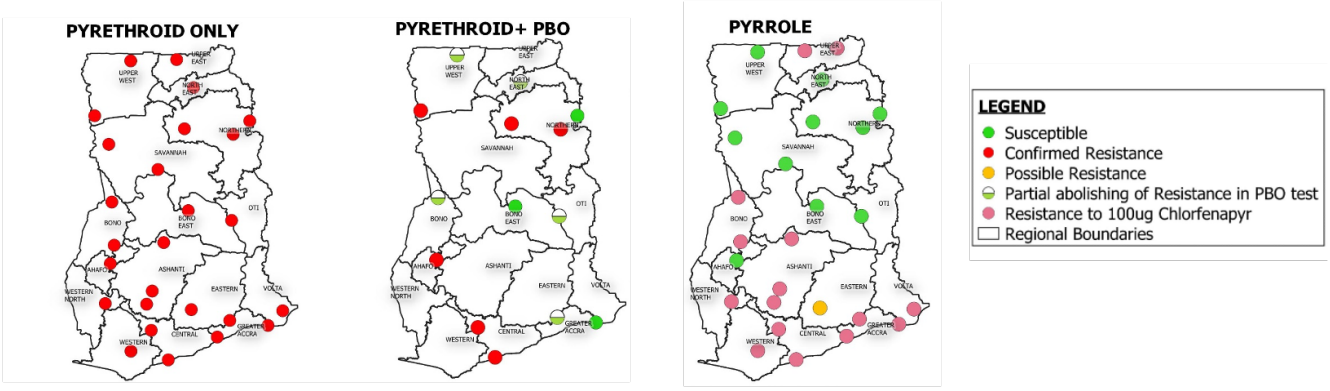


Figure A-3. ITN insecticide resistance profiles

Maps of national insecticide resistance monitoring sites showing susceptibility status of An. gambiae s.l. to pyrethroids, with and without the synergist PBO, and to chlorfenapyr (an insecticide in the pyrrole class)



Conclusions for Entomologic Monitoring Investments

With FY 2022 funding, PMI will maintain support for insecticide resistance monitoring at the 30 national surveillance sites (in coordination with the Global Fund) and 14 additional sites in PMI-supported IRS districts. PMI will also continue to support monthly vector bionomics monitoring at six of the 30 national surveillance sites (four of which will be initiated with FY 2021 support) and seven additional sites within PMI-supported IRS districts. In line with current insecticide resistance data, PMI will continue to procure only PBO or dual AI ITNs and implement an IRS insecticide rotation strategy accordingly. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.2. INSECTICIDE-TREATED NETS (ITNs)

Key Goal

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

Key Question 1

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

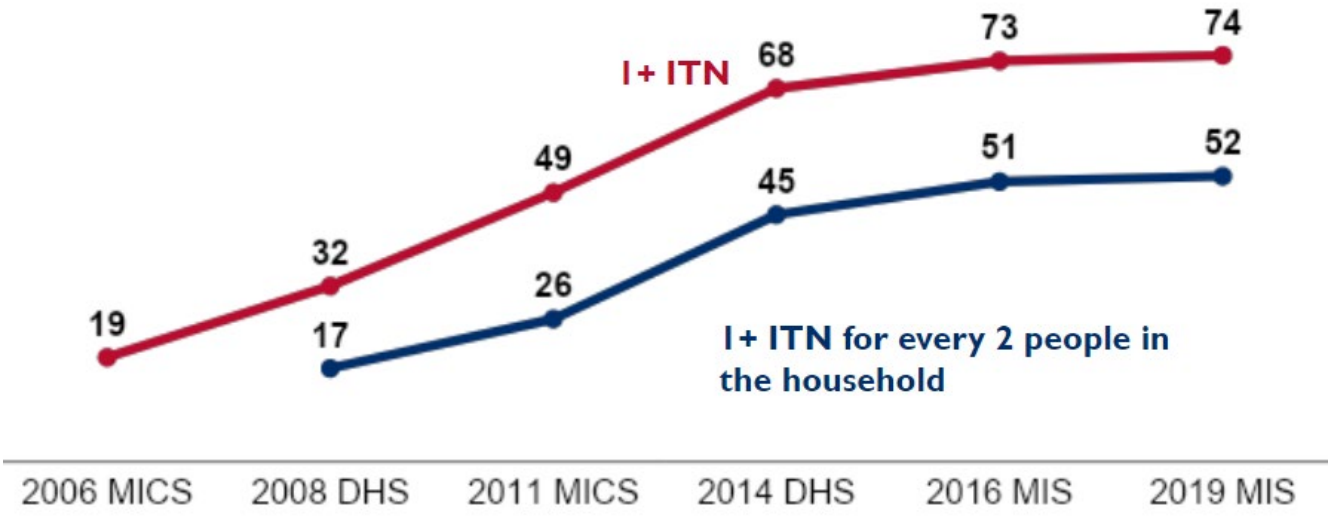
Since the start of PMI support to Ghana, ITN ownership has increased significantly, with 19 percent to 74 percent of households owning at least one ITN in 2006 and 2019 (Figure A-4), respectively. Similarly, the percentage of households owning at least one ITN per two people increased from 17 percent in 2008 to 52 percent in 2019 (Figure A-4). The steady increase was achieved through the use of different but complementary channels, including continuous distribution through ANC and CWC, school-based distribution, and mass distribution campaigns. PMI continues to work with the NMCP, Ghana Health Service (GHS), MaVCOC, and implementing partners to support these different distribution channels for ITNs through quantification, storage and

warehousing, distribution to districts and service delivery points, trainings on accurate data capture, validations, reporting and requisitions.

Supporting Data

Figure A-4. Trends in ITN ownership

Percentage of households that own ITNs



Key Question 2a

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

ITN access increased steadily from 30 percent in 2008 to 67 percent in 2019, but ITN use has not increased as rapidly, from 21 percent in 2008 to 43 percent in 2019 (Figure A-5), resulting in a low-to-moderate ITN use:access ratio that has remained fairly steady over the same period of time. ITN use:access ratio is between 0.4 and 0.6 in most of the country, with lower values in urban/peri-urban areas (Figure A-6). Per the 2019 MIS, ITN use:access ratio is 0.47 in urban areas and 0.77 in rural areas. During the 2018 mass campaign, many individuals in urban settings either refused to register or did not redeem their nets after registration. The commonly cited reasons were that they are not able to hang rectangular nets in their rooms and they prefer other methods of mosquito control (e.g., use of mosquito sprays). This has informed the NMCPs decision to reduce the ITNs needed for urban settings for the 2021 mass campaign.

Figure A-5. Trends in ITN access and use

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

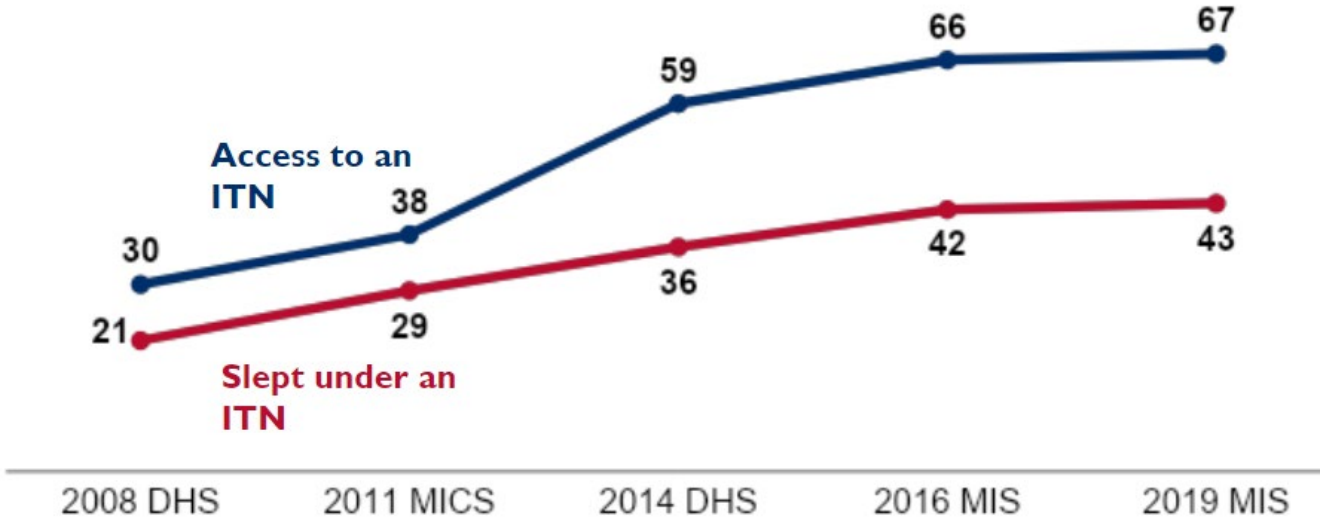
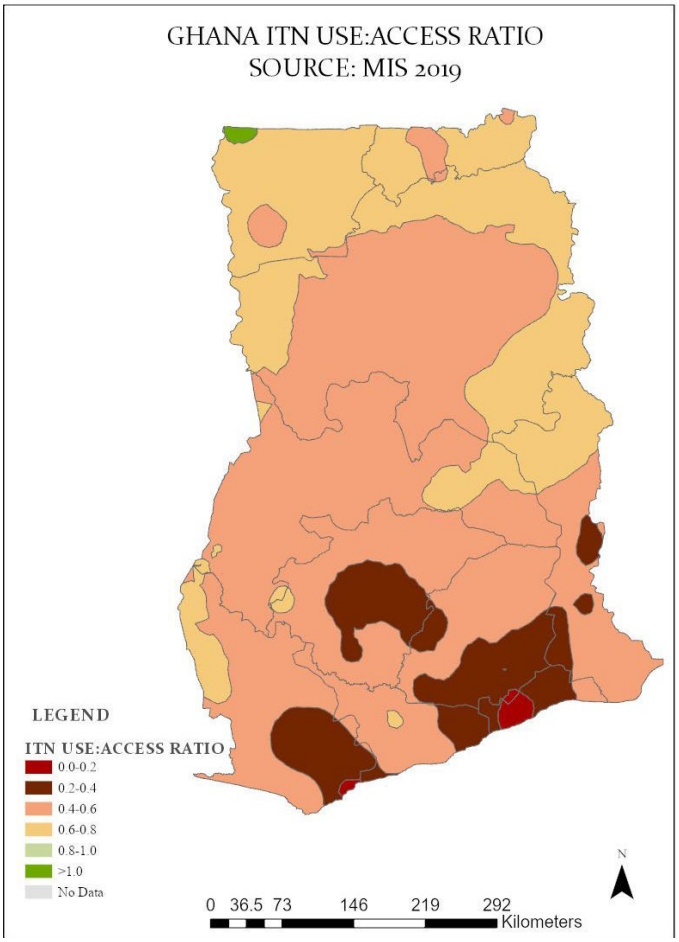


Figure A-6. Ghana ITN use:access ratios

ITN use:access ratios by region



Key Question 2b

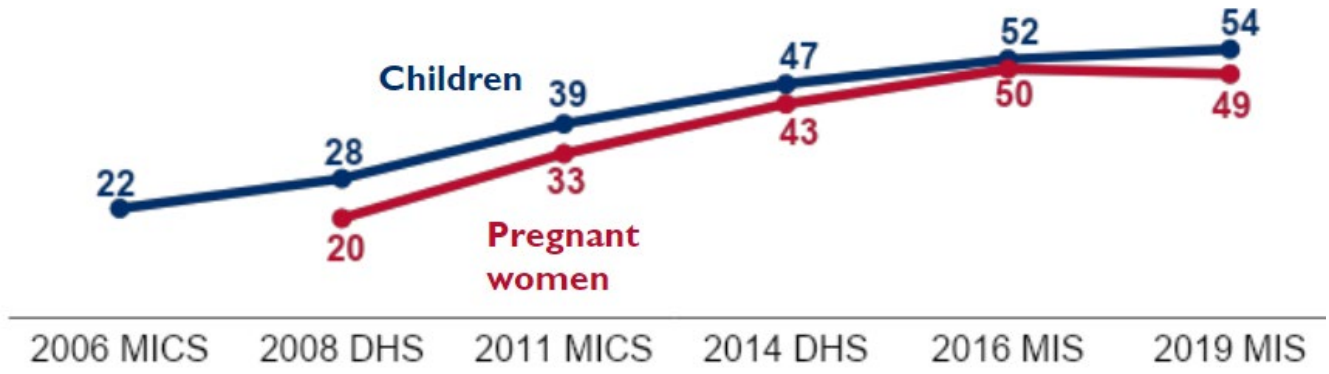
What percent of pregnant women and children under five years of age report sleeping under an ITN?

ITN use among children under five years of age and pregnant women has followed the same trend as that of the general population in Ghana. ITN use among children under five has increased from 22 percent in 2006 to 54 percent in 2019 while use among pregnant women increased from 20 percent in 2008 to 49 percent in 2019 (Figure A-7).

Supporting Data

Figure A-7. Trends in ITN use among children and pregnant women

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



Key Question 3

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

While population access to an ITN is moderate to high, use of ITNs given access is moderate to low in Ghana. PMI has supported two studies to identify barriers and facilitators of ITN use and more recently supported a workshop to use the results of these studies to design a user-centered SBC activity to improve ITN use among target populations.

Supporting Data

PMI supported a qualitative study to explore the individual and contextual factors influencing ITN use among those with access in 2018[6] and a second study on qualitative barriers and motivators to behavior change across different life stages in 2019.[7] Both studies found or confirmed a number of facilitating factors that promote net use, namely knowledge that nets prevent malaria, understanding of the financial and temporal impacts of contracting malaria, and an appreciation that the use of nets promotes sound sleep. The studies also confirmed a number of barriers to consistent net use throughout the year, including the perception that ITNs are of limited value because of exposure to mosquito bites during early evening hours and nighttime activities, experiences with skin irritation even after airing the ITN, congestion and lack of airflow in the sleeping space or feelings of

[6] Ahorlu, C.S., Adongo, P., Koenker, H. et al. Understanding the gap between access and use: a qualitative study on barriers and facilitators to insecticide-treated net use in Ghana. Malar J 18, 417 (2019).

[7] Enuameh, Y. Qualitative Assessment on Barriers and Motivators to Behavior Change among Life Stage Audiences in Ghana. April 2019. For USAID Communicate for Health Project.

breathlessness when sleeping under a net, and a lack of knowledge about the connection between the use of ITNs and malaria prevention.

In 2020, PMI supported a workshop to convene national, regional, and district-level stakeholders with the goal of designing a user-centered SBC activity to promote ITN use.[8] Participants developed a behavioral framework using the data collected in these two studies to illustrate the key behavior, target populations, factors influencing practice of the key behavior among the target populations, and key influencers of the target population. For the key behavior of focus (use of an ITN all night, every night), facilitators and barriers to ITN use were broken down by target population:

- Men
  - Facilitators: past experience with malaria, promise of sound sleep, protection against malaria
  - Barriers: cultural beliefs related to male ego and masculinity, fear of side effects, concerns about comfort
  - Influencers: Other men, girlfriends, family, health workers, and religious leaders
- Youth
  - Facilitators: knowledge of malaria and benefits of ITN use, net culture (experience using an ITN since childhood), past experience with malaria
  - Barriers: desire for "nice" sleeping space, net preference and characteristics, perceived low risk of malaria
  - Influencers: social media and media, teachers, peers, health workers, parents, role models
- Pregnant Women
  - Facilitators: protection against malaria, knowledge of malaria and benefits of ITN use, promise of sound sleep, past experience with malaria, desire to protect unborn child
  - Barriers: heat, fear of side effects, desire for "nice" sleeping space, use of other malaria prevention methods
  - Influencers: peers, husbands, health workers, parents, religious leaders, community members
- Health Workers
  - Facilitators: knowledge of benefits, desire to be seen or known as a role model or advocate, promise of sound sleep
  - Barriers: clinic night duties, use of other malaria prevention methods, desire for "nice" sleeping space
  - Influencers: colleagues, spouses, community members

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

Key Question 4

What type of nets are being distributed via which channels?

In Ghana, ITNs are distributed through mass campaigns every three years in non-IRS districts, with a target of one ITN per two people, as well as through continuous channels, including ANC and CWC to target pregnant women and children under five years of age. ITNs are also distributed to primary schools in non-IRS districts in the years between mass distribution campaigns, targeting pupils in grades two and six. PMI plans to expand this

[8] The PMI VectorLink Project. *Insecticide-Treated Net Use Social and Behavior Change Design Workshop Report.* Washington, DC. The PMI VectorLink Project, Population Services International.

support to include school-based distribution of ITNs to IRS districts in CY 2022. ITNs are also distributed to boarding high schools and when necessary to certain special or vulnerable groups, including TB/HIV patients, and orphanages. PMI and the Global Fund (and other donors as needed) jointly support the procurement and distribution of ITNs through mass campaigns. PMI supports continuous distribution of ITNs through primary schools while the Global Fund supports all other continuous distribution channels, with the exception of boarding high schools, which has been supported by GHS since 2020.

Given widespread pyrethroid resistance throughout Ghana, the NMSP recommends that pyrethroid only nets no longer be distributed in the country. PMI transitioned to procuring only PBO ITNs for school-based distribution in CY 2019 and CY 2020, as well as for the CY 2021 mass distribution campaign. The Global Fund procured a mix of pyrethroid only, PBO, and dual AI (Interceptor G2 nets procured as part of the Unitaid New Nets Project) ITNs for the 2021 mass distribution campaign and pyrethroid only nets for all other continuous channels. Table A-1 details the types of nets to be distributed in CY 2021 via continuous and mass distribution, as well as the recent school-based distribution that was completed in November–December 2020.

Supporting Data

Table A- 3. ITN distribution, 2021

Region(s)	Mass Campaign (2021)	ANC	CWC	Primary Schools (Nov-Dec 2020)	High Schools	TB/HIV
Ahafo, Bono	PBO	PBO	PBO	PBO	pyrethroid	PBO
Ashanti*, Bono East, Central, Eastern, Northern*, North East*, Oti, Savannah, Volta	PBO and pyrethroid	PBO and pyrethroid	PBO and pyrethroid	PBO	pyrethroid	PBO and pyrethroid
Greater Accra, Upper East*	pyrethroid	pyrethroid	pyrethroid	PBO	pyrethroid	pyrethroid
Upper West	N/A	pyrethroid	pyrethroid	N/A	pyrethroid	pyrethroid
Western+, Western North+	dual AI	dual AI	dual AI	PBO**	pyrethroid	dual AI

*IRS districts in these regions are not currently targeted to receive nets during mass campaigns or school-based distributions, although PMI plans to expand to include them in the school-based distribution in CY 2022.
**Beginning in CY 2022, these regions will receive dual AI ITNs through the school-based distribution.
+Metropolitan districts within these regions receive standard nets.

Key Question 5

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

In CY 2021, an estimated 18,578,815 ITNs will be needed for distribution through the mass campaign and all continuous channels, including ANC, CWC, Senior High Schools, and HIV/TB patients, but not primary schools. A combination of standard pyrethroid only, PBO, and dual AI nets procured by PMI, the Global Fund, and the GOG will be distributed. In CY 2022 and 2023, an estimated 4,249,094 and 4,346,024 ITNs will be needed for

distribution through all continuous channels. No ITN gaps are anticipated during CY 2021-2023. See Table A-1 above and the ITN gap analysis below for additional details.

Supporting Data

Table A-4. ITN Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	32,562,671	33,400,644	34,260,928
Total population at risk for malaria	32,562,671	33,400,644	34,260,928
PMI-targeted at-risk population	32,562,671	33,400,644	34,260,928
Population targeted for ITNs	25,749,470	26,435,277	27,143,680
Continuous Distribution Needs			
Channel 1: ANC	1,107,131	1,135,622	1,164,872
Channel 2: EPI	1,042,005	1,068,821	1,096,350
Channel 3: School	0	1,403,431	1,438,517
Channel 4: - ITN Distribution to IRS districts (VL+AGaMAL)	0	122,860	122,860
Channel 5: - *ITN Distribution through Senior High Schools*	446,000	457,150	468,579
Channel 6: - ITN Distribution through HIV/TB clients	247,892	61,211	54,847
Estimated Total Need for Continuous Channels	2,843,028	4,249,094	4,346,024
PBO NET	600,345	2,442,611	2,133,585
STANDARD NET	2,078,508	1,638,204	2,033,951
NEW NET	164,175	168,279	178,488
Mass Campaign Distribution Needs			
Mass distribution campaigns	15,735,787	0	0
Estimated Total Need for Campaigns	15,735,787	0	0
PBO NET	5,698,184	0	0
STANDARD NET	8,597,113	0	0
NEW NET	1,440,490	0	0
Total ITN Need: Continuous and Campaign	***18,578,815***	***4,249,094***	***4,346,024***
PBO NET	*6,298,529*	*2,442,611*	*2,133,585*
STANDARD NET	*10,675,621*	*1,638,204*	*2,033,951*
NEW NET	*1,604,665*	*168,279*	*178,488*
Partner Contributions			
ITNs carried over from previous year	5,086,951	600,376	172,052
ITNs from Government	446,000	446,000	446,000
ITNs from Global Fund	8,548,401	1,548,906	2,254,586
ITNs from other donors	0	0	0
ITNs planned with PMI funding	5,097,839	1,825,865	1,500,000
Total ITNs Contribution Per Calendar Year	***19,179,191***	***4,421,147***	***4,372,638***
Total ITN Surplus (Gap)	***600,376***	***172,052***	***26,614***

Key Question 6

What is the current status of durability monitoring?

PMI supports durability monitoring of two brands of ITNs (DawaPlus 2.0 and Olyset) distributed during the 2018 mass distribution campaign in Zabzugu and Nanumba South in the Northern Region of Ghana. Baseline, 12-, and 24-month data have been collected and analyzed. The 36-month data collection has been completed but analysis is currently ongoing with the final report expected sometime in 2021 (Table A-3).

Supporting Data

Table A-5. Timing of durability monitoring

Campaign Date	Site	Brand	Baseline	12-month	24-month	36-month
June 2018	Zabzugu, Northern Region	DawaPlus 2.0	x	x	x	x
June 2018	Nanumba South, Northern Region	Olyset	x	x	x	x

Conclusions for ITN Investments

With FY 2022 funding, PMI will procure and distribute approximately 1,500,000 ITNs for the CY 2023 school-based distribution, to include distribution of ITNs to IRS districts in response to increased IRS refusals by households that did not receive ITNs during the 2021 mass distribution campaign but cited a need, especially for protection while sleeping outdoors. Both PBO and dual AI ITNs will be procured and distributed based on deployments during the 2021 mass distribution campaign. PMI will also procure approximately 681,500 PBO ITNs, which, along with existing commodity pipeline and FY 2021 funds will be used to procure a total of 3,000,000 ITNs for the 2024 mass distribution campaign. Warehousing and distribution costs for these ITNs will be supported in FY 2023. Due to funding limitations and satisfactory performance level achieved, PMI will discontinue support for technical assistance for health facility ITN distribution in FY 2022. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.3. INDOOR RESIDUAL SPRAYING (IRS)

Key Goal

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

Key Question 1

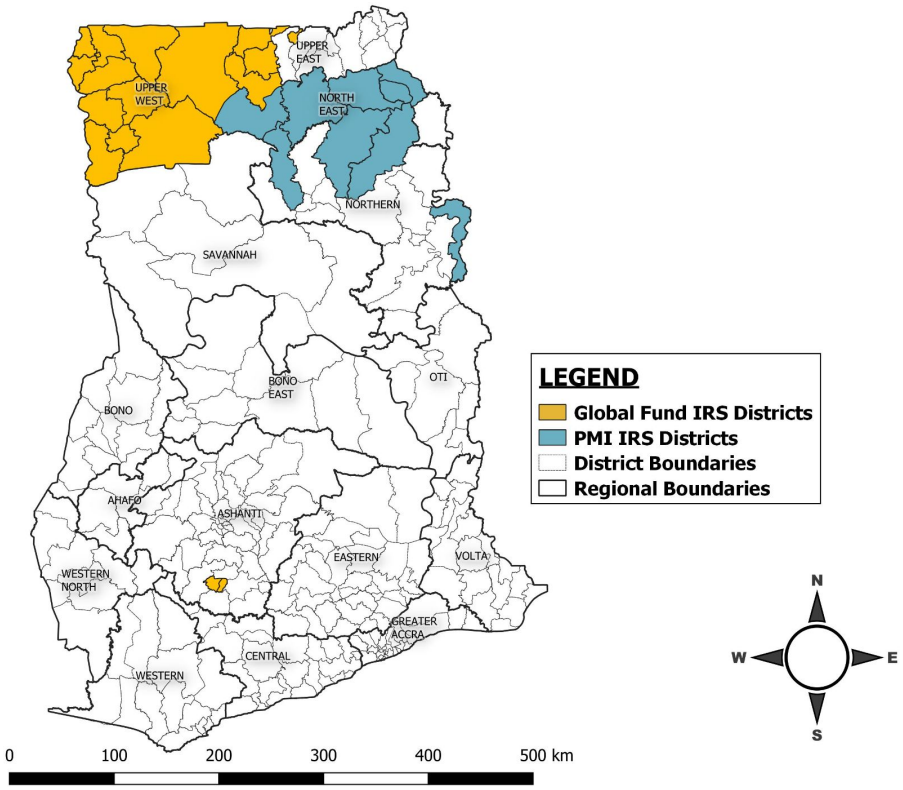
What areas are targeted for IRS and why?

The selection of IRS districts in Ghana is done in consultation with the NMCP with oversight from the MaVCOC. Districts are selected based on high malaria burden (>40 percent parasitemia in children under five), poor healthcare and economic infrastructure, and a relatively short, intense malaria transmission season in the region. IRS is currently implemented in Ashanti, Northern, North East, Upper East, and Upper West Regions (Figure A-

8). AGAMal, with the support of the Global Fund, currently implements IRS in all 11 administrative districts in the Upper West Region, three districts (Kassena Nankana West, Builsa South and Builsa North) in Upper East Region, and one district in Ashanti Region (Obuasi). In 2019, PMI planned to expand support for IRS from eight districts in Northern and North East Regions into one additional district, Cheroponi in North East Region, but was unable to do so due to security concerns stemming from local conflict. In 2020, PMI expanded support for IRS to Tatale-Sangule district in the Northern Region and this support continued in 2021. A pilot of spraying animal shelters commenced in 2020 and continued in 2021 in five of the nine PMI-supported IRS districts after initial surveys between 2017 and 2019 indicated animal shelters as important resting places for *An. gambiae*. PMI and NMCP will review results to determine whether this approach should be widely adopted to increase the impact of IRS in Ghana.

Supporting Data

Figure A-8. Map of IRS districts



Key Question 2

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

Spray coverage in PMI-supported IRS districts has consistently exceeded both PMI (85 percent) and NMCP (90 percent) targets since 2018 (Tabl). IRS is effectively implemented in collaboration with local authorities, traditional leaders, and NMCP/GHS, and beneficiary communities are generally receptive. PMI piloted spraying of animals shelters in five of the nine PMI-supported IRS districts (Bunkpurugu-Yunyoo, East Mamprusi, Karaga,

Mamprugu Moaduri, and Yunyoo-Nasuan) in 2020 and 2021, spraying 6,219 and 4,409 shelters, respectively, at coverage rates of 100 percent.

Supporting Data

Table A-6. IRS Coverage

Calendar Year	Districts Sprayed (#)	Districts	Structures Sprayed (#)	Coverage Rate	Population Protected (#)
2018	7	Bunkpurugu-Yunyoo, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moaduri, West Mamprusi	298,701	92%	836,376
2019*	8	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, West Mamprusi, Yunyoo-Nasuan	298,385	94.3%	875,481
2020	9	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasuan	339,139	92.5%	965,467
2021**	9	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasuan	329,915	90.3%	928,988
2022+	9	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasuan	365,000	90%	1,020,000

*Increase from 7 to 8 districts in 2019 did not represent an actual geographical expansion of IRS because changes to administrative boundaries resulted in the division of Bunkpurgu-Yunyoo into two separate districts (Bunkpurugu-Nakpanduri and Yunyo-Nasuan). Planned expansion into a ninth district, Cheroponi, was not feasible due to security concerns arising from local conflict.
**Preliminary coverage indicators for 2021, final end of spray report not yet available
+Denotes planned targets

Key Question 3

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

Bioassays conducted following the 2020 IRS campaign demonstrate that Actellic (pirimiphos-methyl) remains effective above the cut-off mortality level (80 percent at 24-hours post-exposure) for 8 to 11 months post-IRS, depending on the surface sprayed, based on tests conducted with *An. gambiae* Kisumu strain and wild *An. gambiae* s.l. Sumishield (clothianidin) and Fludora Fusion (clothianidin + deltamethrin) were found to be effective, resulting in 100 percent mosquito mortality within 72 hours following exposure, for at least 11 months post-spray on all surfaces tested. Residual efficacy of Sumishield and Fludora Fusion based on bioassays conducted with *An. gambiae* s.l. are incomplete due to inconsistent and insufficient collections of larvae, but available data suggest

both remain effective for at least nine months (Table A-5). For more information, please see the most recent entomological monitoring report for Ghana.[9]

Supporting Data

Table A-7. IRS insecticide residual efficacy

Site/District	Year	Insecticide	Average Residual Efficacy
Bungyaga/Mamprugu Moadori	2020	Actellic	11 months (Kisumu strain) 9 months (wild *An. gambiae* s.l.)
Yagaba/Mamprugu Moadori	2020	Actellic	9.5 months (Kisumu strain) 8 months (wild *An. gambiae* s.l.)
Cheyohi/Kumbungu	2020	Fludora Fusion	11 months (Kisumu strain) 9 months (wild *An. gambiae* s.l.)
Njobilbo/Tatale-Sague	2020	Fludora Fusion	11 months (Kisumu strain) 10 months (wild *An. gambiae* s.l.)
Bunbuna/Bunkpurugu-Nakpanduri	2020	Sumishield	11 months (Kisumu strain) 10 months (wild *An. gambiae* s.l.)
Wulugu/West Mamprusi	2020	Sumishield	11 months (Kisumu strain 9 months (wild *An. gambiae* s.l.)

Key Question 4

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

Ghana is currently developing a national insecticide rotation strategy for IRS. After a long history of organophosphate use, PMI began supporting IRS with neonicotinoid insecticides, starting with clothianidin (Sumishield) in 2018 and clothianidin+deltamethrin (Fludora Fusion) in 2020. As was done in 2021, only neonicotinoid and neonicotinoid+pyrethroid insecticides will be sprayed in PMI-supported areas in 2022 in an effort to reduce selective pressure for organophosphate resistance. In 2023, organophosphates will be rotated back in for IRS in some districts (Table A-6). Local vector populations are susceptible to both pirimiphos-methyl and clothianidin in all PMI-supported IRS districts except East Mamprusi, where resistance to pirimiphos-methyl prevents implementation of a preemptive insecticide rotation strategy with currently available products.

[9] The PMI VectorLink Project. March 2021. *Annual Entomological Monitoring Report for Northern Ghana, March 1-December 31, 2020.* Rockville, Maryland: Abt Associates Inc.

Supporting Data

Table A- 8. Insecticide rotation plan

Target Spray Area	2020	2021	2022*	2023*
Bunkpurugu-Nakpanduri	neonicotinoid	neonicotinoid	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid
East Mamprusi	neonicotinoid + pyrethroid	neonicotinoid	neonicotinoid	neonicotinoid + pyrethroid
Gushegu	neonicotinoid + pyrethroid	neonicotinoid	neonicotinoid	organophosphate
Karaga	neonicotinoid	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid	neonicotinoid
Kumbungu	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid	neonicotinoid	neonicotinoid
Mamprugu Moadori	organophosphate	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid	neonicotinoid
Tatale-Sangue	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid	neonicotinoid	organophosphate
West Mamprusi	neonicotinoid	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid
Yunyoo-Nasuan	neonicotinoid	neonicotinoid	neonicotinoid + pyrethroid	neonicotinoid + pyrethroid

*Denotes planned insecticide classes

Conclusions for IRS Investments

In FY 2022, PMI will continue to support IRS in nine districts in the Northern and North East regions of Ghana. Given the current data on insecticide resistance and residual efficacy, pirimiphos-methyl (organophosphate) and clothianidin or clothianidin+deltamethrin mixtures (neonicotinoids) will be rotated in PMI-supported IRS districts, though selection of insecticides for future years will depend on the most recent insecticide resistance and residual efficacy data available. In collaboration with NMCP, PMI will review data from the evaluation of spraying animal shelters in 2020 and 2021 and determine whether this approach should be more widely adopted for IRS in Ghana moving forward. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2. HUMAN HEALTH

2.1. CASE MANAGEMENT

NMCP Objective

Ghana's NMSP aims to provide appropriate diagnosis to all suspected malaria cases and prompt and effective treatment to 100 percent of confirmed malaria cases in accordance with treatment guidelines by 2025. Specific malaria case management objectives include:

- Strengthen capacity building for malaria case management at health facilities

- Strengthen capacity building for malaria case management at health training institutions (pre-service)
- Provide quality malaria diagnosis at all levels of care
- Build capacity and improve access to diagnosis and treatment in the private sector (clinics, pharmacies, and laboratories)
- Strengthen referral systems and quality management for severe malaria cases at all levels
- Increase communities' access to healthcare through Community-based Health Planning and Services (CHPS) and by strengthening coordination across the GHS
- Improve availability of guidelines, protocols, and job aids
- Enforce adherence to guidelines at all levels

NMCP Approach

The Guidelines for Case Management of Malaria in Ghana (March 2020) describes the overall approach to diagnosis and treatment of malaria in Ghana. Ghana subscribes to the T3 (Test, Treat, and Track) approach, which seeks to test every suspected malaria case, treat positive cases with the recommended quality-assured antimalarial medicine, and track the disease through timely and accurate reporting to guide policy and operational decisions. In these guidelines, the following components of case management are included, and expected of healthcare providers:

- Correctly recognize the signs and symptoms of malaria and make correct diagnosis
- Confirm the diagnosis by use of an appropriate test (RDT or microscopy)
- Provide correct and prompt treatment in accordance with national guidelines
- Track all positive and negative cases
- Recognize the importance of full compliance with treatment schedules
- Recognize the danger signs of severe/complicated malaria and act promptly
- Ensure prompt referral of cases when necessary
- Provide appropriate pre-referral treatment

There are four levels of the health system where malaria is diagnosed and managed. These are:

- Community level: households, licensed chemical sellers, community-based agents, and volunteers
- Primary health facility level: CHPS compounds, health centers, private clinics and pharmacies, polyclinics, and similar institutions
- Secondary health facility level: district hospitals
- Tertiary health facility level: regional hospitals and teaching hospitals

Diagnosis

Any person presenting with a history of fever within the preceding two to three days, or found to have fever on examination in the absence of any other cause is considered a suspected case of malaria; this includes children under 5 years of age. Since 2014, Ghana's malaria treatment guidelines have mandated laboratory confirmation (via microscopy or RDT) before treatment. For pregnant women, a confirmatory diagnostic test (microscopy or RDT) is recommended. Ghana aims for universal diagnostic testing where microscopy is performed at the hospital and health centers (except in OPDs, where RDTs are used) and RDTs are used at CHPS compounds at

the community level. Ghana implements a multipronged approach to ensure quality assurance of diagnostic testing through:

- Regional malaria diagnostic refresher training to improve use of microscopy and RDT led by the Clinical Laboratory Unit (CLU) and facilitated in coordination with the NMCP, Regional Health Management Teams (RHMTs), and District Health Management Teams (DHMTs).
- Laboratory OTSS is conducted with NMCP, CLU, region, and district participation where biomedical scientists at hospitals and health centers are evaluated on malaria slide proficiency panels and RDT implementation.
- RDT quality assurance at laboratories in hospitals and health centers where discordant results are reported.
- Monitoring of histidine-rich protein deletions, which are currently below 10 percent nationally.

Treatment

ACTs are the standard for treatment, as described in the national Malaria Medicines Policy. Three ACTs have been selected for use nationally: artesunate-amodiaquine (AS-AQ), artemether-lumefantrine (A-L), and dihydroartemisinin-piperaquine (DHAP). DHAP is identified as a second line treatment. Pregnant women with uncomplicated *P. falciparum* malaria during the first trimester are to be treated with oral quinine in combination with clindamycin. The number of these cases are very low. ACTs are recommended for the treatment of uncomplicated malaria for women in their second and third trimesters. Cases of *P. ovale* malaria should be treated with the standard regimen of ACTs; in addition, primaquine is given (except to pregnant women, infants under 6 months of age, women breastfeeding infants under 6 months of age, and women breastfeeding older infants unless they are known not to be Glucose-6-phosphate dehydrogenase (G6PD) deficient and people with G6PD deficiency).

When severe malaria is identified, parenteral treatment (IV/IM medication) or rectal artesunate should begin promptly, and severe malaria cases should be referred immediately to a hospital after instituting pre-referral management. The following are included as pre-referral treatment: IM artesunate, IM artemether, or IM quinine. Rectal artesunate can be given to children less than 6 years of age. In a hospital setting, the order of preference of treatment is: IV/IM Artesunate, IM Artemether, and IV/IM Quinine.

Facility-based case management

The GHS has teaching referral hospitals, regional referral hospitals, district referral hospitals, and health centers. Regional Health Authorities (RHAs) supervise DHMTs, which in turn supervise lower health centers. Malaria diagnosis at health facilities is primarily microscopy although RDTs are used in OPDs to expedite malaria treatment and reduce workload. Severe malaria cases are referred from the community level to health centers and hospitals where patients receive injectable artesunate and supportive therapy. The NMCP has regional and district malaria focal points who liaise with the regions (RHAs) and districts (DHMTs) to improve malaria case management through training, job aids, and supportive supervision. Ghana also implements malaria-specific supportive supervision through the NMCP, RHMTs, and DHMTs, which is termed OTSS and includes both laboratory and clinical practices and is conducted biannually. The GHS has mandated a shift to an ISS approach through the regions and districts. ISS is conducted biannually by interdisciplinary teams from the regions and districts and uses a comprehensive integrated checklist, which includes adherence to treatment guidelines, laboratory, supply chain, management, monitoring and evaluation, maternal and child health, nutrition, malaria,

etc. Unlike the integrated nature of ISS, OTSS only focuses on malaria and should ideally be planned as a follow-up to ISS visits. The GHS plans to make ISS its long term strategy for improving service delivery, whereas the NMCP sees the OTSS as a viable tool for malaria case management.

Community level

In 1999, based on numerous efficacy and impact studies of various community health worker (CHW) models, Ghana adopted the CHPS Initiative to expand health access at the community level where a trained CHN and midwife provide integrated community case management (iCCM) and ANC services in a facility constructed by the community and coordinated through the community health committee. Each CHPS compound serves a catchment population of around 3,500 people and CHPS CHNs and midwives are supported by Community Health Volunteers (CHVs). CHPS provide RDT testing, ACT treatment, IPTp through ANC, ITNs through ANC and CWCs, and rectal artesunate suppositories (RAS) and referral for severe malaria and MIP. Criteria for referral are described in the Case Management Guidelines; children under 6 years of age should be referred. CHPS staff are government employees who receive salaries through the GHS and are supervised and provisioned through their sub-district and DHMTs. Ghana CHPS policy continues to evolve and many new CHPS compounds are constructed, staffed, and accredited annually, improving access.

Private sector case management

Private sector treatment is most common in urban settings and usually starts with pharmacies or medicine sellers. Ghana mandates laboratory confirmation in the private sector but patients must pay for testing (either RDT or microscopy) as well as ACT treatment, which often leads to treatment without testing. The NMCP is increasing private sector engagement through inclusion in supportive supervision to improve compliance with case management guidelines. The National Health Insurance Scheme (NHIS) aims to ensure access to basic healthcare services to all residents. All necessary malaria services and medicines are covered at no cost to NHIS members. The NHIS provides reimbursement of malaria treatment and diagnosis to private facilities and conducts clinical audits *to improve adherence to malaria treatment guidelines*.

PMI Objective in Support of NMCP

PMI support for case management is aligned with the NMSP to improve implementation of the 3Ts strategy. Specifically, PMI supports the following activities:

- Procurement, warehousing, and distribution of RDTs, microscopes, and severe malaria treatments (injectable and rectal artesunate). The Global Fund and the GOG have assumed procurement of 100 percent of the country's ACT needs.
- Malaria case management strengthening in partnership with RHMTs and DHMTs at the facility level through training, mentorship, malaria-specific OTSS, ISS, and data analysis and use.
- Contribute along with maternal and child health, family planning, and HIV to GHS ISS to implement a comprehensive care checklist including supply chain, management, quality assurance, etc. to improve case management throughout the Ghana health system.
- GHS through government-to-government (G2G) funding to support laboratory OTSS and clinical ISS at the facility and community level to make it effective and sustainable.
- Community Health Officers' (CHOs) community outreach activities and follow-up visits for malaria case management.

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Procured 2,500,000 RDTs to fill identified gaps and ensure that health facilities maintain capacity to test fevers and diagnose malaria cases
- Procured 150,000 vials of injectable artesunate and 3,000 RAS for treatment of severe malaria cases
- Supported NMCP to:
  - Update national malaria case management and related standard operating procedures and job-aids
  - Conduct malaria case management across all levels of healthcare reaching 2,396 health workers nationwide
  - Conduct two rounds of clinical OTSS nationwide, reaching 1,423 regional and district supervisors and 10,486 health workers in 3,050 health facilities in prioritized districts
- Supported GHS Director General Office to:
  - Train 292 national and regional supervisors and implement one round of ISS, reaching 2,303 prioritized health facilities
  - Digitize ISS Checklist and Health Network Quality Improvement System to enable real-time data access for timely data and decision making
- Supported NMCP and CLU to:
  - Review, update, and finalize the national malaria diagnostics guidelines, related standard operating procedures and job-aids, laboratory OTSS Checklist, and operational manual for National Archive of Malaria Slides
  - Coach and mentor 1,503 health workers in seven regions on using RDT for malaria diagnostics
  - Train 157 national and regional laboratory OTSS supervisors and to conduct four rounds of Laboratory OTSS and Proficiency Testing Scheme, training 2,226 laboratory staff in 1,110 and 280 targeted facilities, respectively
  - Conduct Malaria Diagnostics Refresher Training for 320 laboratory staff from district and major hospitals nationwide
  - Conduct National Competency Assessment for Malaria Microscopists (NCAMM) for 30 medical laboratory scientists nationwide
  - Support six medical laboratory scientists to obtain WHO microscopy certification as key resource persons for NCAMM
- Supported RHMTs to:
  - Use data from DHIMS2 and stratification maps to identify and prioritize high burden facilities for local planning and implementing interventions
  - Conduct CHO internship training in prioritized CHPS Zones
  - Trained 60 prescribers from CHPS compounds in six Regions (Upper West, Ashanti, Bono, Ahafo, Bone East, and Eastern) and conduct post-training support visits
  - Conduct E-mentoring of CHOs, which has addressed challenges at the facility level

PMI-Supported Planned Activities

In FY 2021, PMI plans to support the following activities:

- Support routine malaria-specific OTSS using the NMCP checklist to strengthen malaria diagnosis and treatment and provide in-service training for prescribers. Support will encourage the engagement of regional and DHMTs and supervision teams to conduct quarterly clinical OTSS visits at district hospitals and health centers, respectively.
- Provide support to the GHS Institutional Care Division (ICD) for implementation of integrated supportive supervision using ICD checklist.
- Contribute along with USAID Ghana to GHS ISS to implement a comprehensive care checklist, including supply chain, management, quality assurance, etc. to improve case management throughout the Ghana health system.
- Support GHS ICD to conduct laboratory OTSS and malaria diagnostic training-of-trainers on a quarterly basis. Funds will support the continued quality improvement of malaria microscopy, RDT use and scale-up, and coordination between laboratory staff and prescribers.
- Procure 545,000 vials of artesunate injectable (roughly 28 percent of national need).
- Procure 2,500,000 RDTs (roughly 20 percent of national need).

Key Goal

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

Key Question 1a

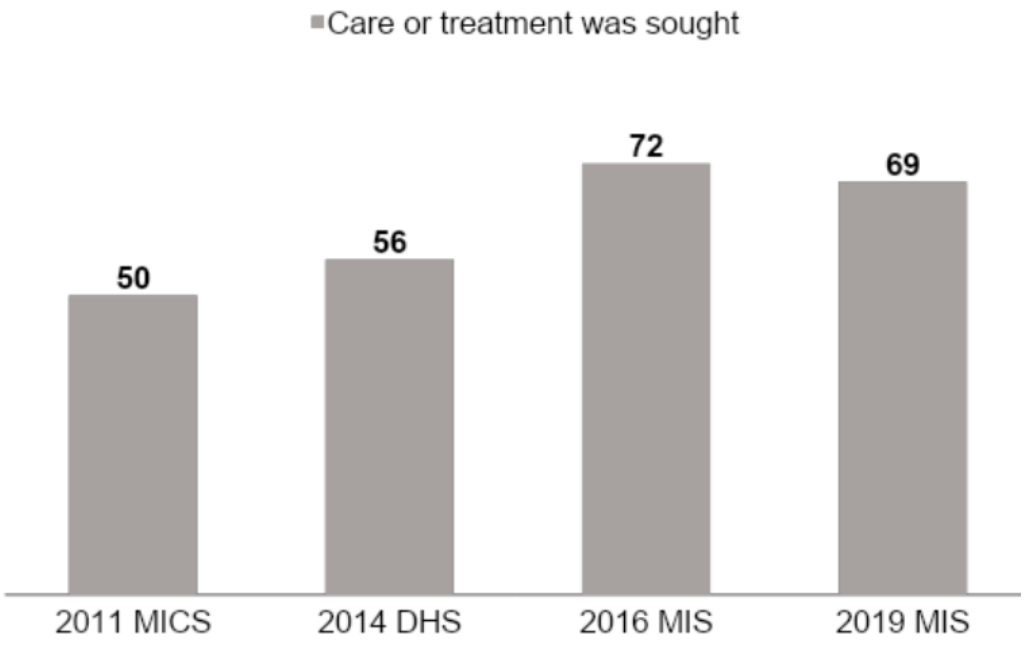
What is the status of care-seeking and/or access to care for children under five years of age with fever?

Timely care-seeking has improved in Ghana consistently from 2011to 2016, with a slight drop in 2019 (Figure A-9). The improvement from 2011 to 2016 can likely be attributed to improved access to services resulting from the continuing expansion of CHPS compounds throughout the country, as well as the NHIS, which has removed or reduced financial barriers over time. The 2019 MIS showed that among children with recent fever, 34 percent received advice or treatment from the public health sector, and 35 percent sought treatment in the private sector while 31 percent did not seek advice or treatment. Of those (69 percent) who sought advice or treatment, 49 percent sought from public sector with 51 percent from the private sector. NMCP, PMI, and other malaria stakeholders will continue to work with the private sector to improve laboratory confirmation, adherence to RDT results, and quality ACT treatments.

Supporting Data

Figure A-9. Trends in care-seeking for fever

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



**Excludes treatment or advice from a traditional practitioner*

Key Question 1b

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

Over the years, care-seeking behavior in Ghana has evolved. Multiple studies (qualitative and quantitative) conducted across the country from the Upper West Region, Volta region, Ashanti Region, Brong Ahafo Region and Greater Accra representing three distinct ecological zones show that distance, positive experiences with health staff, and possession of valid health insurance were key facilitators for prompt care-seeking for fever. Key barriers, such as negative experiences with healthcare workers, local beliefs, cost associated with testing and treatment, malaria commodity stockouts, compounded by negative attitudes towards healthcare providers and a lack of knowledge, attitudes surrounding fevers and social norms that prompt community members to receive informal care before seeking care at health facilities served as barriers to prompt care seeking for fever. Although care-seeking is improving in Ghana, PMI will utilize existing data to inform the SBC strategy to further increase care-seeking behavior.

Supporting Data

Data from a landscape analysis suggest there are several facilitators and barriers that affect prompt care-seeking at both the facility and community level. A 2018 study conducted by Duku et al. titled *"Perceptions of healthcare quality in Ghana: Does health insurance status matter?"* identified several social, internal, and environmental

factors that serve as facilitators or barriers to prompt care seeking. Please refer to Section 3.4. for more information on how SBC interventions will be directed to address the challenges identified above.

Key Question 2a

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

Periodic household surveys show an increasing trend in malaria diagnosis, with the percent of children under five with fever who had blood taken through finger or heel blood testing increasing from 16 percent in 2011 to 34 percent in 2019. ACT treatment among this group also increased from 3 percent in 2006 to 85 percent in 2019 (Figure A-10). HMIS reports a significantly higher percentage of malaria testing (>90 percent) and ACT treatment adherence to laboratory results is high. Supportive supervision visits have revealed that some healthcare workers prioritize microscopy over RDTs even to the point of referring to RDTs as sub-standard.

From 2016 to 2020, the proportion of uncomplicated suspected malaria cases that are treated has increased from 77.3 percent to 95.5 percent. Over the same period of time, the proportion of confirmed malaria cases that were treated with ACTs has gone from 127 percent in 2016 to 96 percent in 2020, indicating that presumptive treatment has declined considerably (Figure A-11). This is reflective of improved health provider competence, including appropriate classification (89 percent) and correct case management (83 percent) of fever and appropriate prescription of antimalarials based on national guidelines (95 percent) in 2020 (Figure A-12).

Supporting Data

Figure A- 10. Trends in diagnosis and treatment of children with fever

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

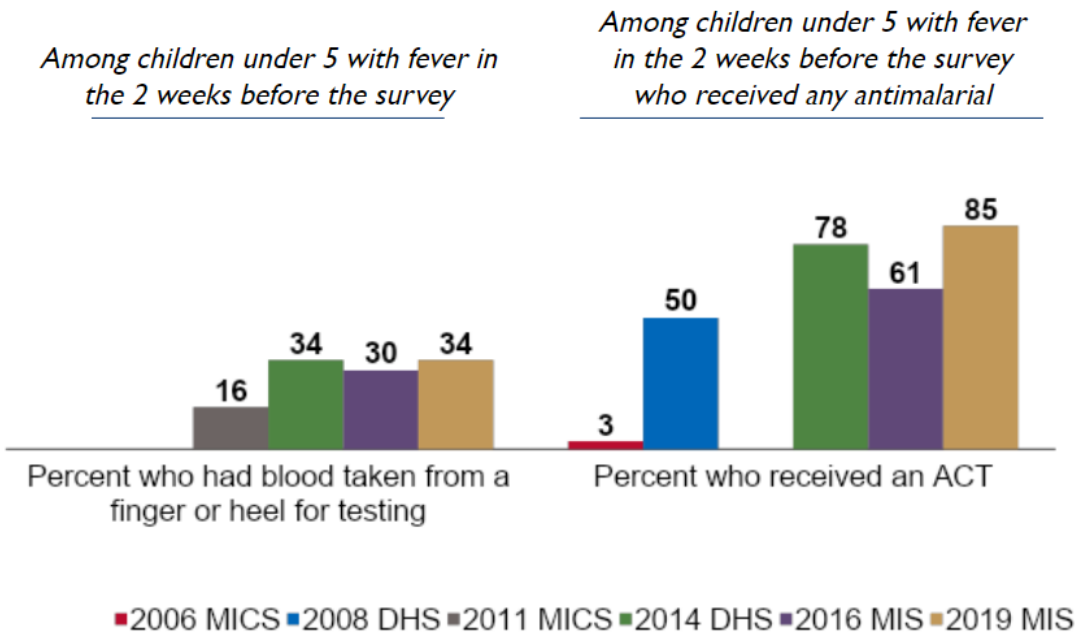
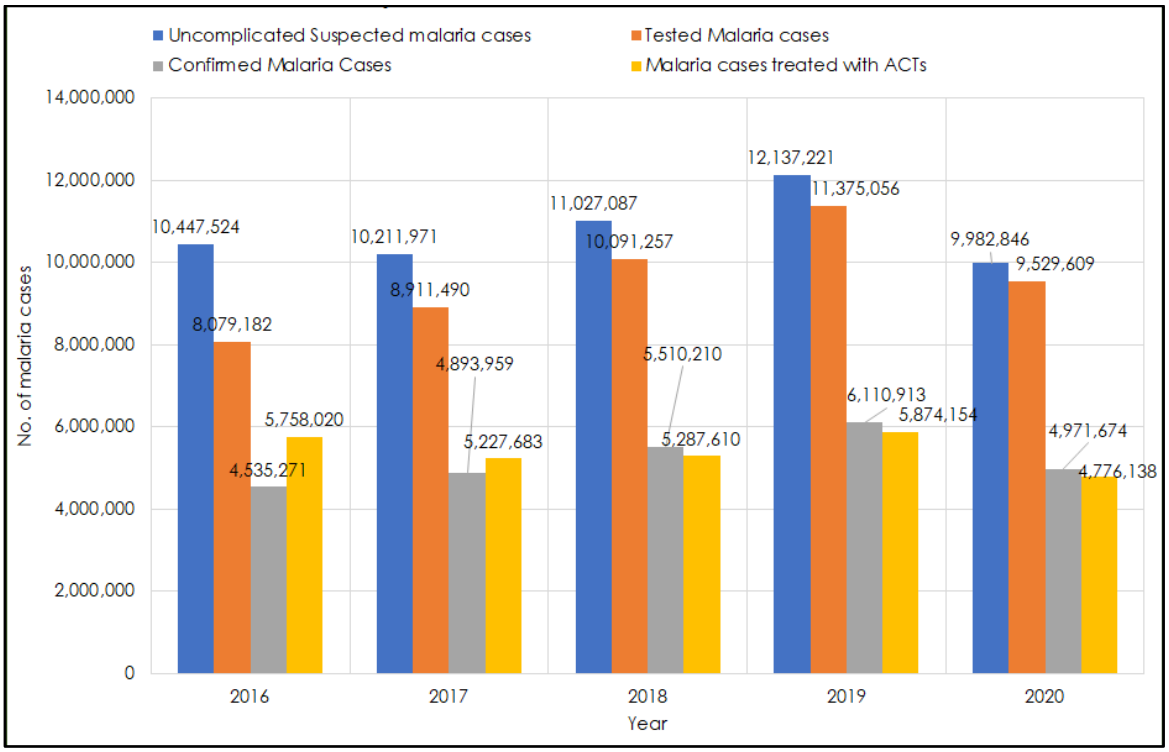
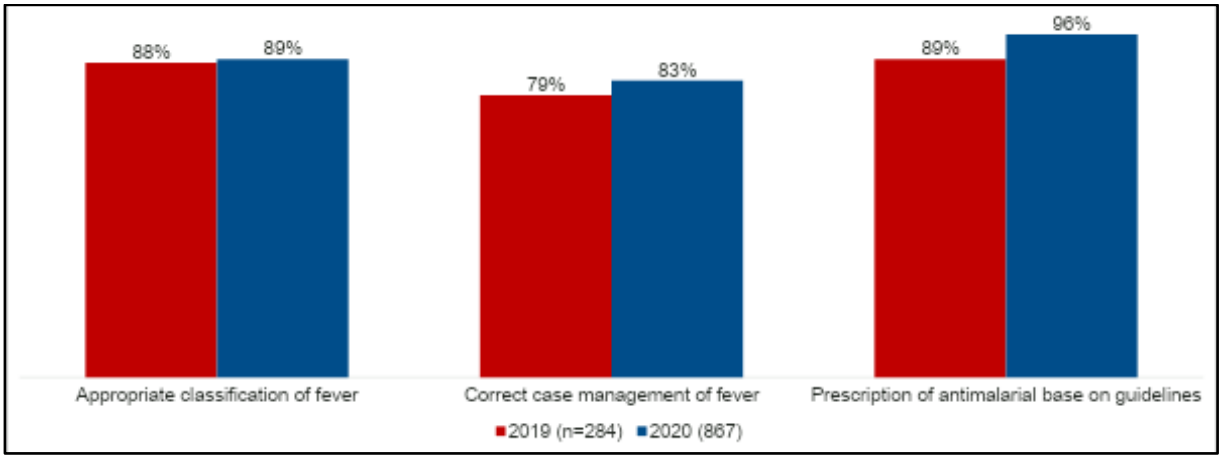


Figure A-11. Trends of uncomplicated suspected malaria cases tested, confirmed and treated with ACTs



Data Source: DHIMS2, 2016 -2020

Figure A-12. Health provider competence in malaria case management



Data Source: Clinical OTSS EDS, 2019 -2020

Key Question 2b

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

A number of studies utilizing a knowledge, attitudes, and practices (KAP) methodology have been conducted in Ghana to identify key facilitators and barriers to appropriate malaria testing and treatment practices.[10,11] Results revealed major facilitators and barriers to diagnosis, including:

- Facilitators: availability of RDTs or microscopy without a financial barrier (free) and that the test was conducted correctly. Healthcare worker performs laboratory tests (RDT or microscopy) correctly.
- Barriers: doubt in the validity of RDT test results and a preference towards microscopy, which is not supported by the literature, presumptive treatment by healthcare workers without exploring other possible causes of fever, healthcare worker lack of confidence in RDT results and perception that RDTs are sub-standard.

Malaria testing is widely available and tests are generally adhered to, especially at lower health facilities and CHPS compounds, but healthcare worker attitudes and behaviors regarding RDTs creates unnecessary reliance on microscopy for confirming suspected malaria cases, resulting in both delays and presumptive treatment of malaria. Collaborative efforts to use RDTs for suspected uncomplicated cases of malaria is necessary to reduce presumptive treatment and improve patient experience.

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

Supporting Data

Not applicable.

Key Question 3

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

Nationwide support for malaria-specific laboratory and clinical OTSS and ISS to strengthen case management at the central, regional, district, and community levels (through CHPS compounds) as described above under NMCP Approach to case management is supported jointly by PMI and the Global Fund (Figure 2.5).

[10] Antwi GD, Bates LA, King R, Mahama PR, Tagbor H, Cairns M, et al. (2016) Facilitators and Barriers to Uptake of an Extended Seasonal Malaria Chemoprevention Programme in Ghana: A Qualitative Study of Caregivers and Community Health Workers. PLoS ONE 11(11)

[11] F. Baiden,, K. Malm , C. Bart-Plange , A. Hodgson , D. Chandramohan,, J. Webster and S. Owusu-Agyei (2014) Shifting from presumptive to test-based management of malaria- Technical basis and implications for malaria control in Ghana. Ghana Medical Journal, 2014, Volume 48, Number 2.

Supporting Data

Table A-9. Donor-supported facility and community-based malaria case management in Ghana

Donor	Regions	Interventions	Type/Place
PMI	All regions	Laboratory OTSS, Clinical OTSS, Clinical ISS, Dx and Tx	Facility-based case management
Global Fund	All regions	Laboratory OTSS, Clinical OTSS, Clinical ISS, Dx and Tx	Facility-based case management
PMI	All regions	Malaria OTSS, ISS, Dx and Tx	Community-based case management
Global Fund	All regions	Malaria OTSS, ISS, Dx and Tx	Community-based case management

Key Question 4

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

The estimated need for RDTs during CY 2021, 2022, and 2023 is 11,222,834, 12,812,477, and 14,390,407, respectively. The Global Fund will cover all RDT needs for CY 2023 and no gaps are anticipated. Please see the gap analysis below for more information.

Supporting Data

Table A-10. RDT Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	32,562,671	33,400,644	34,260,928
Population at risk for malaria	32,562,671	33,400,644	34,260,928
PMI-targeted at-risk population	32,562,671	33,400,644	34,260,928
RDT Needs			
Total number of projected fever cases	13,975,572	15,955,763	17,920,805
Percent of fever cases tested with an RDT	73%	73%	73%
RDT Needs (tests)	11,222,384	12,812,477	14,390,407
Needs Estimated based on HMIS Data			
Partner Contributions (tests)			
RDTs from Government	*0*	*0*	*0*
RDTs from Global Fund	8,649,825	13,641,800	15,167,275
RDTs from other donors	0	0	0
RDTs planned with PMI funding	2,000,000	2,500,000	0
Total RDT Contributions per Calendar Year	***10,649,825***	***16,141,800***	***15,167,275***
Stock Balance (tests)			
Beginning Balance	6,244,395	5,671,836	9,001,158
- Product Need	11,222,384	12,812,477	14,390,407
+ Total Contributions (received/expected)	10,649,825	16,141,800	15,167,275
Ending Balance	5,671,836	9,001,158	9,778,026
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	5,611,192	6,406,239	7,195,203
Total Surplus (Gap)	***60,643***	***2,594,919***	***2,582,823***

Key Question 5

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

The estimated need for ACTs during CY 2021, 2022, and 2023 is 6,783,868, 7,379,929, and 8,028,640, respectively. ACT needs are covered by the Global Fund and GOG; PMI does not plan to procure any ACTs during these years. Gaps between what is projected to be on hand at the end of each year and what should be on hand at the end of the year to keep the central/regional levels stocked according to plan are projected for each year. However, stockouts at the central/regional level are not anticipated in CY 2021 and CY 2022. PMI's implementing partner, together with NMCP, will routinely monitor ACT stock status, update forecasts and supply plans, and work to address the CY 2023 gap of approximately 6,000,000 that theoretically should be met by GOG . Please see the gap analysis for more details.

In FY 2021, PMI supported an ACT preference study, which aimed to quantitatively determine the relative preference of ACTs types and weight bands among key actors across the ACTs value chain. This was sparked

from experience from conducting the national supply chain assessment and end-user verification (EUV) exercises, which pointed to the relative preference and use of the various ACTs and age bands, and facilities stocking higher age bands of AL due to the economic benefits. These ACT preferences have impacted forecasting and supply planning decisions for the procurement of ACTs. Results show that patients, prescribers, and dispensers prefer AL, and that AL 6x4 is the preferred presentation for stocking. The NMCP intends to use the data gathered through the ACT preference study to inform future discussions on the range of ACTs provided, quantification exercises, and procurement decisions.

Supporting Data

Table A-11. ACT Gap Analysis Table

Calendar Year	2021	2022	2023
Total country population	32,562,671	33,400,644	34,260,928
Population at risk for malaria	32,562,671	33,400,644	34,260,928
PMI-targeted at-risk population	32,562,671	33,400,644	34,260,928
ACT Needs			
Total projected number of malaria cases	6,783,868	7,379,929	8,028,640
Total ACT Needs (treatments)	***6,783,868***	***7,379,929***	***8,028,640***
Needs Estimated based on a Combination of HMIS and Consumption Data			
Partner Contributions (treatments)			
ACTs from Government	*2,731,999*	*1,096,575*	*1,109,624*
ACTs from Global Fund	*3,254,140*	4,398,016	4,450,310
ACTs from other donors *[specify donor]*	0	0	0
ACTs planned with PMI funding	0	0	0
Total ACTs Contributions per Calendar Year	***5,986,139***	***5,494,591***	***5,559,934***
Stock Balance (treatments)			
Beginning Balance	3,091,797	2,294,067	408,729
- Product Need	6,783,868	7,379,929	8,028,640
+ Total Contributions (received/expected)	5,986,139	5,494,591	5,559,934
Ending Balance	2,294,067	408,729	-2,059,977
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	3,391,934	3,689,965	4,014,320
Total Surplus (Gap)	***(1,097,867)***	***(3,281,236)***	***(6,074,297)***

Key Question 6

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

The estimated needs for artesunate injection are 1,855,891, 1,972,646, and 2,096,746 vials for CY 2021, CY 2022, and CY 2023, respectively. The absolute number of severe malaria cases has increased from previous years' estimates, based on a revised methodology utilized in the 2021 malaria quantification. The GOG, the

Global Fund, and PMI all support procurement of artesunate injection; however, significant gaps are projected each year, as estimated consumption using this new methodology is larger than the amount upon which committed shipments were based. PMI's implementing partner, along with NMCP, will monitor the consumption and stock status of artesunate injection, and will work to fill any gaps that manifest.

There is a dearth of quantitative data available to support estimates for rectal artesunate; consumption data is not currently nationally available, and estimates are largely driven by expert opinion and practitioner experiences. Though rectal artesunate is primarily targeted for use at the community level, it can also be used at the health facility level, depending on the human resource capacity for the administration of IV/IM artesunate, so referrals may also be made from the health facility level. There are significant implementation challenges around RAS, and its success is predicated upon a strong referral system. The 2021 malaria quantification exercise estimates that 10 percent of severe malaria cases may be pre-referred, which is an increase from the 5 percent used in previous years; consequently, the estimated need for RAS has doubled from previous estimates. The estimates for RAS for CY 2021, CY 2022, and CY 2023 are 79,276, 84,263, and 89,564 suppositories, respectively. Currently, PMI is the only committed supplier for RAS, and plans to procure 30,000 RAS annually, so there are potential gaps for each year; however, quantitative data are needed to better understand RAS use in the country. PMI's implementing partner plans to monitor RAS use and implementation closely next year. Please see the RAS gap analysis for further details.

Table A-12. Inj. Artesunate Gap Analysis Table

Calendar Year	2021	2022	2023
Injectable Artesunate Needs			
Projected number of severe cases	417,242	443,491	471,391
Projected number of severe cases among (all weight/age group) treated with artesunate inj			
up to 10kg	36,717	39,027	41,482
11 - 25kg	146,452	155,665	165,458
26 - 50kg	187,342	199,127	211,654
51kg+	46,731	49,671	52,796
Projected number of vials required for severe cases (all weight/age groups)			
up to 10kg	146,869	156,109	165,930
11 - 25kg	585,807	622,661	661,832
26 - 50kg	749,366	796,509	846,618
51kg+	373,849	397,368	422,366
Total Injectable Artesunate Needs (vials)	***1,855,891***	***1,972,646***	***2,096,746***
Needs Estimated based on HMIS Data			
Partner Contributions (vials)			
Injectable artesunate from Government	300,000	300,000	300,000
Injectable artesunate from Global Fund	584,455	985,192	1,002,271
Injectable artesunate from other donors [specify donor]	0	0	0
Injectable artesunate planned with PMI funding	300,000	545,000	325,000
Total Injectable Artesunate Contributions per Calendar Year	***1,184,455***	***1,830,192***	***1,627,271***
Stock Balance (vials)			
Beginning Balance	491,339	0	0
- Product Need	1,855,891	1,972,646	2,096,746
+ Total Contributions (received/expected)	1,184,455	1,830,192	1,627,271
Ending Balance	-180,097	-142,454	-469,475
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	927,946	986,323	1,048,373
Total Surplus (Gap)	***(1,108,043)***	***(1,128,777)***	***(1,517,847)***

Table A- 13. RAS Gap Analysis Table

Calendar Year	2021	2022	2023
Artesunate Suppository Needs			
Number of severe cases expected to require pre-referral dose	41,724	44,349	47,139
Total Artesunate Suppository Needs (suppositories)	*79,276*	*84,263*	*89,564*
Needs Estimated based on HMIS Data			
Partner Contributions (suppositories)			
Artesunate suppositories from Government	0	0	0
Artesunate suppositories from Global Fund	0	0	0
Artesunate suppositories from other donors	0	0	0
Artesunate suppositories planned with PMI funding	30,000	30,000	30,000
Total Artesunate Suppositories Available	***30,000***	***0***	***30,000***
Stock Balance (suppositories)			
Beginning Balance	30,000	0	0
- Product Need	79,276	84,263	89,564
+ Total Contributions (received/expected)	30,000	0	30,000
Ending Balance	-19,276	-84,263	-59,564
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	39,638	42,132	44,782
Total Surplus (Gap)	***(58,914)***	***(126,395)***	***(104,346)***

Key Question 7

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

No other antimalarial drugs are currently procured per the NMSP.

Key Question 8

Are first-line ACTs effective and monitored regularly?

AS-AQ was adopted to replace chloroquine as the first line drug for uncomplicated malaria in 2004, based on therapeutic efficacy and cost. AL and DHAP were added as alternatives to AS-AQ in 2007 following a review of existing policy and guidelines. NMCP, in collaboration with an in-country research institution, monitors the efficacy of ACTs in the country every other year with support from the Global Fund and NAMRU-3. The in-country research institution and the NMCP will continue to monitor the AL efficacy in select sites in 2021. While support for TES in Ghana has previously been supported by the Global Fund, it will transition to PMI starting with the upcoming 2023 TES and moving forward.

Supporting Data

Not applicable.

Key Question 9

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

There are no other case management areas that should be considered for PMI support.

Supporting Data

Not applicable.

Conclusions for Case Management Investments

In FY 2022, PMI will continue to support the NMCP, RHAs, and DHMTs to strengthen the T3 approach through supportive supervision (laboratory and clinical, malaria-specific and integrated), in-service trainings, job aids, coaching, mentorships, quarterly data analysis/review, and holistic assessments to improve laboratory confirmation and adherence to testing results. Support will encourage the engagement of regional and district health management and supervision teams to conduct quarterly clinical OTSS visits at district hospitals and health centers, respectively, and CHPS compounds. CHPS outreach activities to the community (house-to-house) will also be strengthened. While the Global Fund has historically provided support for the implementation of routine malaria drugs efficacy monitoring, conducted every two years in application of the WHO protocol for drug efficacy monitoring, this support will transition to PMI beginning with the CY 2023 TES, but using FY 2021 funds. PMI will continue to procure rectal artesunate and injectable artesunate in support of case management for severe malaria. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2. DRUG-BASED PREVENTION

NMCP Objective

Under the current NMSP, Ghana aims to protect at least 80 percent of the population at risk with effective malaria prevention interventions by 2020, which includes targeted implementation of SMC in the northern part of the country where malaria transmission is highly seasonal, and prevention of MIP offered as a package of interventions including the use of ITNs and IPTp with SP.

NMCP Approach

Ghana's strategy for drug-based prevention includes both nationwide IPTp for the prevention of malaria in pregnancy and SMC targeting treatment of children under five years of age with SP-AQ. Ghana updated the national MIP treatment guidelines in 2019, including updating IPTp guidance to better align with that of the WHO. The guidance aims to increase IPTp coverage, specifically to three or more doses of IPTp for each pregnant woman, and address healthcare worker concerns about SP and adverse reactions. Ghana implements SMC in the Sahelian zone in the northern part of the country (Northern, North East, Savannah, Upper East, and Upper West) where malaria transmission is seasonal (July - October) and plans to expand to Oti and Bono East in 2021.

PMI Objective in Support of NMCP

PMI support for drug-based prevention of malaria is in line with that of the national strategy. PMI supports procurement of SP-AQ and operational costs for SMC in the Northern, North East, and Savannah regions (with plans to expand support for Oti and Bono East) as well as procurement of SP for IPTp, as needed. PMI strengthens the capacity of healthcare workers at health facilities and CHPS compounds in all 16 regions to effectively deliver malaria prevention services to pregnant women through supportive supervision, including on-site training on provision of IPTp at every ANC visit and ensuring the distribution of an ITN at first ANC visit.

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Procurement and distribution of 1.9 million doses of SP-AQ for SMC in Northern, North East, and Savannah regions
- Implementation of SMC by GHS in the Northern, North East, and Savannah Regions in July-October 2020
- Support to healthcare workers at health facilities and CHPS compounds to effectively deliver malaria prevention services to pregnant women, including supportive supervision and on-site training of IPTp at every ANC visit and ensuring the distribution of an ITN at first ANC visit
- Provision of technical assistance to support the GHS and NMCP in continuous distribution of ITNs though ANC clinics in health facilities

PMI-Supported Planned Activities

In FY 2021, PMI plans to support the following activities:

- Procure approximately 970,000 SP treatments to ensure adequate supply for pregnant women to receive three doses throughout their pregnancies in 2022
- Procure and distribute 1,878,500 doses of SP-AQ for the 2021 SMC campaign in Northern, North East, and Savannah regions
- Implementation of SMC by GHS in the Northern, North East, and Savannah Regions in July-October 2021
- Support healthcare workers at health facilities and CHPS compounds to effectively deliver malaria prevention services to pregnant women, including malaria-specific OTSS and ISS and on-site training of IPTp at every ANC visit and ensuring the distribution of an ITN at first ANC visit

2.2.1. MALARIA IN PREGNANCY (MIP)

Key Goal

Support the national strategy for MIP, which includes provision of ITNs at the first ANC visit, a minimum of three doses of IPTp in malaria endemic areas starting at 13 weeks gestational age, and effective case management of malaria per WHO guidelines.

Key Question 1a

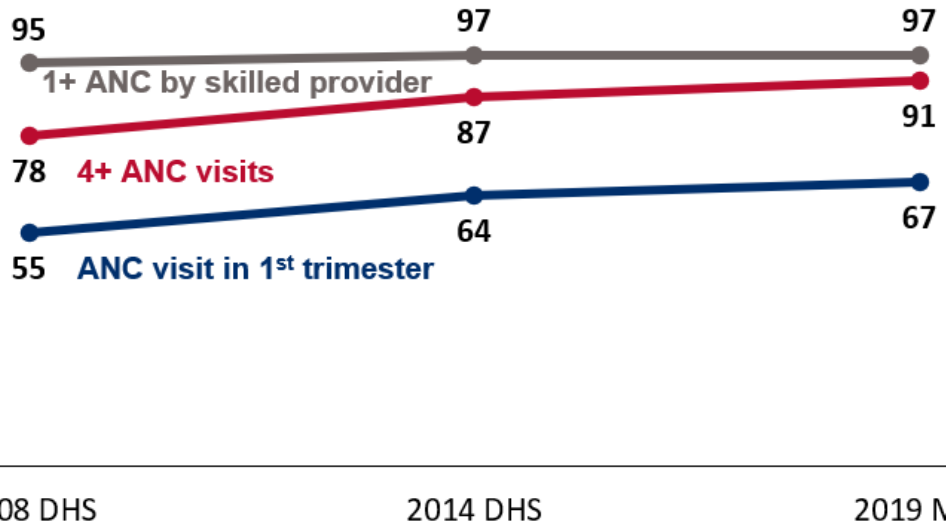
What proportion of pregnant women are accessing ANC early and frequently (as recommended by national and/or WHO strategies) during their pregnancy?

The percentage of women accessing ANC in the first trimester increased from 55 percent in 2008 to 67 percent in 2019 (Figure A-13). While the percentage of women accessing ANC at least once remained fairly constant during this period, the percentage of women completing at least four ANC visits has increased from 78 percent to 91 percent (Figure A-13). Ghana has largely adopted the 2016 WHO ANC guidance, but recommends one contact in the first trimester, three contacts in the second trimester (instead of the WHO recommended two contacts to better facilitate early access to IPTp), and a minimum of four contacts in the third trimester. The updated ANC guidelines are reflected in the updated Ghana National Safe Motherhood Service Protocol and Maternal and Child Health record book.

Supporting Data

Figure A-13. Trends in ANC coverage

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



Key Question 1b

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

A number of studies utilizing a KAP methodology have been conducted in Ghana to identify key facilitators and barriers to ANC attendance.[12,13] Major facilitators and barriers to ANC attendance included:

- Facilitators: positive experiences at ANC, and pregnant women who attended ANC early and often knew the importance of ANC for the health of their baby
- Barriers: negative experiences at ANC mainly around mistreatment, especially young mothers, and distance to ANC making it inaccessible

Supporting Data

Not applicable.

Key Question 2

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

The percentage of women receiving at least one dose of IPTp increased from 58 percent in 2008 to 91 percent in 2019, while those receiving at least two doses increased from 46 percent to 80 percent over the same period (Figure A-14). IPTp3+ uptake has increased from 28 percent in 2011 to 61 percent in 2019.

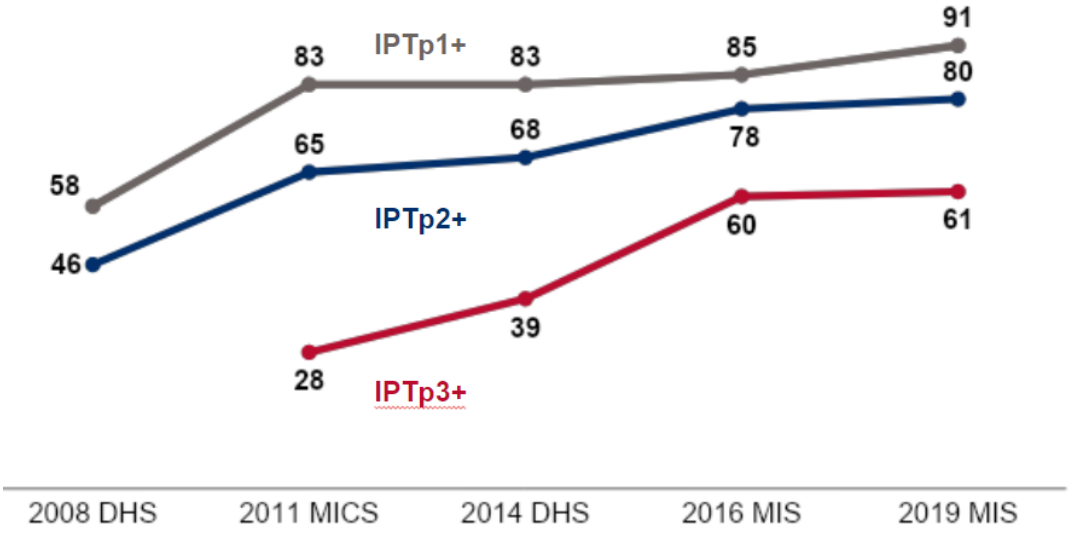
[12] Hill J, Hoyt J, van Eijk AM, D'Mello-Guyett L, ter Kuile FO, Steketee R, et al. (2013) Factors Affecting the Delivery, Access, and Use of Interventions to Prevent Malaria in Pregnancy in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. PLoS Med 10(7).

[13] Odjidja EN, Kwanin C, Saha M (2017) Low Uptake of Intermittent Preventive Treatment in Ghana; An Examination of Health System Bottlenecks. Health Syst Policy Res. Vol. 4 No. 3:58.

Supporting Data

Figure A-14. Trends in IPTp

Women 15 to 49 years of age with a live birth in the two years before the survey who received the specified number of doses of SP/Fansidar during their last pregnancy. IPTp3+ baseline uses the first survey available after the recommendation was updated to three or more doses.



Historical data have been updated to reflect the new definition of these indicators, which includes the specified number of doses, regardless of source.

Key Question 3a

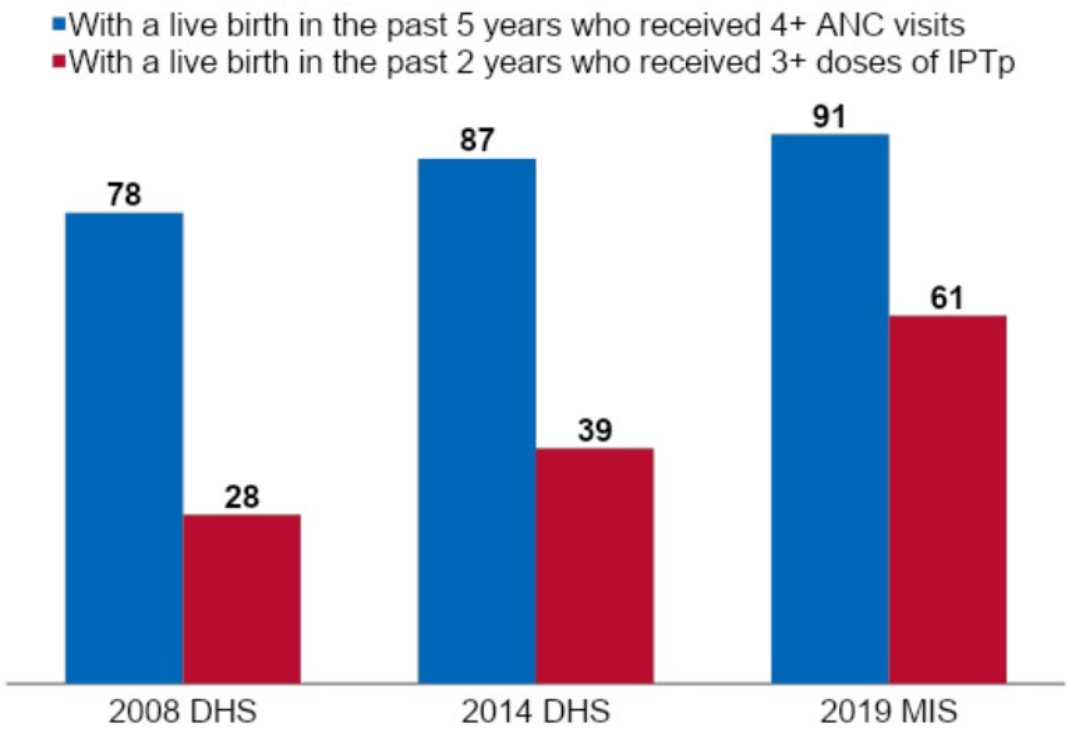
What is the gap between ANC attendance and IPTp uptake (i.e., missed opportunities for giving IPTp at ANC)?

While Ghana has a high ANC attendance rate, with women with a live birth in the last five years who received four or more ANC visits in the last year at 91 percent, uptake of IPTp does not track with ANC attendance, with only 61 percent of women receiving IPTp3+, translating into a 30 percent gap between ANC attendance and IPTp uptake per the 2019 MIS (Figure A-15). Reasons for visiting ANC, but not taking IPTp include side effects (10.8 percent) and not wanting to take the medication (7.6 percent). However, the overwhelming reasons for not taking IPTp were not being aware it had to be taken (42 percent) and not being given the medication by health workers (34.9 percent) (MIS 2019). This data shows that knowledge of the benefits of IPTp in the prevention of MIP by women attending ANC and health system challenges, including the refusal of health workers to give out SP, are the main reasons for the relatively low uptake of IPTp3.

Supporting Data

Figure A-15. Trends in missed opportunities for IPTp

Percentage of women 15 to 49 years of age with a live birth in the past five years who received 4+ ANC visits and those with a live birth in the past two years who received 3+ doses of IPTp.



Key Question 3b

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

Studies[14] utilizing a KAP methodology have been conducted in Ghana to identify key facilitators and barriers to IPTp administration at ANC, including:

- Facilitators: availability of ANC and provider attitude
- Barriers: periodic facility-level stockout of SP and complaints of side effects of SP

Logistics management is a significant challenge to IPTp and ITN distribution at ANC. Particularly for SP, maintaining adequate supply at the central level has been challenging, in part due to available resources for procurement. Ghana is transitioning from a distribution system where facilities travel to the Regional Medical Stores (RMS) to pick commodities to last mile distribution, where commodities are delivered directly to health

[14] Partner reports, desk review, and Hill J, Hoyt J, van Eijk AM, D'Mello-Guyett L, ter Kuile FO, Steketee R, et al. (2013) Factors Affecting the Delivery, Access, and Use of Interventions to Prevent Malaria in Pregnancy in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. PLoS Med 10(7).

facilities based on requisition. At times, poor capture and knowledge of consumption data has led to some facilities missing deadlines for submission of requests for resupply from RMS. If a resupply visit is missed, facilities must wait until the next scheduled delivery to receive supplies. This has led to stockouts of both SP and ITNs leading to missed opportunities for MIP and ITN services.

The 2019 MIS also shows that a significant proportion of ANC attendees did not receive SP because it was not offered by health workers. Several reasons could account for this, including poor attitude to service provision and lack of adherence to guidelines and protocols on the part of health workers. All these could be contributing to the low IPTp uptake reported. Supporting district leaders to schedule and implement outreach services to peripheral and other facilities will be critical in carrying out SBC among health workers to improve MIP services. Malaria OTSS and ISS may also be ideal vehicles for improving the skills of health workers in logistics and IPTp protocol management.

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

Supporting Data

Not applicable.

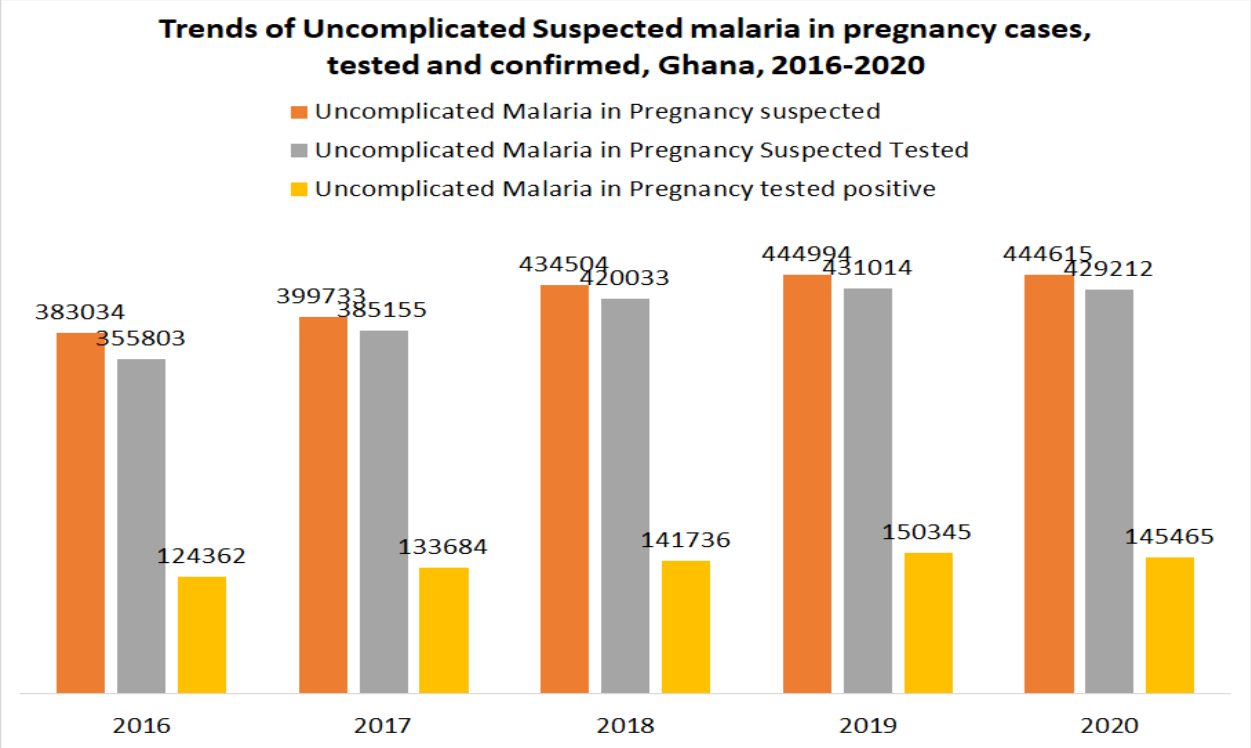
Key Question 4

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

Ghana's Health Information System collects data and tracks trends of uncomplicated suspected cases of malaria in pregnancy. From 2016 to 2020, the proportion of pregnant women with fever who were tested for malaria has seen an increase from 92.9 percent to 96.5 percent. Over this same period, the proportion of those who tested positive has decreased slightly from 35 percent to 33.9 percent (Figure A-16).

Supporting Data

Figure A-16. Trends of uncomplicated suspected cases of malaria in pregnancy



Key Question 5

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

The total SP treatments needed for 2021, 2022, and 2023 are 3,244,805, 3,514,549, and 3,797,481, respectively. A gap of 260,910 is anticipated in 2021; however, it should be noted that this gap is based on the quantity of treatments desired at the end of year stock being less than 12 months and does not reflect a stock out situation at the central/regional level. See the SP gap analysis below for further details.

Supporting Data

Table A-14. SP Gap Analysis Table

Calendar Year	2021	2022	2023
Total Country Population	32,562,671	33,400,644	34,260,928
Total Population at Risk for Malaria	32,562,671	33,400,644	34,260,928
PMI Targeted at Risk Population	32,562,671	33,400,644	34,260,928
SP Needs			
Total Number of Pregnant Women	1,302,507	1,336,026	1,370,437
Proportion of women expected to attend ANC1 at 13 weeks or greater	85%	85%	85%
Proportion of women expected to attend ANC2	67%	70%	74%
Proportion of women expected to attend ANC3	59%	64%	69%
Proportion of women expected to attend ANC4	38%	44%	49%
Total SP Needs (treatments)	***3,244,805***	***3,514,549***	***3,797,481***
Needs Estimated based on HMIS Data			
Partner Contributions (treatments)			
SP from Government	2,680,559	2,997,374	3,328,792
SP from Global Fund	0	1,058,100	1,136,550
SP from Other Donors	0	0	0
SP planned with PMI funding	970,000	970,000	0
Total SP Contributions per Calendar Year	***3,650,559***	***5,025,474***	***4,465,342***
Stock Balance (treatments)			
Beginning balance	2,578,141	2,983,895	4,494,819
- Product Need	3,244,805	3,514,549	3,797,481
+ Total Contributions (Received/expected)	3,650,559	5,025,474	4,465,342
Ending Balance	2,983,895	4,494,819	5,162,680
Desired End of Year Stock (months of stock)	12	12	12
Desired End of Year Stock (quantities)	3,244,805	3,514,549	3,797,481
Total Surplus (Gap)	***(260,910)***	***980,270***	***1,365,199***

Conclusions for MIP Investments

PMI plans to maintain all MIP activities in FY 2022, with the exception of procurement of SP, which will be covered entirely by the Global Fund and GOG. PMI will support supportive supervision and SBC to increase uptake of MIP interventions, including adherence to IPTp protocols and health worker responsiveness to patient needs. PMI will support MIP through revised and updated guidelines, training, supportive supervision, and other quality improvement activities to improve the delivery and uptake of MIP. PMI will also support improved capture and understanding of consumption data to help align facilities to the national supply chain system and avoid stockouts of ANC commodities. Please see FY 2022 MOP budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.2. SEASONAL MALARIA CHEMOPREVENTION (SMC)

Key Goal

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

Key Question 1

What is the estimated need for SMC drug (SP-AQ) during CYs 2021-2023? Are there any projected SP-AQ gaps?

The total SP-AQ co-blister needs for CYs 2021, 2022, and 2023 are 5,361,177, 5,490,508, and 5,623,242, respectively, and will be fully covered by contributions from the Global Fund, PMI, and the GOG. There are relatively small anticipated gaps for the 2021–2023 SMC campaigns. Please see the SMC gap analysis for further details.

Supporting Data2

Table A-15. SMC Gap Analysis Table

Calendar Year	2021	2022	2023
Total population in the SMC targeted age range	6,470,903	6,632,675	6,798,492
SMC Drug (SP+AQ) Needs			
National population 3-11 months targeted for SMC	227,847	233,347	238,988
National population 12-59 months targeted for SMC	1,112,432	1,139,280	1,166,823
Total national population targeted for SMC	*1,340,279*	*1,372,627*	*1,405,810*
PMI population 3-11 months targeted for SMC	157,913	162,367	166,947
PMI population 12-59 months targeted for SMC	770,986	792,734	815,095
Total PMI population targeted for SMC	*928,899*	*955,101*	*982,042*
Total SP+AQ Needs (co-blisters)	***5,361,117***	***5,490,508***	***5,623,242***
Partner Contributions (co-blisters, national)			
SP+AQ carried over from previous year	1,158,600	0	0
SP+AQ from Government		1,300,000	1,358,108
SP+AQ from Global Fund	2,264,550	1,337,050	1,359,050
SP+AQ from other donors	0	0	0
SP+AQ planned with PMI funding	1,878,500	2,795,322	2,900,000
Total SP+AQ Contributions per Calendar Year	*5,301,650*	*5,432,372*	*5,617,158*
Total SP+AQ Surplus (Gap)	*-59,467*	*-58,136*	*-6,083*

Key Question 2

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

In addition to the procurement of SP-AQ, proper delivery of SMC requires support for the distribution of commodities and implementation, namely human resources for pre-dosing, dosing, and supervision activities. SMC is primarily implemented by CHVs, (number required is based on the population of children 3 to 59 months of age), sub-district supervisors (five per subdistrict), district supervisors (six per district), regional supervisors (one assigned to each district), national supervisors for districts (one assigned to each district), national supervisors for the focus areas (planning and coordination, SBC, procurement and supply chain management, monitoring and evaluation, and information technology), and health workers at various facilities for adverse drug reaction management. Stakeholders at the regional and district levels (R/DHMT, Regional/District Assembly, FDA, Ghana Education Service, Information Service Department, Police Service and other security agencies, traditional leaders, religious leaders and all other relevant departments and agencies) are engaged prior to and during the SMC implementation for the purposes of pharmacovigilance, security, community mobilization, information dissemination, and logistical support. Because SMC commodities do not get distributed along with other health commodities under routine resupply programming, an ad hoc distribution from central level directly to districts is required. PMI supports the warehousing and transportation of PMI-funded SP-AQ to PMI focus areas.

Supporting Data

Not applicable.

Key Question 3

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

SMC coverage in Ghana exceeds the national target of 80 percent. Currently, there is limited data available on SMC refusal rates, or barriers and facilitators to SMC acceptance and uptake. However, one study[15] showed that the level of uptake of SMC in communities is influenced by the level of trust in health personnel in the community and observed benefits of SMC (e.g., reduced morbidity and mortality in children under five). Barriers to SMC include preference for herbal medicines (especially among the Fulanis nomads), physical barriers to SMC administration (e.g., no access routes, cut off by water), and fear of adverse drug reactions. However, very few children whose parents refused SMC medicines were found to have reacted adversely to the medicines in previous rounds and hence considered ineligible (allergic to the medicine). The NMCP continues to work with CHOs and CHVs to identify challenges with SMC, including monitoring SMC-associated adverse reactions, and will use community-based SBC to encourage SMC adherence.

Supporting Data

Not applicable.

[15] Antwi GD, Bates LA, King R, Mahama PR, Tagbor H, Cairns M, et al. (2016) Facilitators and Barriers to Uptake of an Extended Seasonal Malaria Chemoprevention Programme in Ghana: A Qualitative Study of Caregivers and Community Health Workers. PLoS ONE 11(11).

Conclusions for SMC Investments

With FY 2022 funding, PMI will continue to support SMC, including the procurement, temporary warehousing, and distribution of approximately 2,900,000 doses of co-blistered SP-AQ, representing 74 percent of the total need for approximately 166,947 children (3-11 months of age) and 815,095 children 12 to 59 months of age for four months in Northern, North East, and Savannah regions and expand to also include Oti, and Bono East regions. PMI will also support operational costs associated with the CY 2023 SMC campaign in Northern, North East, Savannah and Oti regions, which will be implemented by the GHS. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.3. ADDITIONAL DRUG-BASED PREVENTIVE STRATEGIES

This country is not a designated country for near-term pre-elimination or elimination and there is no PMI support planned for such work in Ghana.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.1. SUPPLY CHAIN

NMCP Objective

Per the NMSP 2021-2025, Ghana aims to ensure timely and adequate supply of quality-assured malaria commodities to all service delivery points by 2025. The strategies to achieve this objective are:

- Advocate for accurate data driven forecasting and supply planning of malaria commodities
- Advocate for effective procurement and timely delivery of malaria commodities
- Advocate for efficient warehousing and sustainable distribution system across the supply chain
- Strengthen quality assurance systems for malaria commodities
- Support full implementation of Ghana Integrated Logistics Management Information System (GhiLMIS) for the provision of accurate and timely supply chain information for decision making at all levels (with the acknowledgement that it may not be possible to implement at all SDPs)
- Strengthen capacity of healthcare workers involved in commodity management at sub-national levels
- Establish guidelines and policies to guide implementation for the supply of RDTs and SPs to private sector

NMCP Approach

Ghana has drafted a Supply Chain Master Plan (SCMP) 2021-2025, building on experience and lessons learned from the SCMP 2015-2020, and a national supply chain assessment conducted in 2019. The SCMP provides a broad strategic framework that will guide investment and interventions that strengthen health commodity financing, governance, warehousing, and distribution, as well as logistics information management that benefits all products, including malaria commodities. The SCMP describes supply chain strengthening activities and interventions across 11 focus functional areas:

- Strategic Planning and Management
- Policy and Governance

- Human Resources
- Financial Sustainability
- Forecasting and Supply Planning
- Procurement and Customs Clearance
- Warehousing and Storage
- Distribution
- Logistics Management Information System (LMIS)
- Quality and Pharmacovigilance
- Waste Management

The NMCP aims to strengthen the supply chain through six key strategies:

1. Ensure accurate, data-driven and timely forecasting and supply planning of malaria commodities
    - Conduct annual quantifications, based on consumption data and services data from GhiLMIS and DHIMS
    - Review forecasts semi-annually, update supply plans monthly, and conduct quarterly monitoring reviews
    - Conduct refresher training in quantifications for relevant staff

2. Advocate for effective procurement and timely delivery of malaria commodities
    - Utilize the Ghana Electronic Procurement System to procure malaria commodities
    - Advocate for funding from the government and development partners so it can procure all needed commodities
    - Support and fund devolution of procurement to the regional level
    - Sustain pooled procurement (Framework Contracting) of selected malaria commodities in order to purchase quality commodities at standardized and affordable prices across the country
    - Collaborate with the MOH to engage the relevant private sector organizations to develop a policy and roadmap to supply program commodities to the private sector in a manner that ensures quality, equity, efficiency, transparency, and accountability

3. Advocate for efficient warehousing and a sustainable distribution system throughout the supply chain
    - Advocate for optimization of warehousing and operations across the supply chain
    - Integrate all malaria commodities, except SMC, and other non-medical commodities (e.g., information, education, and communication materials) into the Last Mile Distribution (LMD) program to guarantee continuous delivery and availability at the service delivery points
    - Advocate for the allocation of more resources to RMS to sustain LMD

4. Strengthen quality assurance systems for malaria commodities
    - Collaborate with the FDA and partners to conduct continuous quality monitoring of malaria commodities at ports of entry and post markets
    - Conduct semi-annual audits of quality-assurance processes to ensure they remain current and relevant

5. Support full implementation of GhiLMIS for the provision of accurate and timely supply chain information for decision making at all levels
    - Support implementation of GhiLMIS
    - Conduct regular refresher training for identified end-users who require training

6. Strengthen the capacity of healthcare workers involved in commodity management at sub-national levels
    - Collaborate with the Supply, Stores and Drug Management Division and partners to conduct supply chain supportive supervision and refresher training as a means of retaining high levels of capacity for commodity managers at SDPs.

PMI Objective in Support of NMCP

PMI contributes to the strategies described in the NMSP and the SCMP through the following activities:

- Assist with the NMCP-led annual quantification, routine updates, and monthly supply plan reviews of malaria commodities
- Procure quality malaria commodities for the public health supply chain, including initiating and monitoring order status, and facilitating customs clearance of PMI-procured health commodities
- Strengthen transparency and accountability of public procurement of health commodities through the implementation of framework contracting mechanisms to address cost price variation and quality assurance-related issues and leverage economies of scale for better unit cost price of quality assured essential medicines
- Provide subject matter technical expertise to the Global Fund-supported team and the GHS to support the implementation of GhiLMIS nationwide, including onboarding of all facilities and quality assurance during rollout
- Provision of quality central-level warehousing for PMI-funded commodities
- Distribution of PMI-funded commodities from central to regional and district levels
- Support LMD of GHS-managed commodities, including malaria commodities, from select regional levels to service delivery points
- Provide technical assistance to the MOH and GHS to advocate for Global Standards 1 (GS1) standards among local manufacturers and importers of malaria and other health program commodities and develop a national traceability strategy for GS1 implementation in Ghana

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Supported warehousing/distribution
    - Secured pharmaceutical grade insured warehousing for PMI-funded malaria medicines and RDTs; secured appropriate warehousing with 100 percent fire risk mitigation and 100 percent accountability for inventory
    - Secured non-pharmaceutical grade warehousing for ITNs at the central level prior to distribution to the districts for planned school distribution and mass campaigns
    - Conducted a full and open competitive process for transportation and distribution services for FY 2020 for central to regional delivery services of malaria commodities
    - Distributed $639,718 worth of malaria commodities from the central level to 10 RMSs and 4 teaching hospitals
    - Distributed $330,600 worth of ITNs from the central level to districts to support continuous distribution

    - Collaborated with Global Fund to support LMD in Eastern, Northern, Ashanti, and Upper Western regions (TA and funding for third party logistics providers), Greater Accra, Volta, Upper East, and Central regions (TA; 3PL funding by Global Fund)
    - Achieved high LMD coverage, delivering commodities directly to health facilities (97.31 percent to hospitals, polyclinics, health centers and CHPS and clinics
    - Distributed over 1.24 million ITNs to targeted schools across 15 regions within three weeks using 3PL concept
- Worked with the NMCP to carry out forecasting, supply planning, and pipeline update for all malaria commodities
- Supported LMIS implementation and transition
    - Integrated GhiLMIS with critical systems in the Ghana supply chain ecosystem
    - Mobile devices implemented at two RMS (Brong Ahafo and Eastern Region) to support the efficient and accurate capturing of supply chain commodity weights and dimension measurements
    - GhiLMIS (initial operating capability) implementation rollout to 299 sites
    - GhiLMIS (full operating capability) rollout to 466 sites: Western Region – 106 sites, 8 clinics, 82 health centers, 16 district health authorities; Zone 1 (Brong Ahafo and Ashanti Regions) – 360 sites (291 health centers, 69 district health authorities)
    - Currently on-boarded 765 sites/district health departments with GhiLMIS with target of reaching 1,020 sites and 216 DHDs by end of FY21
    - Drafted roles and responsibilities of each stakeholder regarding GhiLMIS implementation and data access
- Conducted EUV in 103 randomly selected SDPs across 10 regions
- Provided technical assistance for logistics training and SMC commodity distribution monitoring
- Conducted ACT preference study to examine the relative preference of ACT types and weight bands across the supply chain to inform future forecasting exercises
- Conducted ACT, RDT, and SP stockout root cause analysis as a first component of the implementation of the PMI Stockout Reduction Initiative

Challenges have included:

- Selective stocking of AL formulation by health facilities, affecting availability of all range of ACTs for treatment; however, facilities retain ability to treat
- SDPs non-adherence to appropriately implement basic logistics management principles (storage, reporting, and requisitioning for ITNs) via health facility-based ITN distribution
- Low levels of monitoring and supportive supervision at the lower levels by RHAs as a result of financial and Human Resources constraints
- Limited site-level data visibility
- Central and regional stock levels rose above maximum due to delayed ACT shipments arriving simultaneously with scheduled shipments

PMI-Supported Planned Activities

In FY 2021, PMI support for the activities described above will largely continue, including:

- Provision of technical assistance in quantification of malaria commodities, including routine updates, and ongoing supply plan monitoring
- Support GhiLMIS implementation and transition
- Support LMD and the implementation of transition plans for LMD
- Warehousing and distribution support, including for ITNs
- Development of a two-year PMI supply chain investment and implementation plan toward reducing stockouts

Key Goal

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

Key Question 1

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

Both AL and AS-AQ are used for malaria treatment in Ghana. Although stock levels for most presentations, particularly for AL, were below the minimum in FY 2020, availability of a range of presentations enabled distribution down to lower levels. Stock levels of SP were particularly challenging, in part due to lack of resources available for procurement, but the stock levels stabilized, and were maintained between the minimum and maximum. RDTs have remained between minimum and maximum stock levels through the year. Several strengths of artesunate injection are used in Ghana and stock levels have fluctuated, exceeding the above maximum and dropping below minimum levels at various times throughout the year.

Key Question 2

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

SDP stockout rates of individual ACTs were high; however, this is not indicative of ability to treat as Ghana uses both AL and AS-AQ. An ACT preference study has been conducted and is in the process of being finalized, but findings show there is a preference to stock AL 6x4; AL 6x4 had the lowest stockout rate. Stockout rates for AS-AQ have fluctuated throughout the year, but overall have declined. The stockout rate for SP increased, reflecting the unavailability of SP at the central level. However, shipments of SP have arrived and the product is currently available in-country. For RDTs, stockout rates increased through the year; however, RDTs are within minimum and maximum stock levels at the central level.

Key Question 3

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

In previous years, the quantities of ACTs and RDTs consumed at each SDP were mandated to be reported monthly to the district level via the Requisition, Issue, and Receipt Voucher Report of the paper-based LMIS, which is used for multiple GHS health programs. However, the malaria commodity data from these reports,

when they are submitted, has not routinely been forwarded in either aggregated or disaggregated form, to the central level. Subsequently, the quantities of ACTs or RDTs that have been consumed at a national level across a specific period of time are not available and quantification is limited to the use of higher level issues data.

The GhiLMIS, for which rollout commenced in mid-CY 2019 and will be completed in late 2023, will eventually be forwarding LMIS data, disaggregated by service delivery point, to the central level from around 3,800 of approximately 5,500 sites. This will include approximately 2,500 of 4,160 CHPS compounds where there is sufficient infrastructure in place to support the platform. As GhiLMIS rollout continues, periodic reporting of the consumption of ACTs, RDTs, and other malaria commodities from sites having reported into the system on time will be able to be compared with case management data.

Key Question 4

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

GhiLMIS captures facility-level logistics data, including consumption and stock on hand, and is in the process of being rolled out. Implementation is on track to reach the target of 1,020 sites and 216 District Health Departments by the end of FY 2021. Once GhiLMIS is fully rolled out, commodity data visibility will no longer be exclusively dependent on surveys such as the EUV survey.

Key Question 5

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

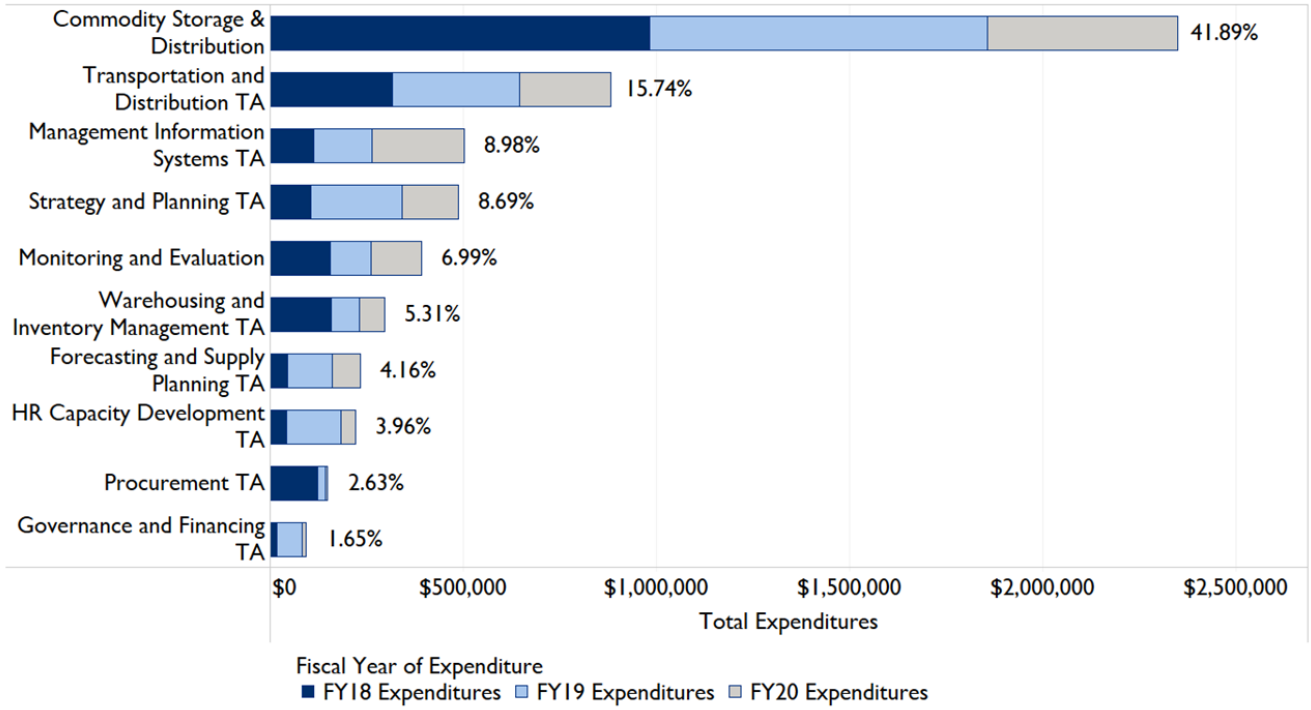
As part of the stockout reduction initiative, a two-year investment plan for supply chain strengthening is in development. The following investments have been identified, which support the strategies described in the NMSP and the SCMP, and include:

- Support rollout and uptake of GhiLMIS to SDPs
- Support MOH/NMCP to update national policies and guidelines to ensure proper use of ACTs
- Provide and/or advocate for using emergency / reprogram funds to fill identified funding gaps or anticipated shipment delays resulting from MOH procurements
- Support supply chain workforce development
- Support MOH/GHS to develop and implement robust and sustainable plans to achieve successful transition from Global Fund support with regards to the last mile distribution activities
- Support integration of ITNs continuous distribution process into LMD

Commodity storage and distribution represents a significant proportion of overall PMI supply chain investments (~42 percent), along with transportation and distribution TA (~16 percent). A complete breakdown of PMI supply chain investments by technical area is shown in Figure A-17.

Supporting Data

Figure A-17. PMI supply chain investments by technical area



Conclusions for Supply Chain Investments

In FY 2022, PMI will continue to support supply chain strengthening activities. In addition to procurement of severe malaria medicines, SMC medicines, and ITNs as described in other sections, PMI will support a review of policies to rationalize ACT stocking in line with recommendations from the ACT preference study, provide technical assistance to forecasting and supply planning, including routine stock status monitoring, provide technical assistance to MOH and GHS for GhiLMIS implementation, including strengthening data use, and support the implementation of the SCMP. PMI will also provide warehousing and distribution support, including LMD and providing technical assistance for the implementation of transitioning this distribution support, and provide technical assistance in integrating ITNs into last mile distribution. Supply chain technical assistance will also be provided in planning and monitoring the SMC campaigns. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

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

NMCP Objective

The National Malaria Control Monitoring and Evaluation Plan 2021-2025 was developed alongside the NMSP and provides the monitoring and evaluation framework for implementation of the NMSP 2021-2025. The Monitoring and Evaluation Plan 2021-2025 aims to strengthen malaria surveillance systems to ensure timely availability of high

quality, consistent, and relevant malaria data at all levels, in order to track the progress of malaria control and prevention interventions towards 2025 malaria control targets. Specific objectives of the plan include:

- Strengthening technical capacity for surveillance of malaria control at all levels
- Strengthening the logistics structure for surveillance at all levels
- Improve malaria quality assurance system at all levels
- Establish malaria surveillance, M&E system for pharmacies and over the counter medicine sellers (OTCMS)
- Strengthening surveillance at sentinel sites
- Enhanced coordinated monitoring of program progress towards malaria elimination
- Supervision of malaria program implementation at all levels
- Population-based survey and operational research to inform program direction
- Dissemination of survey and surveillance reports

The Monitoring and Evaluation Plan also includes objectives for areas targeted for pre-elimination (annual parasite incidence and slide positivity rate <5 percent), including:

- Outbreak detection and response mechanisms
  - Migrate reporting system to case-based reporting at all service delivery sites
  - Detect all malaria infections
  - Weekly case-based malaria data reporting through Integrated Disease Surveillance and Response (IDSR)
  - Establish thresholds to identify outbreaks
  - Intensify response and surveillance activities in the targeted areas
  - Reactive case detection and treatment

NMCP Approach

Surveillance helps to assess the impact of all malaria interventions being implemented across all levels. NMCP, in collaboration with Policy Planning Monitoring and Evaluation, (PPME) will put in measures to strengthen the technical capacity of health workers as well as logistic infrastructure for an effective functioning of DHIMS2, through:

- Training-of-trainers targeting regional level staff/facilitators on data management and use
- Training of district level staff by regional facilitators/data managers on data management and use
- Training of facility level staff by district facilitators/data managers on data management and use (public sector including teaching hospitals, quasi-government, and Christian Health Association of Ghana
- Training of facility level staff by district facilitators/data managers on data management and use (private sector)
- Supervision of trainings of facility data managers by national level staff (public and private sectors)
- Updating staff on new SM&E via national and international courses

A robust logistic structure is required for an effective surveillance system. The NMCP, together with stakeholders ,will ensure that logistic management is strengthened at all levels using the under listed activities:

- Print and distribute data reporting forms

- Upgrade information communication technology infrastructure (server, applications and accessories)
- Procure computers, printers, and accessories for data management at national level
- Procure computers, printer,s and accessories for data management sub-national levels
- Support maintenance of information communication technology infrastructure at NMCP

Malaria data quality assurance is still a major challenge at the subnational levels and some data managers are unable to provide timely and quality data to inform decisions. NMCP, together with partners, will strengthen the capacity of staff and stakeholders to improve the malaria quality assurance system at all levels. To improve on the quality assurance systems the following strategies and activities will be implemented:

- Develop/update standardized SM&E procedures, tools, and guidelines
- Printing of malaria data reporting tools and guidelines
- Support update and printing of guidelines for data use/sharing (data utilization manual)
- Update, print and distribute Standard Operating Procedures on Health Information Management
- Conduct monthly (weekly for areas in pre-elimination) data verification meeting at all levels
- Conduct periodic data analysis for use of decision-making
- Supervision of periodic data analysis meetings by the next level
- Roll out data quality audits at district level

Many health service data produced by pharmacists and OTCMS are lost due to inaccurate data or non-reporting in DHMIS-2. The NMCP will integrate the information system used by the pharmacies and OTCMS in the control of malaria in Ghana to facilitate timely, accurate, reliable, and valid data for planning, management, and decision-making. By this strategy, all pharmacies and OTCMS staff will be equipped and trained to master the act of monitoring and evaluation by the following activities:

- Engage pharmacies and OTCM institutions on need for malaria data reporting and its impact on control activities in Ghana
- Develop appropriate data management systems for pharmacies and OTCM, including data collection tools, etc.
- Conduct training for pharmacies and OTCMs staff on data management
- Conduct joint periodic review meetings to assess performance and provide update on control intervention

Malaria sentinel site surveillance is vital in guiding program planning, updating, and notifying governments and donors on progress made towards malaria control to improve on sentinel surveillance of malaria morbidity, drug efficacy, and entomology. NMCP intends to maintain the gains made through sentinel site surveillance over the years.

PMI Objective in Support of NMCP

PMI contributes to Ghana's SM&E strategy for malaria, which prioritizes DHIMS2 data validation, analysis, and use at all levels of the health system through quarterly data review meetings at the districts and capacity building of health information officers in districts, sub-districts, health centers, and CHPS compounds. PMI support for SM&E is nationwide and includes:

- Improving supportive supervision and training at all health levels to ensure proper data collection, reporting, and interpretation
- Continuing to support regional malaria data review workshops to discuss DHIMS2 data use and programmatic implications
- Work with the NMCP on the integration of DHIMS2 data with ISS and other health facility data from GhiLMIS
- Support the deployment of the E-tracker, a transactional electronic register to help track patient service delivery and streamline data collection, in health facilities through the PPME to strengthen and improve maternal and child health, including malaria routine data, analysis, and evidence-based decision-making
- Implementation of household surveys, including DHS and MIS, as needed

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Prioritized 270 health facilities for data coaching visits from nine regions
- 408 staff from 990 health facilities in three regions were coached and mentored on malaria standard registers, monthly reporting forms, GHS SOP HIMS, visualization of data on facility-based wallcharts
- Collaborated with NMCP and PPME to train 120 regional, district and hospital Health Information Officers and malaria focal persons on wall charts and customization of dashboards for key malaria indicators in DHIMS2
- Strengthened capacity of RHMTs and DHMTs to use HMIS data to prioritize health facilities for clinical OTSS and develop stratification maps for prioritization to support implementation.
- Trained 105 regional Laboratory OTSS Supervisors on use of dashboard for decision making and local planning
- Supported training of health workers in Upper East, Eastern, Oti, and Volta regions as part of rollout of E-tracker
- Supported a rapid ecosystem assessment of how digital technologies are used for community-based case management, data collection, reporting, and decision-making and developed recommendations on how to prioritize opportunities for improvement.
- Dissemination of 2019 MIS with over 150 local and international participants
- Supported FELTP by identifying malaria specific projects for two Field Epidemiology and Laboratory Training Program fellows

PMI-Supported Planned Activities

In FY 2021, PMI will support the following activities:

- Planning for implementation of the 2022 DHS
- Integrated data coaching visits to health facility data management staff to validate and audit data collection, analysis, and reporting to improve data quality
- Planned review meetings by the NMCP that focus on improved analysis and data use and the PPME Division's Center for Health Information Management boot camp meetings to routinely assess and discuss malaria data

- Training of health facility and subdistrict GHS personnel (30 per cohort for three months) in the Frontline Field Epidemiology Training Program (FETP) to strengthen a "data quality and use" culture at the SDPs. This program includes two weeks of didactic training and the field support and application of training competencies (surveillance, outbreak investigation, data analysis/use, SBC, etc.) through daily mentoring
- Quarterly data review meetings at the subdistrict levels where service providers must analyze, present, and make programmatic improvements based on their data. Frontline FETPs will facilitate these important meetings.
- Expand support for E-tracker to Central, Northern, North East, and Savannah regions

Key Goal

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

Key Question 1

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

Ghana uses DHIMS2 as the main source of data for tracking and measuring programmatic progress. The DHIMS2 web-based platform is managed by the GHS PPME Division through the Centre for Health Information Management. This system is used for reporting and analyzing district-level data from health facilities, is available in all districts, and includes a customized dashboard to report malaria-focused indicators. Ghana utilizes GhiLMIS to collect routine logistics data, including consumption and stock on hand, which is utilized to calculate resupply as well as for conducting forecasts. The EUV, which is conducted semi-annually, is a health facility-based survey used to monitor the availability of malaria commodities at facilities, gain insights into the reasons for commodity stockouts, assess gaps or challenges with inventory management and commodity storage practices and conditions of facilities and equipment. Routine entomological monitoring and TES are also conducted to inform vector control interventions and malaria treatment guidelines. Ghana also conducts household surveys, including DHS and MIS, as well as ad hoc targeted surveys, such as Malaria Behavior Surveys (MBS), health facility surveys, and impact evaluations, as needed.

Table A-16. Available malaria surveillance sources

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

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

Key Question 2

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

PMI has worked with the NMCP and other malaria stakeholders to strengthen DHIMS2, and data completeness and timeliness of reporting have improved. PMI has supported several HMIS activities at the central, regional, district, facility, and community (Community-based Health Planning and Services [CHPS] compound) level. The activities include:

- Central and regional level
  - Data quality assessments
  - Program monitoring and technical assistance
  - Data use through analysis, interpretation, dissemination, and decision-making
- District, facility, and community level
  - Data entry and transmission trainings
  - Data validation activities before monthly data submission
  - Supervision of CHWs
  - Monthly/quarterly data quality review meetings
  - Data use through analysis, interpretation, dissemination, and decision-making

In FY 2022, PMI will strengthen routine data use by supporting quarterly data review meetings at the regional and district levels. PMI will also support the GHS to expand the E-tracker, which is an electronic tablet-based system that provides real-time OPD data and improves data validation, visualization, analysis, and use. Activities to be supported include trainings, manual development, supportive supervision, and server maintenance cost. The regions for the roll-out will be determined by the GHS in collaboration with partners.

Supporting Data

Not applicable.

Key Question 3

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

DHIMS2 quality is improving over time with respect to timeliness, completeness, and reliability when triangulated with other data sources (i.e., sentinel sites and household surveys). The percent of reports received on time was 90.1 percent in 2019 and 87.1 percent in 2020, while the reporting rate for suspected malaria cases tested was 94.9 percent in 2019 and 96.4 percent in 2020 (Table A-17). Data validation, analysis, and use remain key challenges especially at lower levels. PMI continues to support data reviews, validations, and analyses at district and sub-district levels to increase the use of data for decision making and address quality of data going into the DHMIS2 platform.

Supporting Data

Table A-17. Outcomes of HMIS strengthening efforts

	Indicator	2019	2020
Timeliness	Percent of reports received on time	90.1	87.1
Completeness	"Suspected uncomplicated malaria cases tested" reporting rate	94.9	96.4
Accuracy	N/A	Not available	Not available

Key Question 4

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

There are currently no other considerations that impact PMI's funding allocations for SM&E.

Supporting Data

Not applicable.

Conclusions for Surveillance, Monitoring, and Evaluation Investments

In FY 2022, PMI will continue to support SM&E activities as in previous years. PMI will provide technical assistance and support to improve data quality and ensure development and use of sub-district and facility-specific dashboards. PMI will also support implementation of E-tracker through the PPME to strengthen and improve malaria routine data, analysis, and evidence based decision making. In addition, PMI will support the Frontline FETP to train district, sub-district, and health center healthcare workers in data analysis and use. See FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.3. OPERATIONAL RESEARCH

NMCP Objective

As a policy, the MOH has a knowledge transition platform to guide programs to improve, and demonstrate impact and efficacy. Additionally, the GHS Research and Development Division (RDD) is mandated to generate relevant information through research to inform policy and implementation of all health programs in Ghana. The division has a robust ethical review mechanism for research activities. The NMCP drawing from these levels has outlined in the current NMSP 2021-2025 operational research to support program direction.

NMCP Approach

The NMCP/GHS, in collaboration with other partners, holds biannual research symposiums to discuss ongoing and completed research and identify OR priorities in Ghana. The NMCP also periodically works with donors and

in-country research institutions, academia, and implementers to review malaria studies and identify priority areas requiring OR. The MaVCOC reviews data and discusses vector control research areas for investment during its quarterly meetings. The RDD of the GHS sets the research agenda for the country. The GHS research agenda (2015-2019)[16] reiterates the priorities as described in the current NMSP, including health facility surveys, IPTp and SMC impact studies, durability assessments of ITNs, prevalence of histidine rich protein 2 (HRP2) gene deletions, monitoring of *P. vivax* parasites, and the impact of different SBC approaches.

PMI Objective in Support of NMCP

PMI has supported the development and implementation of OR initiatives in Ghana and will continue to invest in PE/OR in line with the NMCP's strategic plan that evaluates quality and efficiency of services, improves coverage, tests the effectiveness of new tools, and identifies opportunities and operational bottlenecks.

PMI-Supported Recent Progress

PMI did not support any PE/OR activities in FY 2020.

PMI-Supported Planned Activities

In FY 2021, in consultation with the NMCP, PMI plans to support PE of Ghana's LSM program. There is no concept note available yet in support of this planned activity at the time of this MOP.

PMI Goal

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

Key Question 1

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

At the time of this MOP, no technical challenges or operational bottlenecks in program interventions have been identified that require PE/OR. Current PE/OR activities supported by the Global Fund and WHO are described in Figure A-15.

[16] Ghana National Health Research Agenda, 2015-2019:
https://adphealth.org/upload/resource/Ghana_National_Health_Research_Agenda_2015-2019.pdf

Supporting Data

Table A-18. Ongoing Program Evaluation and Operational Research

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
WHO, Global Fund	WHO	Malaria Program Review	Completed
Global Fund	NMCP, Noguchi Memorial Institute for Medical Research	Histidine rich protein 2 deletions	Ongoing
Global Fund	WHO	Malaria Stratification through High Burden High Impact	Completed

Key Question 2

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

With the development of the new NMSP 2021–2025, the NMCP, PMI, WHO, and other partners are focusing on building the capacity of health personnel to analyze and use data at lower levels in order to target malaria interventions more effectively. SMC has been implemented in Ghana since 2015 starting in the Upper West and subsequently expanded into other regions including the North East, Northern, and Savannah with PMI support. The NMCP has identified an impact evaluation of SMC as a priority for PE/OR with the availability funds. With PMI support to expand SMC into other regions, including Oti and Bono East, the need for PE/OR in the area of SMC is of increasing importance, but is not currently planned due to resource constraints.

Supporting Data

Not applicable.

Conclusions for Program Evaluation and Operational Research Investments

Both NMCP and PMI see PE/OR as integral to achieve and improve malaria interventions as well as identify opportunities for improved efficiencies and impact. In line with the NSP, areas for PE/OR will be identified periodically in collaboration with partners before funding is earmarked. However, PMI is not planning to support any PE/OR in FY 2022.

3.4. SOCIAL AND BEHAVIOR CHANGE (SBC)

NMCP Objective

Per the NMSP 2021-2025, Ghana's objective is to ensure at least 95 percent of the population will use at least one malaria preventive measure, and 95 percent of those with fever seek care within 24 hours of onset of symptoms by 2025.

NMCP Approach

Understanding and addressing the barriers to behavior change is a key strategy in Ghana's efforts to increase the uptake of diagnostic, treatment, and prevention services. Key behavioral risk factors that threaten the effort to interrupt onward transmission of malaria exist, including delays in care-seeking due to long distances to access healthcare, low use of ITNs, low uptake of IPTp, and poor adherence to guidelines by healthcare personnel. Ghana will be using multi-pronged strategies to encourage the adoption of desired malaria prevention and treatment behavior at various levels. The strategies include:

- Advocacy with stakeholders for commitment to ensure malaria interventions are prioritized and supported. The advocacy focuses on mobilizing support of traditional, religious and opinion leaders including queen mothers, chiefs, and policy-makers (e.g., regional house of chief), district assembly members, and the private sector for malaria prevention and treatment. These efforts are aimed at increasing the commitment of policy-makers at all levels (national, regional, district, and community) to allocate resources for the prevention and treatment of malaria.
- Use of mass media or engaging the general public through mass media on malaria control interventions. Strategic mass media activities will be used to provide information and engage the public on malaria prevention and treatment. These activities provide national coverage with targeted media spots and provide information to families on appropriate care-seeking for fever, ITN use, IRS acceptance, larviciding acceptance, and malaria vaccine acceptance. Both electronic media—TV, radio, and videos—and outdoor media such as billboards will be employed to enable communication to various target audiences. Mobile vans and community information centers will broadcast pre-recorded malaria related-messages to the general public.
- Strengthen community action for social mobilization. The CHPs concept of GHS is community engagement aimed at fostering ownership and commitment to acceptance, and ensuring sustainability, of community health services including malaria prevention and treatment interventions. The CHPs strategy brings health services to the doorstep of the population by promoting the uptake of all malaria control interventions ongoing in the country. At the community level, local leaders, citizens, NGOs, FBO, and CBO are mobilized to increase awareness and to correct misconceptions about malaria. Other activities to strengthen community action and social mobilization include:
  - Development of community action plans by community health management committee
  - Conduct of door-to-door education visits by community health officers and volunteers to motivate people to use key malaria prevention and treatment interventions
  - Organize night/evening video shows on cinema vans to educate communities on appropriate use of ITNs and other malaria prevention interventions
  - Conduct education sessions at mosques and churches on malaria prevention
- Development of SBC materials to facilitate and complement communication with general and specific audiences of the population. Materials include posters, counseling cards, leaflets, and TV spots.
- Strengthen the capacity of health workers and stakeholders in both private and public institutions to effectively engage communities at all levels. Health workers are an important source of information for the general public. The capacity of health workers in public and private sectors, and the capacity of over the counter medicine sellers, will be improved in interpersonal communication to effectively engage communities at all levels.

PMI Objective in Support of NMCP

PMI is an active member of different national malaria communication working groups. At the national level, PMI aims to improve the uptake of key malaria prevention and treatment interventions by the population, as well as adherence to national guidelines by service providers. In Ghana, PMI's SBC efforts are focused on increasing the use of ITNs, the uptake of IPTp given the recent shift from IPTp3 to IPTp5, and prompt care-seeking for fever. PMI also targets SBC activities to service providers to improve adherence to malaria in pregnancy and case management guidelines and strengthen interpersonal communication skills to promote the uptake and use of key malaria control interventions. In particular, PMI builds community outreach skills of CHNs and CHOs at CHPS compounds to engage community members and opinion leaders to adopt and promote desired malaria control behaviors. In targeted districts, PMI supports SBC activities to increase coverage and acceptance of IRS and SMC interventions. PMI also supports the HPD through G2G funding to implement integrated community engagement to improve health outcomes and to conduct formative research to identify barriers and facilitators to the uptake and maintenance of malaria prevention and treatment behaviors to inform malaria control and prevention strategies at the community level.

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Supported HPD to implement and evaluate CE4MP in the Volta region to expand community engagement in the Volta region, supporting communities and CHOs to design and implement tailored Malaria Community Action Plans (mCAPs) to address malaria disease burden in 95 CHPS zones in seven districts.
- Capacitated 190 CHOs, 34 sub-district heads, 28 district officers, and 475 Community Health Management Committee (CHMC) members in community engagement, mobilization, and the use of participatory approaches for action plan development.
- Supported CHMCs and CHOs to implement a range of advocacy, community engagement, and mobilization activities reaching over 380,450 beneficiaries across 880 communities.
- Along with other stakeholders, supported the NMCP to adapt messaging to encourage ITN use at the community level based on barriers and facilitators identified in 2018 and 2019 qualitative studies.

PMI-Supported Planned Activities

In FY 2021, PMI plans to support the following activities:

- Implementation of a Malaria Behavior Survey to better understand ideational factors associated with malaria-related outcomes to help tailor and target SBC programmatic activities to the Ghanaian context.
- Support the scale-up of mCAPS in rural CHPS communities.
- Support the HPD of the GHS in the nationwide implementation of community engagement programs to promote early malaria preventive strategies based on community action plans.
- Support strengthening of interpersonal communication between health providers and beneficiaries, specifically pregnant women.

Key Goal

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

Key Question 1

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

The available data from various surveys and the DHIMS2 have been used to identify three priority behaviors to target through PMI-supported SBC programming (Table A-19). PMI support will include national-level coordination and technical assistance to develop new malaria-specific communication materials and inform below the line communication efforts through the GHS HPD community outreach program. PMI will prioritize the following behaviors for its SBC programming:

- ITN ownership and use: The 2019 MIS shows that ITN access is 67 percent and ITN use is 43 percent among the general population in Ghana, with higher ITN use:access ratio in rural versus urban/peri-urban areas. SBC activities will focus on increasing awareness of the benefits of ITNs, increasing demand for ITNs during a woman's first ANC visit, and using multiple channels, such as community outdoor durbars (community meetings), mother-to-mother groups, father-to-father groups, Village Savings and Loan Association platform, and farmers groups (e.g., women out-growers) to promote ITN use.
- IPTp uptake: While 91 percent and 80 percent of women received IPTp1+ and IPTp2+ during their last pregnancy according to the 2019 MIS, IPTp3+ lags behind at only 61 percent. There is a 30 percent gap in ANC4 attendance and IPTp3+ uptake in 2019. SBC activities will focus on missed opportunities for IPTp by increasing demand for SP during ANC and improving provider attitudes towards SP administration based on supportive supervision and peer review findings. In addition, PMI will support supply chain activities to ensure availability of SP at service delivery points and explore the feasibility of resupplying SP outside ANC clinics.
- Health provider interpersonal communication: The 2019 MIS found that 59 percent of women reported having seen or heard malaria messages in the past six months, with television (77 percent), radio (56 percent), a health worker (40 percent), and word of mouth (38 percent) being the most common sources of exposure to malaria messages. However, only 15.8 percent reported receiving malaria messages from community health workers. SBC activities will aim to strengthen the capacity of health providers in general to provide quality interpersonal communication (IPC) to mothers and caregivers on malaria prevention and treatment. In particular, CHNs and CHOs from CHPS compounds will be equipped with IPC skills to engage the community to initiate and implement malaria control activities specific to their communities. Support will also be provided for CHO community outreach activities and follow-up household visits with CHVs to promote consistent use of ITNs, early care-seeking for fever, early ANC visits for IPTp uptake, SMC, and IRS.

Supporting Data

Table A 19. Prioritized behaviors with FY 2022 funds

Behavior	Target Population	Geographic Focus	Justification
Increase ITN use	General population	Nationwide	ITN ownership is 74%, below the national target of 80%, and the net use: access ratio remains low at <0.6, especially in the urban/peri-urban areas.
Adherence to MIP guidelines for administration of IPTp	Health Providers	Nationwide	Data from recent knowledge, attitudes, and practices studies identified significant barriers to IPTp administration and uptake, including perceived adverse reactions to SP. Data from these studies have informed the SBC strategy, which is focused on improving IPTp uptake through ongoing malaria community outreach and engagement. The percentage of women who received IPTp3+ during their last pregnancy was 61%, which is below the national target of 80%.
Health provider IPC	Health Providers	Nationwide	Only 59% of women report having seen or heard general malaria messages, with communications from a health worker or community health worker comprising only 40% and 16% of these messages, respectively. This suggests limited time spent by health workers to explain to clients desired malaria prevention and treatment behaviors.

Key Question 2a

For ITN ownership and use, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention behaviors?

Identified gaps in ITN ownership and use vary and are dependent on geographic area, income level, cultural practices, and formal education level. PMI will support SBC programming based on an understanding of key barriers and facilitators In CY 2021, PMI will field an MBS in Ghana. The results of the MBS are expected to provide more detailed information on barriers to ITN ownership and use. Following the MBS, PMI will assess whether there are any remaining knowledge gaps related to ITN ownership and use. If priority gaps are identified based on the results of the MBS, plans will be made for addressing those gaps.

Supporting Data

Not applicable

Key Question 2b

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

Identified gaps in IPTp uptake vary and are dependent on geographic area, cultural practices, and level of formal education in the communities. PMI will support SBC programming based on current knowledge of gaps as

described above and support the assessment of new emerging issues and gaps for better tweaking of SBC interventions for impact.

Supporting Data

Not applicable

Key Question 2c

For health provider IPC, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Identified gaps in health provider interpersonal communications vary and are dependent on geographic area. PMI will support SBC programming based on the current knowledge of gaps as described above and support the assessment of new emerging issues and gaps for better tweaking of SBC interventions for impact.

Supporting Data

Not applicable

Key Question 3

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

Capacity for SBC activities has improved over the years. The unit that spearheads SBC activities in the GHS was recently elevated and the HPD was formed. A cadre of SBC officers (Health Promotion Officers) have been absorbed into the formal health human resource structure with this elevation and have been posted to the various regions and districts to support in district or community level SBC activities. PMI supported the capacity development of the HPD and will strategically continue the support in coordination and collaboration with our MCH colleagues, the NMCP, and GHS HPD. The NMCP, in consultation with major stakeholders in community engagement, planned to establish a malaria SBC sub-committee to update the current National Malaria Communications Plan 2014–2020 to cover the period 2021 to 2025. The new plan will detail the malaria SBC approaches and guide all malaria SBC programs and interventions in the country. SBC activities will be implemented at various levels of existing leadership and management structures. At the sub-national level, HPOs will implement the activities in collaboration with other health workers and stakeholders. The National SBC Technical Review Committee, which is composed of directors of key departments and divisions of the GHS including the NMCP, provides the final clearance and endorsement for production, dissemination, and broadcast of all SBC materials including materials on malaria. The committee is under the office of the GHS Director General.

Supporting Data

Not applicable

Conclusions for SBC Investments

In FY 2022, PMI will increase support for SBC activities to continue to put more emphasis on the malaria community engagement program while also continuing to support above the line mass media activities. PMI will

continue to support the GHS HPD to strengthen malaria SBC activities through expansion of the malaria community engagement program, and strengthen IPC at SDPs in order to improve the quality of malaria services. SBC activities will target three priority areas, namely ITN use, IPTp uptake, and health provider interpersonal communication. Support will also be provided to CHPS nurses, health officers, and health volunteers to engage with communities and promote correct and consistent uptake of malaria interventions. Funding will support capacity building of NMCP, HPD, RHMTs, and DHMTs to deliver appropriate SBC interventions and will include support for attendance at SBC-specific trainings or conferences.

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

3.5. OTHER HEALTH SYSTEMS STRENGTHENING

NMCP Objective

Ghana's current NMSP does not include any specific HSS objectives, but highlights the critical need to build health systems' capacities to remove implementation bottlenecks for the successful implementation of the NMSP interventions and to achieve set targets. The NMSP is aligned with Ghana's Universal Health Coverage Roadmap to achieve broader objectives of the MOH and Health Sector by 2030:

- MOH mission: To contribute to socio-economic development and wealth creation by promoting health and vitality, ensuring access to quality health, population, and nutrition services for all people living in Ghana, and promoting the development of a local health industry.
- Health Sector goal: Ensure a healthy and productive population that reproduces itself safely by ensuring an increased life expectancy, and people who live healthy and productive lives and reproduce without an increased risk of injury or death; reducing the excessive risk and burden of morbidity, mortality, and disability, especially in the poor and marginalized groups; and reducing inequalities in access to health.

NMCP Approach

As described in the NMSP 2021–2025, the Ghana NMCP aims to strengthen health systems by:

- Engaging both the public and private health sectors in all its activities
- Supporting the effective rollout and use of the GhiLMIS
- Advocating for optimization of warehousing and operations across the supply chain
- Working closely with the Ghana FDA to strengthen quality assurance systems, which are an integral part of efficient supply chain management
- Collaborating with the PPME to put in place measures to strengthen the technical capacity of health workers as well as a logistics infrastructure for effective functioning of DHIMS2

PMI Objective in Support of NMCP

PMI aims to support a broad array of cross-cutting HSS activities to support NMCP, including building capacity of health workers, supply chain management and health information systems strengthening, drug quality monitoring, malaria stakeholders coordination, and NCMP capacity building. While PMI has previously supported the NHIA to conduct clinical audits to improve treatment standards and the quality of service provision among accredited

providers, to ensure adherence to standard protocols, and to check against fraud and abuse, these audits have been discontinued.

PMI-Supported Recent Progress

In FY 2020, PMI supported the following activities:

- Supported long-term training of individuals to build capacity at the NMCP and GHS in epidemiology, SM&E, or other malaria program management functions as needed through CDC's Field Epidemiology Training Program, which was established with US government support at the University of Ghana's School of Public Health in collaboration with the GHS.
- Supported capacity-building of Ghana FDA to:
  - Improve country and regional regulatory systems to assure the quality of medical products in the public and private sectors through the creation and facilitation of a national post market surveillance technical working group, and the implementation of risk-based post market surveillance of antimalarial drugs.
  - Increase supply of quality-assured essential medical products of public health importance through providing technical assistance to one local manufacturer towards WHO prequalification of AL tablets, and conducting an assessment of the status and needs of three other local manufacturers of AL.
- Facilitated the process for local manufacturers and FDA for the adoption of the GS1 Standards.
- Worked with GHS on coordination for implementation of ISS through strengthened regional and district supervision health teams. PMI, along with other USAID Ghana technical teams, supports integrated planning and management of supervision aimed at building strong regional and district teams to run independent and efficient systems for on-the-job training, cutting down the high costs of traditional classroom training, and more importantly, ensuring continued improvement of quality health services.
- Supported capacity building of GHS and NMCP in data management, specifically to improve the quality of data entered into DHMIS2 and the review, analysis, and use of data for improved malaria programming.
- Supported a rapid ecosystem assessment of how digital technologies are used for community-based case management, data collection, reporting, and decision-making and developed recommendations on how to prioritize opportunities for improvement.
- Recruited and seconded a malaria data specialist to NMCP, with the objective to build the skills and establish the culture of regularly interrogating data to inform malaria control programming.
- Supported the NMCP and HPD to assist the metropolitan, municipal and district assemblies to put in place a reliable and transparent system to mobilize and utilize resources for malaria control, in the framework of what is generally known as the District Assembly Common Fund. This includes establishing a district health and advocacy group, opening a malaria control dedicated bank account, and drawing an annual malaria control plan reviewed and approved by the district assembly in coordination with the DHMT.
- Continued to support the MOH and health partners to develop national procurement and supply chain schemes, which includes strengthening the quantification capacity for health commodities, including antimalarials. PMI continues to invest considerable efforts to support supply chain reforms aimed at improving efficiency and preventing stock-outs of health commodities.

- Support for the Peace Corps was disrupted due to the coronavirus pandemic and the evacuation of volunteers worldwide.

PMI-Supported Planned Activities s

PMI plans to continue support for all HSS activities supported in FY 2021, with the exception of National Health Insurance Authority (NHIA) clinical audits. PMI will also resume support for Peace Corps Volunteers returning to Ghana following the coronavirus pandemic, through small grants to engage in malaria control and prevention activities, such as community mobilization for SBC and ITN distribution, continued partnership with the "Stomping out Malaria in Africa" program, and organization of Malaria Bootcamps.

Conclusions for Additional Health Systems Strengthening Investments

In FY 2022, PMI will maintain support for HSS activities as funded in previous years, including support for long-term training of individuals through FETP, small grants to Peace Corps Volunteers, and building capacity of FDA. In addition, PMI will support institutional capacity strengthening of the GOG to promote and oversee the delivery of quality of health services in the public and private sectors. Support will also target improving coordination at the central level between GHS, NHIA, and the Health Facilities Regulatory Agency, who are the national bodies jointly responsible for service delivery. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.