

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



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PRESIDENT'S MALARIA INITIATIVE

UGANDA

Malaria Operational Plan FY 2019

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ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AMF	Against Malaria Foundation
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate/Amodiaquine
CDC	Centers for Disease Control and Prevention
CHEW	Community health extension worker
DFID	U.K. Department for International Development
DHIS2	District Health Information System 2
DHMT	District health management team
DHS	Demographic and Health Survey
DOT	Directly observed treatment
DP	Dihydroartemisinin-piperaquine
EPI	Expanded Program on Immunization
EUV	End-use verification
FETP	Field Epidemiology Training Program
FSN	Foreign service national
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoU	Government of Uganda
HC	Health center
Hgb	Hemoglobin
HLC	Human landing catch
HMIS	Health management information system
HRH	Human resources for health
iCCM	Integrated community case management
IMM	Integrated management of malaria
IPC	Interpersonal communication
IPTp	Intermittent preventive treatment in pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
JMS	Joint Medical Stores
LMIS	Logistics management information system
MAAM	Mass Action Against Malaria
M&E	Monitoring and evaluation
MCH	Maternal and child health
MDA	Mass drug administration
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria operational plan
NGenIRS	Next-generation indoor residual spraying
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NMS	National Medical Stores
OR	Operational research
PBO	Piperonyl butoxide

PCR	Polymerase chain reaction
PCV	Peace Corps Volunteer
PEPFAR	President's Emergency Plan for HIV/AIDS Relief
PFP	Private for-profit health facilities
PMI	President's Malaria Initiative
PNFP	Private not-for-profit health facility
ProAct	Proactive Community Treatment
PSC	Pyrethrum spray catch
QA/QC	Quality assurance/quality control
RA	Resident Advisor
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
RHD	Reproductive Health Division
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
TES	Therapeutic efficacy survey
TRP	Technical resource people
TWG	Thematic working group
UCC	Universal coverage campaign
UMRC	Uganda Malaria Research Center
UMRSP	Uganda Malaria Reduction Strategic Plan
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
VHT	Village health team
WHO	World Health Organization

I. EXECUTIVE SUMMARY

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

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

In 2017, consistent with an increase in annual appropriations, PMI again launched new country programs in Cameroon, Côte d'Ivoire, Niger, and Sierra Leone, and expanded an existing program in Burkina Faso to full PMI focus country status. With the addition of these new focus countries, PMI now has programs in 24 countries in sub-Saharan Africa, in addition to two bilateral programs and targeted support in the Greater Mekong Subregion in Asia. Uganda was selected as a PMI focus country in fiscal year (FY) 2006.

This FY 2019 Malaria Operational Plan (MOP) presents a detailed implementation plan for Uganda, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the Uganda Malaria Reduction Strategic Plan 2014 – 2020 (UMRSP) and build on investments made by PMI and other partners to improve and expand malaria-related services, including the United Kingdom's Department for International Development (DFID) and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Uganda, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2019 funding. The proposed FY 2019 PMI budget for Uganda is \$30 million. PMI will support the following intervention areas with these funds:

Entomological monitoring and insecticide resistance management: Proven interventions such as IRS and ITNs can impact vector behavior and insecticide resistance. Therefore, the UMRSP supports

monitoring these and other entomological indices as a key component to evaluating progress in malaria reduction goals. PMI supports comprehensive entomological monitoring, which includes decay rate testing, bionomics monitoring, CDC bottle intensity bioassays, and oxidase enzyme testing. In addition, traditionally six eco-epidemiological zones throughout Uganda have conducted biennial susceptibility monitoring to the four classes of WHO-recommended IRS insecticides. In 2016 and 2017, two sites were added each year to the existing 6 sites, increasing the total to 10 sites to be monitored beginning in 2018 and allowing for a more comprehensive understanding of the resistance status nationwide in Uganda. In addition, susceptibility testing for new insecticides such as chlorfenapyr and clothianidin, which began in 2017, will continue. During the 2017 calendar year, national susceptibility testing results indicated there is confirmed resistance to all pyrethroid insecticides tested, full susceptibility to organophosphates (the insecticide used in PMI's spray program), and varying susceptibility levels to carbamates and DDT. With FY 2019 funding, PMI will continue to monitor malaria mosquito bionomics in four IRS districts, along with vector resistance status. Additionally, insecticide susceptibility monitoring will be conducted in 10 eco-epidemiological zones to test for resistance (including testing of intensity and resistance mechanisms) to WHO-recommended IRS insecticides; 5 zones will be surveyed each year on alternate years. Lastly, funding will be provided to support entomological monitoring activities by district vector control officers, including provision of supplies and per diem, to better understand malaria mosquito activity in Uganda.

ITNs: The UMRSP supports universal access to ITNs through mass campaigns and routine distribution channels, including antenatal care (ANC) clinics, Expanded Program on Immunization (EPI) visits, schools, outreach distribution points, private providers, and commercial outlets. Uganda completed a major universal coverage campaign (UCC) from February 2017 to March 2018, which distributed more than 26 million ITNs through the support of PMI, the Global Fund, Against Malaria Foundation, and DFID. PMI provided support for the UCC through the procurement and distribution of 1 million ITNs as well as robust technical assistance towards planning, implementation, and evaluation of the campaign. In addition, PMI has been continuing to support ITN routine distribution (through ANC and EPI) and introduced a new channel in June 2018: traditional school-based distribution. With FY 2019 funds, PMI will procure approximately 400,000 ITNs for the planned 2020 UCC, as well as approximately 640,000 ITNs for distribution through routine channels including traditional school-based distribution. PMI will use mass media and community mobilization strategies to increase knowledge and promote proper and consistent use of ITNs.

IRS: The UMRSP supports scale-up and sustainment of IRS in 45 percent of Uganda's districts. From 2009-2014, PMI implemented IRS in 10 high-burden districts in the Northern region. As a result, the malaria burden in these districts decreased significantly and PMI shifted its spray operations to target higher burden districts in the Eastern region. PMI will continue to support spraying in 10 districts with high malaria prevalence (Tororo, Lira, Butaleja, Namutumba, Kibuku, Budaka, Pallisa, Butebo, Bugiri, and Serere) during the 2018 calendar year targeting more than 900,000 houses to protect approximately 3.3 million people with a long-lasting organophosphate insecticide. In addition, with DFID support, PMI will spray an additional five high-burden districts in the Eastern region in 2018 (Otuke, Alebtong, Dokolo, Kaberamaido, Amolatar). With FY 2019 funds, PMI will continue to implement IRS in 10 Eastern districts with a long-lasting non-pyrethroid insecticide. DFID support for IRS will be gradually phased out prior to their withdrawal from bilateral funding in 2021. PMI will ensure the withdrawal of IRS in some districts will be evidence-based, not donor-based. Through DFID support, a third-party assessment will be conducted in current IRS districts to, in part, determine which districts are ready for IRS withdrawal. PMI believes it is essential to replace one form of effective vector control with another, and thus will work with other partners to ensure next-generation ITNs are distributed in the areas where IRS is withdrawn to the greatest extent possible. To prepare for the removal of IRS, PMI will also work with other partners to ensure adequate stocks of ACTs and RDTs are in place, intensify integrated community case management

(iCCM) efforts, strengthen malaria in pregnancy (MIP), and conduct social and behavior change communication (SBCC) and epidemic surveillance.

MIP: With PMI technical support, coordination of MIP-related efforts has improved with the Ministry of Health's Reproductive Health Division and the NMCP, through the establishment of a functional national MIP working group. In 2014, Uganda successfully updated its national MIP policy, guidelines, job aids, and SBCC materials to reflect the revised WHO guidance on IPTp. According to the 2016 Demographic and Health Survey (DHS), women receiving two or more doses of IPTp remained at 45 percent, unchanged from the 2014 Malaria Indicator Survey. Increasing IPTp uptake will therefore continue to be a focus for PMI. With FY 2019 funds, PMI will continue to: 1) strengthen the delivery of MIP services, increasing ITN use, IPTp uptake, and early diagnosis and treatment in public and private sectors; 2) coordinate with the NMCP and district health management teams to bring onboard all RBM partners to fully adopt and implement the 2016 WHO ANC recommendations for positive pregnancy outcomes; and 3) support the update and dissemination of the National Malaria Control Policy 2011. PMI will also strengthen the coordination of ANC workers and continue to provide on-site training and supportive supervision related to MIP in the public and private sector. To increase uptake of IPTp, PMI will work through integrated projects that leverage resources available through the President's Emergency Plan for AIDS Relief (PEPFAR) that support scale-up of prevention of mother-to-child HIV transmission. PMI will continue to provide clean water and drinking cups so that health workers can administer sulfadoxine-pyrimethamine (SP) at ANC clinics as directly observed treatment.

Case management: The UMRSP objective is to achieve and sustain the target of at least 90 percent of malaria cases in the public and private sectors and community level receiving early diagnosis and prompt treatment according to national guidelines by 2020. Since the launch of PMI, a total of 8.1 million RDTs, 12.4 million ACTs, and 2 million injectable artesunate treatments have been procured. Due to current restrictions on supplying commodities to public sector health facilities through the National Medical Stores (NMS), PMI is limited to supplying commodities to private not-for-profit (PNFP) facilities through the Joint Medical Stores (JMS). There are ongoing efforts with PEPFAR support to improve efficiency and transparency at NMS in its internal operations as well as with partners. PMI is currently advocating for distributing PMI-procured commodities to the public sector through the JMS in hard-to-reach areas and in times of outbreaks until NMS is in full capacity to distribute U.S. Government commodities. With FY 2019 funds, PMI will support the scale-up of an appropriate quality assurance/quality control (QA/QC) system for diagnostics and continue to support strengthening treatment for uncomplicated and severe malaria through training, supportive supervision, clinical audits, and on-the-job mentoring in public and private facilities. PMI will prioritize strengthening prevention and treatment services in communities through iCCM in 11 districts, in addition to the procurement of approximately 2.9 million RDTs and 1.3 million ACTs to be distributed to PNFP health facilities through the JMS. Additionally, with FY 2019 funds, PMI will continue to support strengthening of the national pharmaceutical management system, including an intensified focus on improving the NMS. Lastly, PMI will conduct end-use verification surveys twice yearly in 75 randomly selected health facilities in 10 districts.

SBCC: Past PMI activities have included key malaria messages on the importance of net use, malaria testing, timely treatment, and prevention of MIP. Communication approaches used included radio talk shows and radio spots, interpersonal communication, print materials, and health education activities in schools. In 2017, PMI supported the finalization and adoption of Uganda's national SBCC strategy. The strategy is based on the UMRSP and incorporates available technical evidence on SBCC, findings of the midterm review, and the Malaria Indicator Survey 2014/15. In the last 12-18 months, PMI supported the NMCP to continue reaching approximately 10 million Ugandans with key messages on correct and consistent use of nets, care-seeking behavior, and IPTp through radio talk shows, radio spots, and as part

of interpersonal communication, worked with a network of over 20,000 village health workers to conduct 5,938 home visits, 9,952 small group discussions, and 9,418 one-on-one sessions. As a result, more than 65,000 community members were reached with malaria messages. With FY 2019 funds, PMI will continue to support targeted and evidence-based SBCC at the national, district, and community levels, with a focus on more precise measurement of specific behavioral drivers. PMI's SBCC activities will encourage consistent and proper use of ITNs, the importance of IPTp, timely testing of all fevers, and appropriate malaria treatment for confirmed cases. PMI will continue to monitor the outcomes of its SBCC activities through national surveys and evaluations, when appropriate.

Surveillance, monitoring and evaluation (SM&E): PMI is supporting a targeted health management information system (HMIS) strengthening approach to improve HMIS malaria data quality and use by building cost-effective and sustainable data collection and reporting capacity at level IV health centers. At lower level facilities in target districts, a minimum package for HMIS strengthening will be implemented. With FY2019 funds, PMI will support training of people involved in collection and analysis of malaria data at subnational and health facility levels, as well as supportive supervision and data audits for malaria focal points at the regional and district levels and for district biostatisticians. With this targeted approach, PMI will prioritize the districts that are currently receiving or recently transitioned from IRS. In addition, PMI is leveraging integrated efforts to strengthen HMIS and DHIS2 data to scale up surveillance strengthening in additional districts beyond the targeted PMI focus districts. PMI will also continue to support the NMCP to improve their capacity to ensure data are being collected, analyzed, and reported and will support and actively participate in the NMCP's M&E Technical Working Group.

Operational research: PMI has been integral to supporting studies that address priorities for malaria prevention and control in Uganda. PMI is currently contributing to a study funded by the Bill and Melinda Gates Foundation that will help the NMCP and other decision-makers develop transition strategies to maintain gains and prevent a malaria upsurge when transitioning from IRS. PMI is also proposing to pilot an ITN repurposing house screening intervention to provide sustainable, cost-effective options to IRS for vector exclusion in households. However, no new studies are planned with FY2019 funding.

Other health systems strengthening: The Government of Uganda has been implementing decentralization to improve the efficiency and effectiveness of service delivery since 1993. Services are decentralized to districts and within districts to health sub-districts with each level having specific roles and responsibilities. Health system strengthening is the cornerstone of Uganda's Health Sector Development Plan 2015-2020. PMI supports health sector development through strengthening health service delivery systems, health information, health workforce, and health infrastructure. Over the past 12-18 months, PMI supported the NMCP to strengthen coordination with malaria stakeholders through the RBM forum, technical working groups, malaria scientific sessions, review meetings, capacity assessments and village health team assessments and surveys (e.g., DHS 2016); and review of policies, guidelines, manuals, and job aids (e.g., MIP). PMI has provided technical assistance to revitalize five major technical working groups focused on M&E, integrated vector management, case management, MIP, and SBCC. PMI also supported the USAID/Uganda sector-wide initiative to address human resource shortages and develop the capacity of the health workforce at national and district levels, and the sector-wide private health sector activity. With FY 2019 funds, PMI, in collaboration with PEPFAR and other USAID health programs, will continue to support regions and districts to improve performance management, planning, pre-service training, and improvement of service quality. Through secondment of two senior staff, PMI will continue to support the capacity of the NMCP to manage and coordinate multi-sectoral malaria reduction efforts at all levels. PMI will also support training of two new Ugandan nationals through the Field Epidemiology Training Program and three Peace Corps volunteers.

II. STRATEGY

1. Introduction

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

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2. Malaria Situation in Uganda

Uganda ranks 8th in number of malaria infections in sub-Saharan Africa, and has some of the highest reported malaria transmission rates in the world. There is stable, perennial malaria transmission in 95

percent of the country. In the rest of the country, particularly in the highland areas, there is low and unstable transmission with potential for epidemics. Using data from the national health management information system (HMIS), total reported malaria cases have slightly declined from 15,876,319 in 2016 to 14,485,313 in 2017, despite improved reporting from 86 percent in 2016 to 92 percent in 2017. In 2017, malaria accounted for 27-34 percent of outpatient visits and 19-30 percent of inpatient admissions. In 2017, 71 percent of the reported malaria cases were laboratory confirmed compared to 60 percent in 2016, representing 11 percentage points improvement.

The most common malaria vectors are *Anopheles gambiae* s.l. and *An. funestus*. *An.gambiae* s.l. is the dominant species in most places, while *An. funestus* is generally found at sites having permanent water bodies with emergent vegetation. *An. funestus* are the more predominant malaria mosquito in Northern Uganda (Apac, Lira) during dry months while *An. gambiae* can be found at both sites during the rainy season. Like *An. gambiae*, *An. funestus* mosquitoes are strongly endophagic and are commonly collected indoors, resting on walls during early morning hours, making ITNs and IRS viable vector control strategies. Recently, *An. arabiensis* have been found in northern, eastern, and south central Uganda, having been identified from *An. gambiae* s.l. samples. A species identification survey conducted in eastern Uganda (Tororo) showed a shift from predominantly *An. gambiae* to *An. arabiensis* after the start of IRS in 2015. *An. arabiensis* tends to bite earlier in the evening, feeds more willingly on domestic animals, and has a greater propensity to feed outdoors than *An. gambiae*, but remains an effective malaria vector. Sampling from Apac District (in the previous northern IRS zone) indicates that *An. arabiensis* may have replaced *An. gambiae* as the predominant malaria mosquito in this district.¹

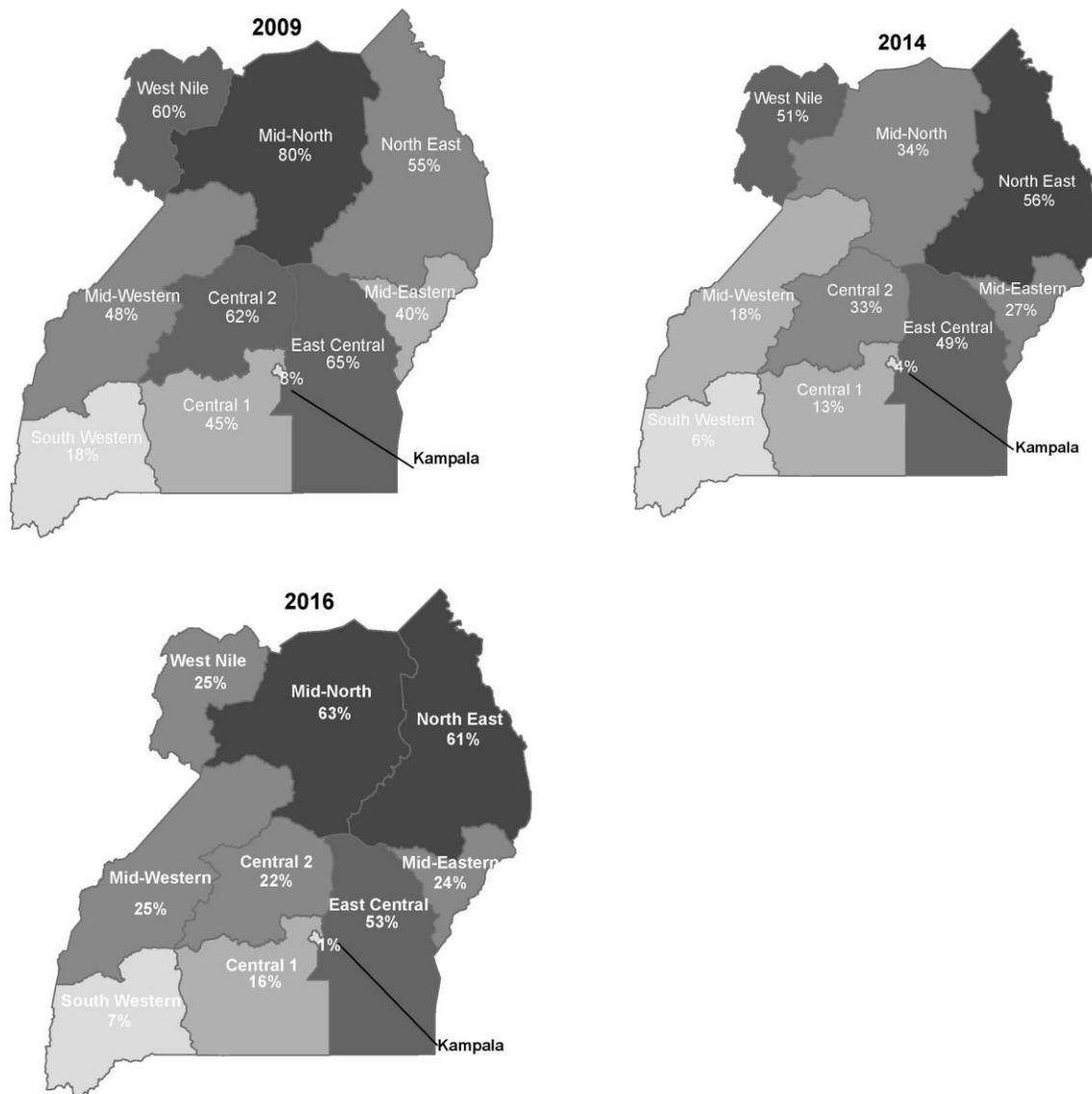
Figure 1 shows the percent of children aged 0-59 months that tested positive for malaria using RDTs in the 2009 and 2014 Malaria Indicator Surveys (MIS) and in the 2016 Demographic Health Survey (DHS). After the 2009 MIS revealed a prevalence of 52 percent, five years later the national prevalence had decreased to 30 percent, (ranging from 56 percent in the North Eastern sub-region to 6 percent in the Southwest and as low as 4 percent in Kampala). The 2016 national DHS indicated that malaria prevalence had not been reduced nationally. Some areas, like the West Nile region saw a dramatic decrease, from 51 to 25 percent, while several other regions experienced increases.

Survey data also indicate that severe anemia (often a result of malaria) remains a public health problem in Uganda. The 2016 DHS reported 6.1 percent of children 6-59 months of age were severely anemic (<8.0 g/dL); this percentage was slightly lower (4.6 percent) in the 2014 MIS among children 0-59 months, but improved compared to the 9.7 percent estimate in 2009.

The MIS, conducted in late 2014, and more recent entomological surveillance supports that *Plasmodium falciparum* remains the species responsible for the vast majority of malaria cases. *P. malariae* accounts for less than 1 percent of cases as a single infection, but is more commonly found as a mixed infection with *P. falciparum* (up to 3 percent of child infections in highly endemic areas). Both *P. vivax* and *P. ovale* are rare and do not exceed 2 percent of malaria cases in Uganda.

¹Okia et al. 2015. Impact of IRS on malaria vector bionomics in IRS districts compared to a non-IRS district in northern Uganda.

Figure 1. Malaria prevalence using RDT by sub-region, 2009-2016, Uganda



2015/2016 malaria upsurge in Uganda

Data from the District Health Information System 2 (DHIS2) covering 2012-2015 showed that from April-June 2015, 50 of the 116 districts combined saw a 156 percent increase in RDT use as a result of increased testing, and a 184 percent increase in the proportion of positive cases among those tested compared to the baseline period of 2012-2014 (same months). Based on national data, it was found that the most affected districts were the former 10 IRS districts that had transitioned from IRS to universal coverage of ITNs and improved case management in 2014. In response, the NMCP and partners, including PMI, provided technical assistance to the affected districts, health facilities, and communities. This support included provision of additional supplies of ITNs, ACTs, and RDTs, which were complemented with comprehensive social and behavior change communication (SBCC) messages. Note: years reported in Table 2 are based on the Uganda Fiscal Year July-June. The elevation in cases documented during the malaria upsurge was reported in the fiscal year of 2016 (July 1, 2015 to June 30, 2016).

PMI supported the northern districts by providing more than 300,000 doses of ACTs for mass fever treatment and trained 8,000 village health teams (VHTs) that moved door-to-door to identify people with fever and perform directly observed treatment (DOT) with ACTs based on age. At the same time, the VHTs used the opportunity to promote key prevention methods such as correct and consistent ITN use and prevention of malaria in pregnancy (MIP), as well as early diagnosis and treatment. PMI’s efforts helped to stabilize the malaria upsurge and prevented excessive deaths in the northern districts.

District-level data from January 2015 to March 2018 indicates Uganda still experiences two peaks in malaria transmission in tandem with the two rainy seasons each year. The data from 10 former IRS districts in mid-northern Uganda, previously affected by the malaria upsurge, shows a similar pattern to the national trend (Figures 2 and 3). There was a greater than 50 percent caseload reduction comparing the same periods in early 2018 to those in early 2017 and 2016.

Figure 2. Weekly malaria cases and reporting rate in 11 northern districts, January 2015 to April 2018

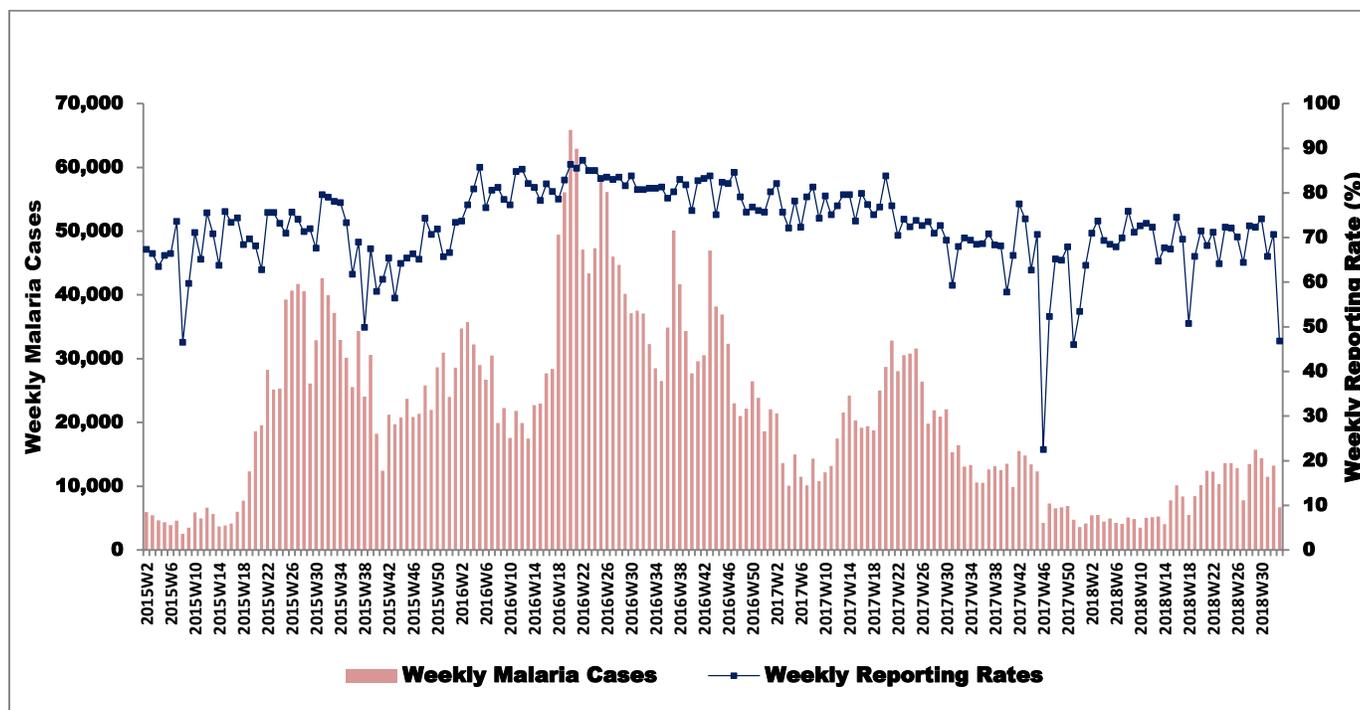
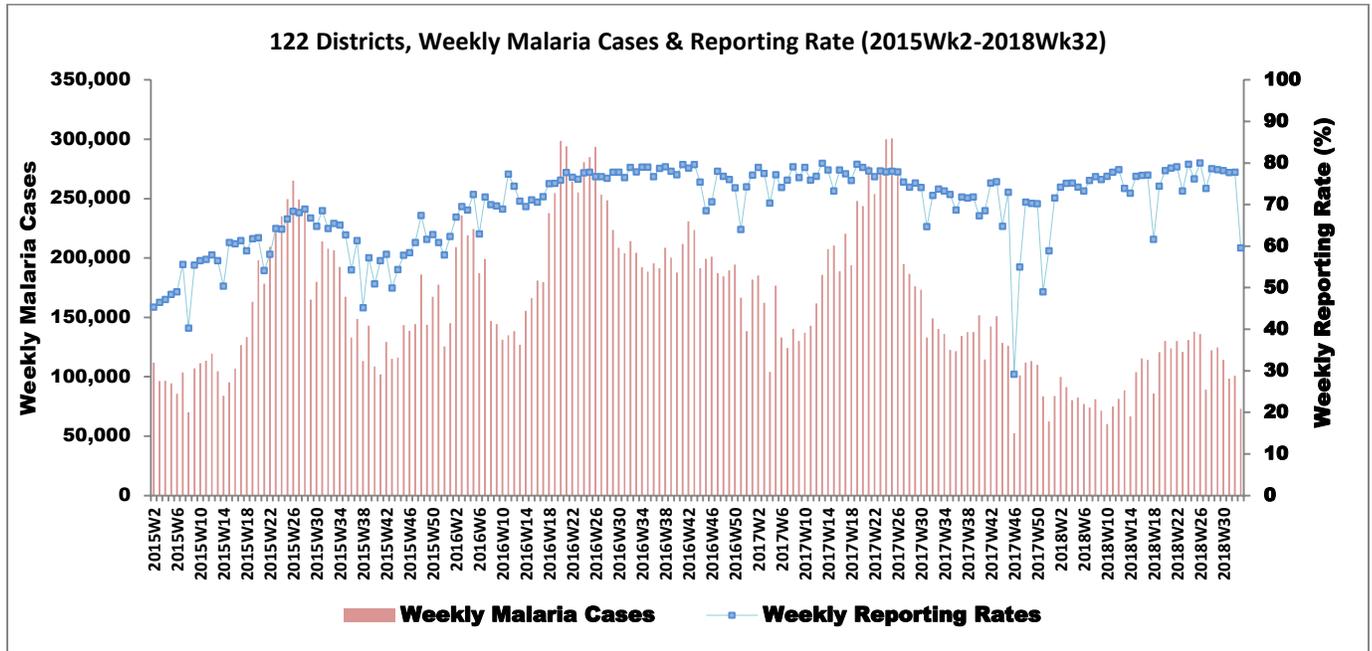


Figure 3. Weekly malaria cases and reporting rate in all 122 districts, January 2015 to April 2018



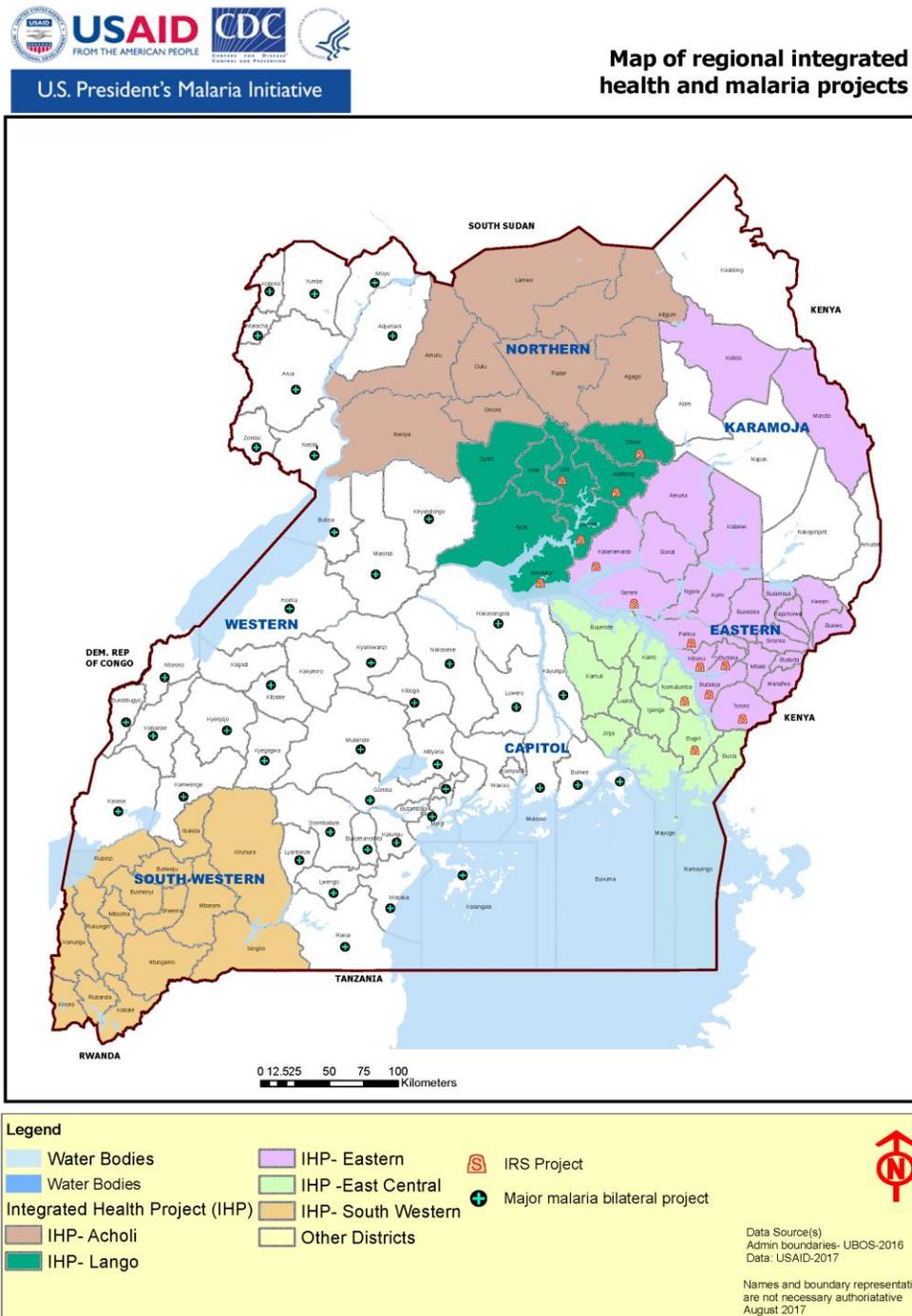
Geographic coverage of PMI activities

PMI’s malaria control activities are implemented in 118 districts (of 122 districts total) providing close to national coverage, with the exception of 4 districts in Karamoja where activities have not yet been extended due to various reasons including security in the area, and which are covered by other partners (Figure 4). PMI’s support at different levels of the health system depends upon need, NMCP priorities, and geographic coverage of other donors and partners to ensure complementarity and have the greatest impact. PMI is supporting the implementation and scale-up of case management; IPTp; ITN distribution; surveillance, monitoring, and evaluation (SM&E), and SBCC in 47 high-burden districts. For additional information on PMI’s geographic coverage, see the technical sections below.

Vector Control: PMI provides focused support to the mass distribution of ITNs through universal coverage campaigns (UCCs), which cover the entire country. In addition, PMI supports continuous distribution, nationally, through antenatal care (ANC) and the Expanded Program on Immunization (EPI) which covers all public facilities as well as private not-for-profit (PNFP) facilities and school-based distribution of ITNs in the Central region, which began in June 2018. PMI-supported IRS currently covers 10 districts in the east and central part of Uganda and DFID complements PMI’s funding to cover an additional five contiguous districts. In most districts, the Uganda vector control division places a vector control officer to assist with vector related health issues. The NMCP plans to collaborate with the vector control division and other partners to help build and improve a comprehensive national vector surveillance plan.

MIP: PMI’s MIP support covers the largest part of the country via PMI mechanisms and the support largely covers training, mentorship, and supportive supervision; prevention; early diagnosis; and prompt treatment for MIP activities. PMI provides ITNs through ANCs for public and private facilities nationwide. PMI’s MIP support is national except for commodities, which go through JMS, which covers more than 600 PNFP facilities nationwide.

Figure 4. Geographic Coverage of PMI Activities



Case Management: The bulk of PMI's work in case management will be implemented in 47 high-burden districts in West Nile, Mid-West and Central regions, with additional support in five regions (East, East Central, North-Acholi, North-Lango, and South-West). In addition, beginning in April 2018, integrated community case management (iCCM) is now being rolled out in a phased manner in 5 of 11 districts with the remaining 6 districts to begin in the fall of the same year. Case management commodities support is currently directed at all PNFP facilities nationwide.

SM&E: SM&E activities are predominantly implemented in 47 districts (West Nile, Mid-West, and Central regions). PMI will help coordinate SM&E-focused activities implemented in five regions (East, East Central, North-Acholi, North-Lango, and South-West); these activities will strengthen HMIS at the district, regional, and national levels. In 2018, PMI will also carry out surveillance of antimalarial drug efficacy as well as ITN durability monitoring, including survivorship, attrition, and bio-efficacy of nets from the 2017/18 UCC.

SBCC: SBCC activities will be mainly supported at the national level as well as in 47 high-burden districts, with limited activities in five additional regions (East, East Central, North-Acholi, North-Lango, and South-West).

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

The national health system in Uganda is made up of public and the private sectors. The public sector includes all government health facilities under the Ministry of Health (MoH), health services of the ministries of Defense (Army), Internal Affairs (police and prisons), and Local Government. The private health delivery system consists of private health practitioners, PNFP providers, and traditional and complementary medicine practitioners. The MoH has four levels of administration: national, regional, district, and county. The central level includes the National Directorate of Public Health of the MoH (which houses the NMCP), where national guidelines and norms are promulgated.

The MoH provides leadership for the health sector and is responsible for overseeing the delivery of curative, preventive, palliative, and rehabilitative services to the people of Uganda. The provision of health services in Uganda has been decentralized with districts and health sub-districts playing a key role in the delivery and management of health services at each respective level. Health services are structured into national referral hospitals and regional referral hospitals, general hospitals, and health center (HC) levels IV, III, and II. HC IIs provide the first level of interaction between the formal health sector and communities. HC IIs only provide outpatient care and community outreach services, and health assistants are key to the provision of comprehensive services and links with the VHT. HC IIIs provide basic preventive and curative care, while also providing supportive supervision to the community and HC IIs under their jurisdiction. HC IVs sometimes serve as headquarters for health sub-districts that provide day-to-day management and technical oversight of lower-level health facilities (III and II) in a jurisdiction.

HC I does not have a physical structure but rather consists of a team of people—VHTs—who link health facilities with the community. VHTs in Uganda provide the lowest level of care at the village level, classified as HC-I, and serve an average of 100 households or approximately 500 people. VHTs provide a range of preventive health services and, in some districts where there is support, VHTs carry out iCCM as well. The MoH has been working on developing a community health extension worker (CHEW) model, which is likely to be implemented in the next five years. Under this model, CHEWs will be positioned at the parish level (about 10 villages, 1000 households, and 5000 people) and they will have conventional health posts. CHEWs will be paid and will receive comprehensive training prior to deployment. During the recent Commonwealth Heads of Government Meeting malaria summit, the Government of Uganda (GoU) committed to have 15,000 CHEWs recruited and fully supported by 2023. When the CHEWs program is implemented, VHTs will remain active at the village level but will receive supervision from the envisioned CHEWs. The implementation of iCCM will continue to be at the village level by VHTs.

These VHT networks also facilitate health promotion, service delivery, and community participation in access and utilization of health services. In 2015, the MoH carried out an assessment to determine the national status and functionality of VHTs in Uganda to improve the planning and delivery of health

services to households and communities. The assessment indicates that the VHT strategy has been implemented to varying degrees across the districts. Funding of the program by the government has been gradually decreasing since its inception, leaving donors to fund most of the activities. Districts have different levels of capacity to coordinate, train, and supervise VHT activities but have been hampered by a lack of funds. Coordination and supportive supervision by the MoH have not been conducted as desired due to funding constraints. Overall, VHT coverage is still limited because of challenges surrounding lack of tools, resources, motivation, and regular supervision, which has resulted in high attrition among VHTs. The assessment recommended that the government should have a clear commitment to adequate financing and institutionalization of the VHT strategy and should ensure regular payment of VHTs for the sustainability of the program.

4. National malaria control strategy

The UMRSP 2014-2020 has three main goals to be achieved by 2020: 1) reduce annual malaria deaths from 2013 levels to near zero, 2) reduce malaria morbidity to 30 cases per 1,000 people, and 3) reduce malaria parasite prevalence to less than 7 percent. The UMRSP calls for a rapid and synchronized nationwide scale-up of cost-effective interventions to achieve universal coverage of malaria prevention and treatment. It is a very ambitious strategic plan with a \$1.23 billion proposed budget expected to be funded by the GoU with assistance from donors. The UMRSP was developed by a government-led consortium of major donors, including PMI.

The objectives of the UMRSP are:

1. By 2017, achieve and sustain protection of at least 85 percent of the population at risk through recommended malaria prevention measures
2. By 2018, achieve and sustain at least 90 percent of malaria cases in the public and private sectors and community level receive prompt treatment according to national guidelines
3. By 2017, at least 85 percent of the population practices correct malaria prevention and management measures
4. By 2016, the program is able to manage and coordinate multi-sectoral malaria reduction efforts at all levels
5. By 2017, all health facilities and district health offices report routinely and timely on malaria program performance
6. By 2017, all malaria epidemic-prone districts have the capacity for epidemic preparedness and response

The role of the NMCP at the central level continues to be to support the implementation of the UMRSP through policy formulation, setting standards and quality assurance, resource mobilization, capacity development and technical support, malaria epidemic identification and response, coordination of malaria research, and SM&E. The UMRSP calls for vector control through IRS, ITNs, and larviciding according to WHO guidelines, prevention of MIP through ITNs and IPTp, effective case management including parasite-based diagnosis and treatment with ACTs, and M&E of all components of the program.

In 2017, the NMCP led a midterm review of the UMRSP 2014-2020. Key findings noted great progress in the reduction of under-5 mortality rates that were in line with UMRSP goals, but a stalled decline in malaria incidence does not match expectations. Based on the midterm review, the MoH has launched the Mass Action Against Malaria (MAAM) strategy to accelerate implementation of the current strategic plan and the goal of reaching zero malaria deaths by 2030. MAAM's strategic focus is to "Reach Every Household with All Malaria Interventions." The premise being malaria is everyone's business at all levels

and by all stakeholders. Key objectives of MAAM are to empower communities to take responsibility for malaria reduction and elimination, to adapt a public health and multi-sectoral approach to malaria control, and to foster political action for malaria.

5. Updates in the strategy section

- **NMCP capacity building:** With funding from DFID and technical support from PMI, a capacity assessment of the NMCP was completed in early 2015. The assessment indicated an urgent need for strengthening the capacity of the NMCP, including structure and functions involving the recruitment of qualified staff. The assessment also proposed that the MoH elevate the profile of the NMCP to a division of malaria and other vector-borne diseases if the vision of malaria elimination by 2030 is to be achieved. To date, the designation of the malaria program as a division has been approved but not officially instituted with a commissioner. The main requirement for the elevation of a program to a division involves staffing changes, including the selection of a commissioner and sub-commissioner to oversee program managers. In January 2018, the Ministry of Public Services approved the new proposed MoH staffing structure, which includes the elevation of the NMCP to a division within available resources. The MoH has started implementing the changes in the staffing structure beginning with positions that are mostly administrative and policy related. The MoH's timeline to fill critical positions is indicated to begin October 2018. In addition, the assessment proposed the decentralization of planning, programming, and supportive supervision of malaria service delivery to the districts and regional/zonal levels. The findings and recommendations of the assessment were communicated to the highest levels of the MoH, including the Minister of Health. The response has included support from DFID to hire four senior staff through WHO, and PMI is supporting efforts to strengthen the capacity of the NMCP by seconding two additional long-term advisors within the NMCP to focus on vector control and MIP, in addition to the support already being provided by PMI's two in-country RAs.
- **2017-2018 Universal ITN coverage campaign:** The distribution of ITNs for Uganda's second UCC began in February 2017 and concluded in March 2018. The UCC was supported by Global Fund, PMI, DFID, and Against Malaria Foundation (AMF), who collectively supported the procurement and distribution of more than 26 million ITNs. PMI contributed 1 million ITNs to the UCC and provided technical assistance for planning the campaign. A subset of the ITNs being distributed were Permanet 3.0 and Olyset Plus, piperonyl butoxide (PBO) ITNs, in areas that are not covered by IRS, and a randomized controlled trial has been funded by AMF to compare the impact of ITNs with and without PBO on malaria indicators. Results are expected to be shared sometime after the 18 month survey in September 2019.
- **Supply chain:** Commodity supply to public health facilities continues to be a major challenge but recently significant strides have been taken to make improvements. The key persistent documented issues have been poor accountability and transparency, leading to only a limited supply of USG-funded life-saving commodities going through the National Medical Stores (NMS). In 2017, the USG began placing limited quantities of HIV antiretroviral drugs through the public sector, as this is where the majority of HIV patients seek care. In 2018, the USG is tripling the quantities of these drugs it is channeling through this sector. The high-level collaboration between the USG and the various ministries of the GoU is documented in an implementation letter that clearly spells out conditions precedent and lists the concerned stakeholders with their roles and responsibilities. In Uganda's FY 2018 HIV/AIDS Country Operational Plan, as well as the implementation letter, PEPFAR and USAID have initiated a number of measures to increase internal controls, including governance reforms, conducted a national supply chain assessment, improved information management through the procurement of an enterprise resource planning tool, and recruited

fiduciary agents to monitor and track commodities along the supply chain (central and health facility levels). Additional support for supply chain activities may come through embedding staff at NMS. PMI is working with PEPFAR and other USG partners on these reforms and intends to contribute to the integrated mechanisms to strengthen the accountability and effective management of the public sector supply chain. The implementation letter, which includes strong fiduciary measure, will allow the progressive reintroduction of PMI-procured commodities through the NMS. USAID Uganda has appointed an independent third-party fiduciary agent that will verify that NMS is meeting all the implementation letter requirements, including verification of commodities at source and at the last mile to ensure delivery. Distribution through NMS is expected to start incrementally with sulfadoxine-pyrimethamine (SP) in public health facilities while PMI monitors progress and maintains distribution for PNFP facilities through the Joint Medical Stores (JMS). The PMI Uganda team participated in the drafting of the implementation letter, and has included PMI-specific language on PMI's role in its implementation including that PMI will provide concurrence to commodity orders both going to and exiting NMS, and provide technical assistance in stock management (i.e., ordering, warehousing, and distribution).

6. Integration, collaboration, and coordination

Over the years, malaria control activities in Uganda have been successfully implemented and the NMCP has benefited from increasing support from various partners. PMI works hand-in-hand with the NMCP to ensure complementarity.

- **Global Fund:** Since the inception of support to the GoU in 2002, the Global Fund has signed a total of 20 grants amounting to \$1 billion, \$623 million of which had been disbursed to the country. Of these grants, the Global Fund has signed, committed, and disbursed \$149 million, \$132 million, and \$16 million respectively to the malaria program. However, \$133 million, remained undisbursed to the same program at the time of a 2016 audit.¹ The grants are implemented by two principal recipients: The Ministry of Finance, Planning, and Economic Development and The AIDS Support Organization. The Ministry of Finance has delegated responsibilities with respect to implementation of the grants to the MoH. Approximately 90 percent of Global Fund grants to Uganda are spent on the procurement of medicines and health products. The Global Fund has contributed 55 percent (14.3 million) ITNs to support the recently completed (March 2018) universal net coverage campaign. With support from the Global Fund Health Systems Strengthening grant, the MoH has operationalized 12 regional monitoring performance teams (RMPTs). These teams based at the regional referral hospitals each have a malaria resource person responsible for the districts within the catchment area of the regional referral hospitals. The main objective of the RMPTs is to strengthen the capacity for active performance monitoring and surveillance of program outputs to support the performance management of implementing agencies at all levels. During the next several years, the functionality of the malaria resource focal points in the RPMTs is to coordinate on behalf of the MoH the malaria reduction activities, especially those related to case management, IPTp and MIP, and SM&E will be strengthened. The current Global Fund grant for malaria will support procurement and distribution of ACTs, intravenous artesunate, and RDTs for treatment and diagnosis of malaria. The case management component of the grants also includes support for SBCC, iCCM, and subsidized ACTs for the private sector (co-payment mechanism).

¹ Global Fund Audit Report, February 2016.

- **DFID:** DFID made a commitment in 2010 to significantly increase support for health and malaria control in Uganda. In 2012, a special arrangement between USAID and DFID allowed the use of PMI's supported projects to scale-up its contribution to malaria control in Uganda. DFID funds supported the procurement and distribution of ITNs for the 2013/14 and 2017/18 universal coverage campaigns and for routine net distribution and commodity surveillance through PMI's supported projects. DFID through PMI has also supported two ITN-related assessments of the UCC 2013/14. In addition, using DFID funding, PMI scaled up implementation of IRS from 10 districts to 15, increased the number of health workers trained in integrated malaria management (IMM), and provided capacity building to the NMCP and district health management teams (DHMTs). DFID has extended funding until 2021 to support malaria control and prevention efforts in Uganda but during this period DFID plans to step down its direct bilateral support for malaria and by 2021 phase out direct support for malaria completely.
- **WHO/Uganda:** WHO provides malaria control technical assistance at the national level, including support to M&E (data collection and analysis), entomologic training, and emergency preparedness and response. WHO also provides capacity building support to the NMCP through the supply of vehicles and office equipment, placement of three senior staff, support for RBM meetings, support for MAAM, funding for therapeutic efficacy surveys, and contribution to the 2018 MIS.
- **UNICEF/Uganda:** UNICEF supports implementation of iCCM in 19 districts, in addition to providing commodities for iCCM in Global Fund and Malaria Consortium-supported districts, and advocating for scale-up at the national level. In addition, with funding from DFID, UNICEF provided five public health specialists and procured ACTs, intravenous artesunate, and RDTs for effective malaria case management in 10 northern districts in response to the malaria upsurge.
- **Clinton Health Access Initiative:** Is providing technical assistance to the NMCP to develop a strategy for effective case management including diagnosis and appropriate treatment with ACTs in public and private sectors in nine districts.
- **UN High Commissioner for Refugees:** Uganda is hosting more than 1.4 million refugees and asylum-seekers, most fleeing war and human rights abuses in South Sudan, the Democratic Republic of the Congo, and Burundi, providing unique challenges for malaria control. Uganda has a long history of providing sanctuary to refugees and its policy of integrating refugees in local communities, rather than camps, is widely considered as an exemplary model. Acknowledging the support of local Ugandan communities in welcoming refugees, the humanitarian response in refugee-host areas ensures that at least 30 percent of their efforts go towards assisting local Ugandans. Malaria continues to be the leading cause of death among people living in refugee-host districts in Uganda. One out of every four deaths among refugees is caused by malaria and one-third of all medical consultations at health centers in refugee settlements are people suffering from malaria. Efforts have been made to tackle the problem, including endeavoring to ensure new cases are diagnosed early, but the most effective way to bring down deaths from malaria is to prevent people from becoming infected in the first place. In 2016, PMI donated 267,000 ITNs to refugees and Ugandans to protect against malaria. Refugees settled in private houses and camps in Mid-West and West Nile regions benefit from PMI-supported health facilities.
- **Collaboration within USG:** PMI works closely with other USG initiatives including PEPFAR, maternal and child health (MCH), the Global Health Security Agenda, and Feed the Future to leverage their resources to better achieve malaria control efforts. In addition, the USAID Uganda Mission is focusing on integration in its health portfolio; PMI has contributed resources in these

integrated projects that reach populations that PMI's malaria projects may not adequately reach, thus increasing the effectiveness of PMI funds.

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

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

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80 percent reduction from PMI's original 2000 baseline levels
2. Reduce malaria morbidity in PMI-supported countries by 40 percent from 2015 levels
3. Assist at least five PMI-supported countries to meet WHO criteria for national or sub-national pre-elimination¹

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

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

To track progress toward achieving and sustaining scale of proven interventions, PMI will continue to track the key indicators recommended by the RBM M&E Reference Group as listed below:

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

¹ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

8. Progress on coverage/impact indicators to date

Table 1. Evolution of key survey-based malaria indicators in Uganda, 2006-2016

Indicator	2006 DHS	2009 MIS	2011 DHS	2014 MIS	2016 DHS
% Households with at least one ITN	16	47	60	90	78
% Households with at least one ITN for every two people	N/A	N/A	28	62	51
% Children under five who slept under an ITN the previous night	10	33	43	74	62
% Pregnant women who slept under an ITN the previous night	10	44	47	75	64
% Households in targeted districts protected by IRS	N/A	N/A	N/A	N/A	N/A
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	N/A	70	82	82	81
% Children under five with fever in the last two weeks who had a finger or heel stick	N/A	17	26	36	49
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	N/A	23	65	87	88
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	16	32	25	45	45
% Prevalence of parasitemia (by microscopy) in children 0-59 months	N/A	42	N/A	19	N/A
% Prevalence of anemia in children 0-59 months (Hgb<10.9g/dl)*	73	62	50	N/A	53
% Prevalence of severe anemia in children 0-59 months (Hgb<8 g/dl)	N/A	10	5	5	6

*All DHS measured anemia and severe anemia in children between 6-59 months.

Table 2. Evolution of key malaria indicators reported through routine surveillance systems in Uganda, 2012-2017*

Indicator	2012	2013	2014	2015	2016	2017
Total # Cases	13,641,502	16,321,917	13,704,101	13,080,797	16,071,710	14,485,313
Total # Confirmed Cases	2,515,715	5,345,269	5,773,346	7,144,971	9,644,154	10,251,007
Total # Clinical Cases	11,125,787	10,976,648	7,930,755	5,935,826	6,427,556	4,234,306
Total # <5 Cases	4,387,768	4,935,631	4,079,086	3,886,786	4,464,146	3,566,893
Total # inpatient malaria deaths	5,582	6,183	5,043	4,672	5,635	6079
% Data Completeness**	69	91	97	99	97	92
% Test Positivity Rate	45	46	43	45	43	51

* Data presented reflects significant improvements in reporting, confirmation and accuracy of data as a result of DHIS2 adoption and national roll-out. Please note: minor data cleaning was done to account for outliers and there are no validation checks in the system. Note that the years reported in Table 2 are based on the Uganda Fiscal Year (July-June).

**Percentage of health facilities reporting each month

Figure 5. Trends in key malaria indicators reported in routine surveillance systems

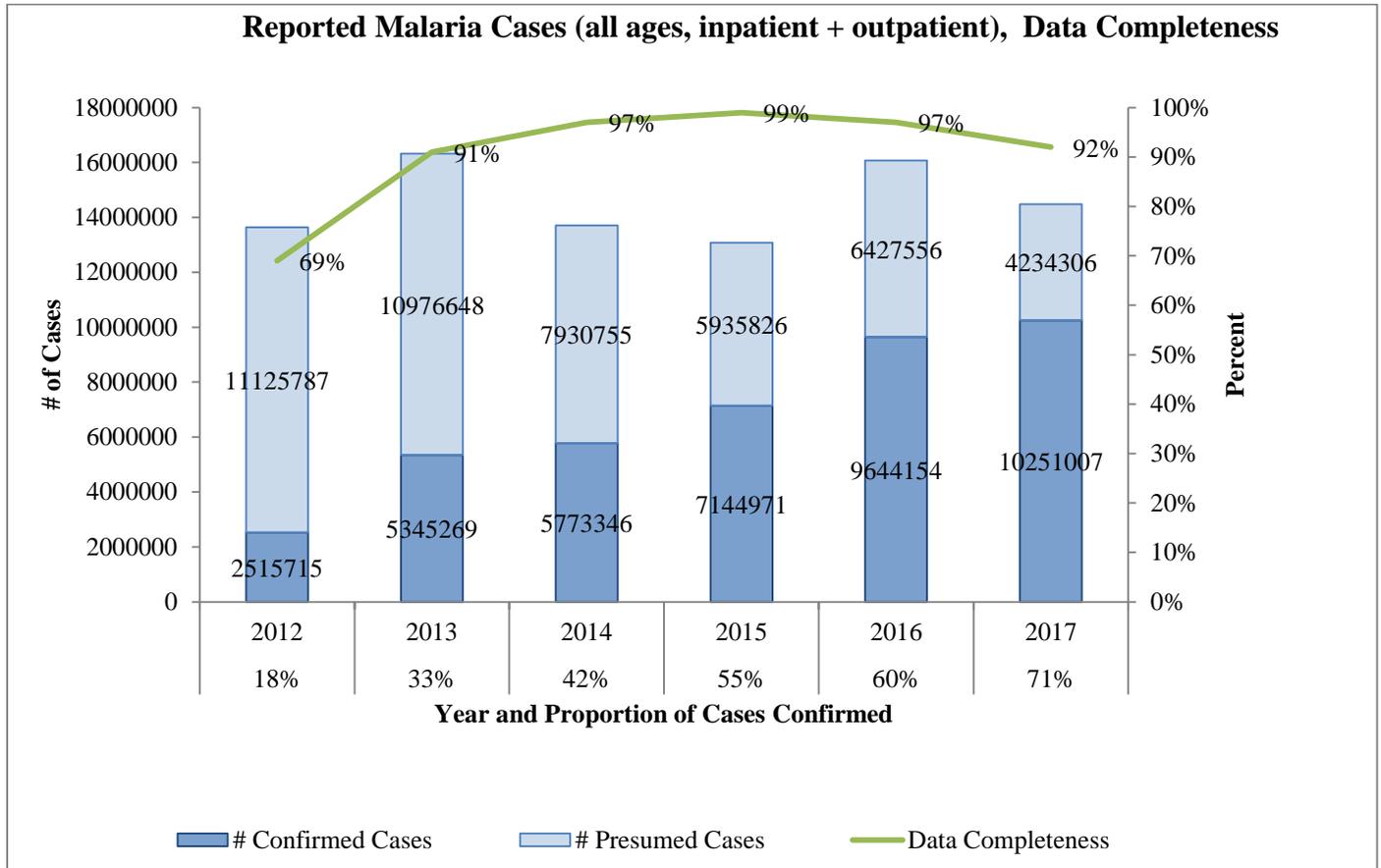
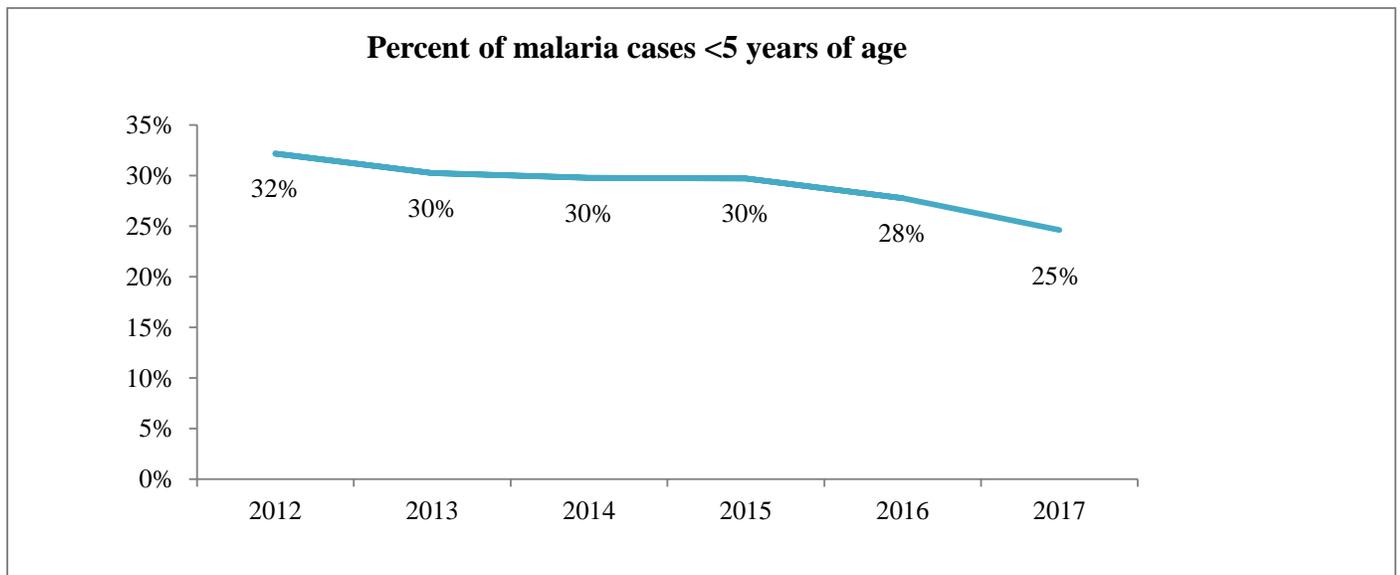


Figure 6. Trends in key malaria indicators reported in routine surveillance systems

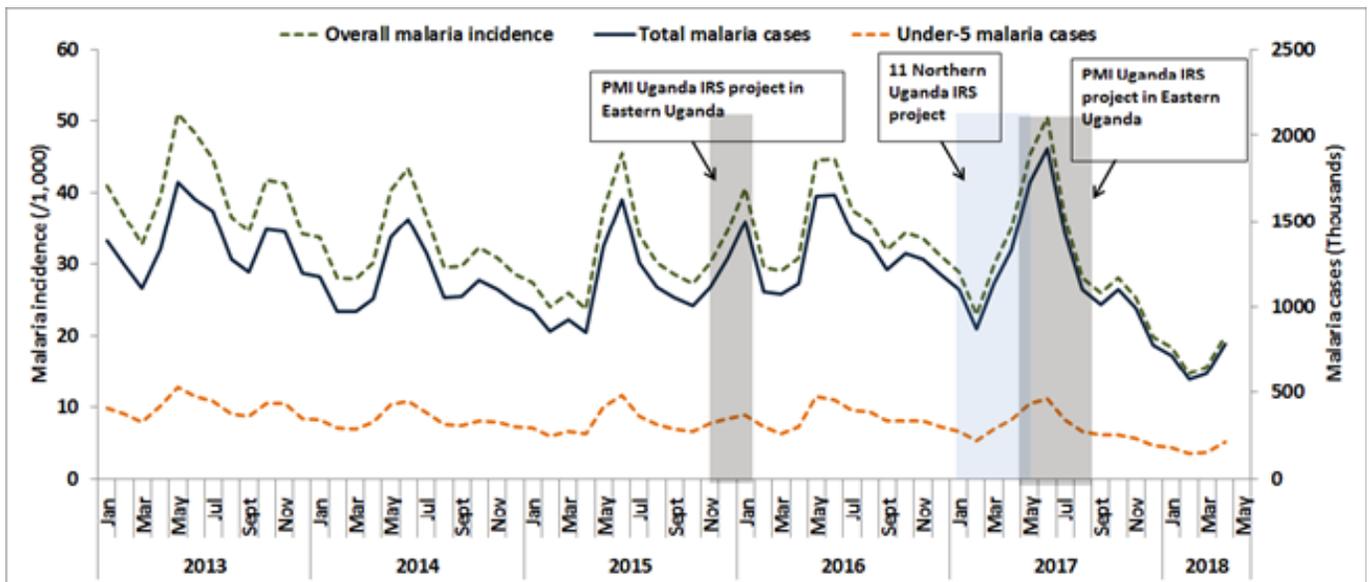


9. Other relevant evidence on progress

HMIS/DHIS2: The HMIS provides key data on malaria-related indicators that are used to assess trends, highlight progress and challenges, and guide PMI’s programmatic activities. Since 2013, there has been an improvement in the accuracy, completeness (with about 90 percent of public facilities reporting), and timeliness of malaria data contributing to the regular preparation of the Uganda malaria quarterly bulletin. The quarterly bulletin includes updates on malaria interventions; malaria burden (national, regional, and district level); and data on laboratory diagnosis, treatment practices, and special topics as needed. The bulletin, which is developed through a collaborative process led by the NMCP and PMI-supported Field Epidemiology Training Program (FETP) fellows, provides an opportunity for the NMCP and malaria stakeholders to monitor and review malaria program performance and to make informed decisions.

While the monthly data received from the HMIS/DHIS2 system has a high completeness rate, the weekly data are less complete (around 60-70 percent completeness). The 2015/16 malaria upsurge in the north was detected by HMIS/DHIS2, but that detection was somewhat delayed because of the timeliness and incompleteness of weekly data. The DHIS2 system was rolled out in 2012, and continues to improve. However, at all levels, data quality is not always optimal, nor is timely data analysis and use. PMI has strengthened HMIS/DHIS2 at national and subnational levels with efforts such as the M&E thematic working group (TWG), the quarterly bulletin, and data analysis and use workshops; however, there is still room for improvement. PMI has spearheaded a change in the HMIS reporting forms to address some of these issues affecting the quality of data.

Figure 7. Outpatient department national malaria burden in Uganda, 2013-2018*



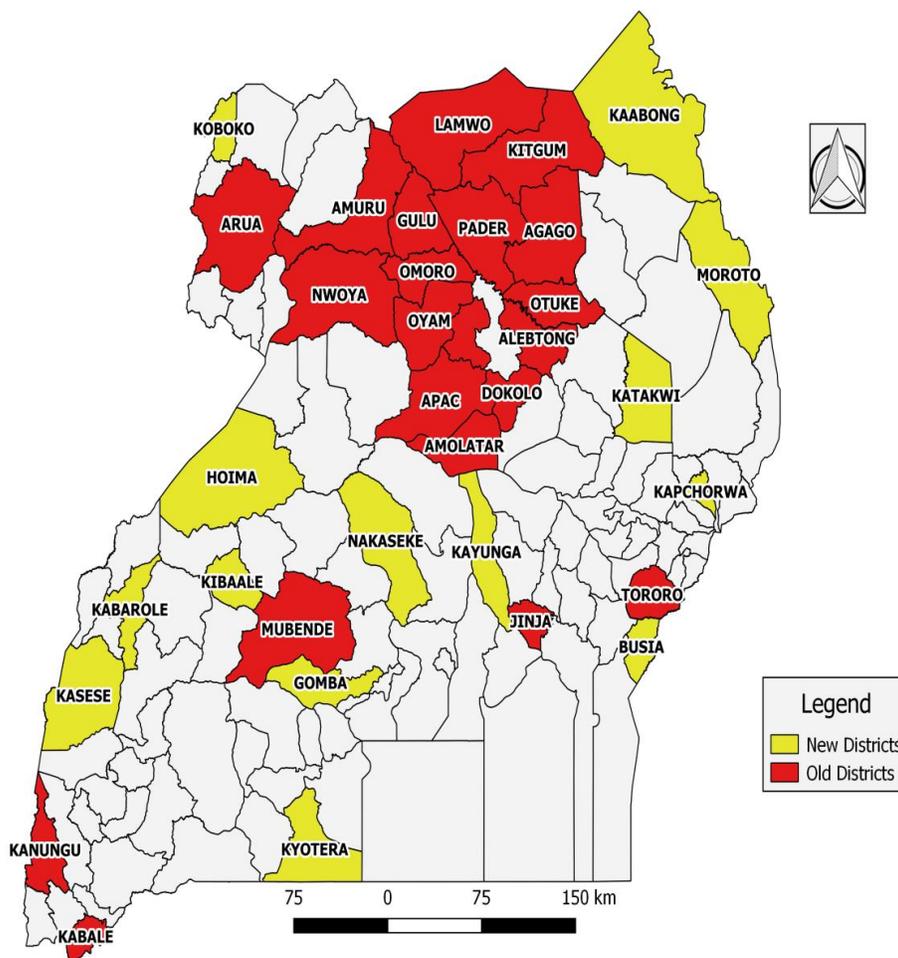
*Includes both confirmed and non-confirmed cases.

Malaria reference centers: As part of the overall effort to improve the reliability of HMIS data, PMI supports malaria reference centers (MRCs), which are strategically located across the country in different transmission zones, and in new and old IRS districts, providing high-quality malaria surveillance data that has been used to inform policy and evaluate the impact of ongoing interventions. In 2014, the original enhanced surveillance program was expanded from 6 inpatient sites to 21 outpatient malaria reference centers located in 21 districts in the country. The goal of the expansion was to increase geographical coverage of the malaria surveillance program. Monitoring trends in malaria burden at the health facilities

relies on the HMIS outpatient register as the primary data source. Data from the outpatient register is captured electronically facilitating management and analysis of data at the individual level. To ensure high-quality malaria surveillance data, the program emphasizes reporting of malaria cases based on laboratory confirmation. Staff at MRCs are trained and regularly supervised on medical recordkeeping best practices.

MRCs will also be used to strengthen surveillance in other facilities located within reasonable distance. Health workers trained at MRCs will provide training and mentoring to providers at other nearby facilities. Additionally, lessons learned from MRCs will be used to design a ‘minimum package’ for strengthening HMIS that will be implemented in other facilities. In other words, MRCs will function as centers of excellence and learning hubs from which best practices in malaria surveillance and HMIS strengthening will be cascaded to other facilities within the district.

Figure 8. Malaria Reference Center Sites



In Figure 8, old districts refer to districts where MRCs were launched between February and September 2014, and new districts refer to MRCs launched between February and August 2018. It should be noted that of the 21 old MRCs, 6 were previously sentinel sites launched in 2006/07 and transitioned to MRCs in August/September 2014.

MRCs are high-volume level IV/III public health facilities, which serve as centers of excellence and learning for malaria surveillance. They generate high-quality, program-relevant, individual-level

surveillance data to support evidence-based action at the facility, district, and national levels. The immediate plan is to have 35 sites in 35 districts of which 26 are already functional, and 6 inpatient sites (also already functional). Inpatient sites offer integrated surveillance for malaria and non-malarial febrile illnesses among hospitalized children. Key learnings from MRCs will be used to design a minimum package for strengthening HMIS, which will be implemented in non-MRCs. Specifically, MRCs will function as centers of excellence and learning hubs from which best practices in malaria surveillance and HMIS strengthening will be cascaded to other facilities in the district. They will serve as a technical resource in districts where they are located, from which opportunities for risk stratification, mapping, and other key learnings will be harnessed.

III. OPERATIONAL PLAN

PMI supports all elements of the NMCP's national malaria strategy, with the exception of larviciding and environmental management.

1. Vector control

NMCP/PMI objectives

IRS and ITNs are proven interventions and key components of the UMRSP, reinforced in Uganda's Integrated Vector Management Strategic Guidelines 2016 that address malaria and other major vector-borne diseases. Both interventions rely heavily on monitoring entomological indices to assess progress and inform implementation. Vector biting can be impacted by IRS and ITN use, so it is necessary to monitor vector behavior with respect to indoor resting densities, place and time of biting, species composition, and the insecticide resistance status of mosquitoes as they become subjected to insecticide selection pressure presented by IRS and ITNs.

The UMRSP objective for vector control is to achieve and sustain protection of at least 85 percent of the population at risk through recommended malaria prevention measures (ITNs, IRS, and larval source management) by 2020. The UMRSP recommends that IRS coupled with routine entomological monitoring and vector susceptibility studies be scaled-up in a phased and contiguous manner in 50 districts with the highest transmission rates.

The UMRSP objective for nets is to maintain universal access to ITNs in all transmission settings and control stages, resulting in a minimum of 85 percent of households with at least one ITN for every two people. Universal net coverage is to be maintained through a continuous distribution system that employs a range of delivery channels, including: 1) free ITN distribution through ANC and EPI clinics, 2) free ITN distribution in schools to students and their teachers, 3) sale of subsidized ITNs through the private sector (social marketing), and 4) commercial sale of ITNs at full cost. Despite the multiple continuous distribution channels proposed, social marketing and commercial sales have not been operational to date; distribution so far has been limited to mass campaigns, ANC/EPI clinics, and school-based distribution.

a. Entomological monitoring and insecticide resistance management

Progress since PMI was launched

PMI-supported IRS began in 2006, the year after PMI was launched, on a small scale in southwest Uganda. Monitoring of insecticide decay rates, human landing catch (HLC) counts indoors and outdoors, biting activity, pyrethrum spray catch (PSC) counts, species determination, and insecticide resistance

monitoring began in earnest in 2007. IRS transitioned to a block of 10 districts in the northern region that were experiencing the highest prevalence of malaria nationwide. Six eco-epidemiological zones across Uganda began receiving biennial susceptibility monitoring to four classes of WHO-recommended IRS insecticides in 2009. Two districts were added in 2016 for a total of eight: four districts surveyed year one followed by the other four the next year; new districts are located in east and northwest Uganda. Another two districts in southern and mid-western Uganda were added in 2018 to make a total of 10 sites; five will be surveyed in September of this year followed by the other five districts the next year. Within the IRS operational zone, an additional four districts receive annual insecticide resistance monitoring to detect the possible impacts of insecticide resistance on IRS operations. CDC bottle intensity bioassays and oxidase enzyme testing for resistance mechanisms began in these four sites in late 2014. Bionomics monitoring has been conducted at a single site in each of four districts: one district which has never received IRS, two currently implementing IRS, and one withdrawn IRS district. Beginning in 2017, bionomics monitoring has been conducted in five districts: Bugiri, Otuke and Tororo (current IRS districts), Apac (former PMI IRS district, but sprayed in February-March 2017 by the MoH), and Soroti (a non-IRS district).

Progress during the last 12–18 months

During the past year, PMI supported robust vector monitoring activities, including IRS quality assurance and longevity wall bioassays, PSCs to monitor indoor mosquito densities, and HLCs to check for indoor/outdoor biting activity and species composition. In addition, PMI supported light trap captures and insecticide susceptibility bioassays to determine the resistance status and intensities to WHO-recommended insecticides and tested for oxidase detoxification mechanisms. An overview of the locations and timing of PMI-supported entomological monitoring activities is found in Table 3.

Table 3: PMI-funded entomological monitoring, 2017

Activity	Location	Frequency
Bionomics monitoring ¹	Tororo (IRS)	Monthly up to July 2017
	Lira (IRS)	Monthly up to July 2017
	Apac (former IRS)	Monthly up to July 2017
	Soroti (never sprayed)	Monthly up to July 2017
Resistance monitoring in IRS areas	Bugiri, Lira, Soroti, Gulu	Yearly
Resistance, intensity, mechanism monitoring nationally; 8 districts	Year 1: Hoima, Kitgum, Katakwi, Wakiso (Sep-Oct 2016) Year 2: Kanungu, Arua, Apac, Tororo (Sep-Oct 2017)	Alternate 4 districts annually, each district receives biennial coverage
Insecticide quality assurance	All PMI-supported IRS districts	Yearly (2-3 weeks after IRS)
Decay rate monitoring	Kaberamaido, Lira, Pallisa, Tororo	Monthly up to December 2017
Mosquito density monitoring with PSC in withdrawn districts	Apac, Amuru, Gulu, Kitgum, Oyam, Pader	Monthly up to March 2018

¹Includes HLC, PSC, light trap collections, nightly (hourly) bite activity

Note: Bionomics monitoring was conducted over two years from July 2015 to July 2017 with the understanding that two-year monitoring would be sufficient to generate data on vector behavior and the impact of IRS in sprayed districts compared to non-IRS districts.

Entomological Monitoring in IRS Zones:

- **Post-IRS wall bioassays:** All post-IRS wall bioassays were conducted within two weeks of spraying, which was conducted in two phases between May 2 and August 19, 2017. In May 2017, the project conducted 63 post-IRS wall cone tests in the sentinel sites in phase one districts of Alebtong, Amolatar, Budaka, Dokolo, Kaberamaido, Namutumba, and Pallisa to assess the quality of IRS on different sprayed wall surfaces. Phase one districts were sprayed May 2 to June 6, 2017. All the *An. gambiae* s.s. mosquitoes exposed to the plaster painted, plain brick, and mud and wattle wall surfaces in all seven districts were knocked down within 40 minutes post-exposure except for plain brick walls in Dokolo, where they were knocked down at 60 minutes post-exposure. A 100 percent mortality rate was achieved on all the three wall surfaces after the 24 hour holding period in all seven districts. This indicates good quality of IRS on all the different sprayed wall surfaces in these districts. In August 2017, the project conducted 63 post-IRS wall cone tests in the sentinel sites in the phase two districts of Bugiri, Kaberamaido, Kibuku, Lira, Otuke, Serere, and Tororo, which had been sprayed July 17 to August 19, 2017. All the *An. gambiae* s.s. mosquitoes exposed to the plaster painted, mud and wattle, and plain brick wall surfaces in all districts were knocked down within 50 minutes post-exposure. A 100 percent mortality rate was achieved on all three wall surfaces after the 24 hour holding period, indicating good quality of IRS on all sprayed surfaces.
- **Insecticide decay rate monitoring:** Pirimiphos-methyl (long-lasting formulation) decay rates were monitored on three different wall surface types (plain brick, mud and wattle, and painted plaster) to determine the longevity of the insecticide in four districts (Kaberamaido, Lira, Pallisa, and Tororo). Results from July 2017 to March 2018 showed very high efficacy post-spray, killing 100 percent of susceptible *An. gambiae* s.l. (Kisumu) exposed to pirimiphos-methyl-treated plaster painted, plain brick, and mud and wattle walls through eight to nine months. Decay rate monitoring typically begins one month post-spray and continues at monthly intervals until mortality drops below 80 percent for two consecutive months.
- **Bionomics monitoring:** Indoor/outdoor biting activity, hours of activity, and species involved with malaria transmission is being monitored. Earlier bionomics studies comparing two IRS districts (Kitgum and Apac) against one non-IRS district (Lira) found that sprayed districts received more HLC activity before midnight while the unsprayed district received more HLC counts after midnight. Indoor biting activity was over 50 times greater in the non-sprayed district compared against sprayed districts. Bionomics studies will be conducted in the five districts of Bugiri, Otuke, and Tororo (current IRS districts), Apac (former IRS project district, but sprayed in February-March 2017 by the MoH, and Soroti (a non-IRS district). Pyrethrum spray catches were conducted at single sites in six northern districts to monitor indoor mosquito densities after withdrawal of IRS; however, this monitoring activity was completed in March 2018.
- **Susceptibility monitoring:** Additional insecticide resistance monitoring in PMI's IRS zone (separate from national susceptibility monitoring sites) occurred this year to gain understanding of resistance levels in malaria vectors within the IRS spray zone (northern and eastern Uganda), including possible changes in their status. This information would be used to inform the NMCP and PMI of potential insecticide resistance problems in real-time to plan for future insecticide rotations. Districts monitored include two IRS districts (Bugiri and Lira), a withdrawn district (Gulu), and a never-sprayed district (Soroti). Basic susceptibility status was determined using WHO bioassay tubes. Data indicated mosquitoes are still fully susceptible to organophosphates except for reduced susceptibility to malathion in Soroti (89.4 percent mortality), susceptible to carbamates with possible resistance (mortality 90-97 percent) in Lira, and widespread and high

levels of resistance to two pyrethroid insecticides commonly used in ITNs in several sites (Table 4). Intensity bioassay results are included for *An. gambiae* s.l. in Table 5 and *An. funestus* in Table 6. Presence of oxidative enzyme detoxification in IRS zone mosquitoes is shown in Table 7.

Table 4: 24-hour holding mortality (%) of *An. gambiae* s.l. after exposure to discriminating dosages of various insecticides in four IRS zone sites in Uganda, June 2017

Insecticide tested	BUGIRI			GULU			LIRA			SOROTI		
	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>
	A	L	A	A	L	A	A	L	A	A	L	A
Organochlorine:												
DDT		92			19			91			90.8	
Carbamate:												
Bendiocarb		100			100			90			100	
Organophosphate:												
Pirimiphos-methyl		100			100			100		100	100	
Malathion		100			100			100			89.4	
Pyrethroid:												
Alphacypermethrin		82			17			80			34.5	
Deltamethrin		79			49			91			33.7	
Permethrin		45			3			91			25	

KEY: *An. gam.* = *An. gambiae* s.l.; *An. fun.* = *An. Funestus*; A = results for adults collected indoors; L = results for adults reared from larvae)

Confirmed resistance	Probable resistance	Susceptible
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Table 5: Survival of *An. gambiae* s.l. exposed to insecticides after a 30 minute diagnostic time using the CDC bottle bioassay, June 2017

District	Insecticide	Vector Survival (%) by Insecticide Concentration			
		1X	2X	5X	10X
Bugiri	Alphacypermethrin	1.8	0	0	0
	Deltamethrin	5.1	0	0	0
	Permethrin	13	3.6	1.8	0
Gulu	Alphacypermethrin	24	20	0	0
	Deltamethrin	52	12	8	4
	Permethrin	43	20	8	0
Lira	Alphacypermethrin	12	8	0	0
	Deltamethrin	24	0	0	0
	Permethrin	72	64	60	36
Soroti	Alphacypermethrin	4	-	0	0
	Deltamethrin	3.8	-	0	0
	Permethrin	28	-	8	0

Table 6: Survival of *An. funestus* exposed to insecticides after a 30 minute diagnostic time using the CDC bottle bioassay in Soroti, June 2017

District	Insecticide	Vector Survival (%) by Insecticide Concentration			
		1X	2X	5X	10X
Soroti	Alphacypermethrin	-	-	-	-
	Deltamethrin	0	-	0	0
	Permethrin	24	-	0	0

Table 7: Mortality (%) of *Anopheles gambiae* s.l. after exposure to a diagnostic dose of insecticides in four districts in Uganda, June 2017

Insecticide	Bugiri	Gulu	Lira	Soroti
Alphacypermethrin	73	17	80	34.5
Alphacypermethrin + PBO	100	98	100	85.9
Deltamethrin	79	49	91	33.7
Deltamethrin + PBO	100	100	100	100
Permethrin	45	3	91	25
Permethrin + PBO	96	98	100	99

Additional Entomological Monitoring:

National susceptibility surveys: Epidemiological zones throughout Uganda are biennially surveyed. Beginning in 2015, yearly surveys were planned in six districts (Apac, Hoima, Kanungu, Kitgum, Tororo, and Wakiso). That year, a decision was reached by the NMCP and PMI to add two districts to the survey in unmonitored regions in the West Nile sub-region in the northwest and the eastern regions above Mbale District to gain a more comprehensive understanding of the extent of pyrethroid resistance in the country. In 2018, another decision was taken to add two districts to the survey in unmonitored regions in the southern sub-region in the northwest and the mid-western cattle corridor region, beginning in September 2018. Five zones will be monitored each year and alternated annually; each survey was expanded from two weeks to three weeks to enable better quality testing with a wider array of insecticides while easing the manpower and logistical burden. National susceptibility surveys in 2017 were conducted in the districts of Apac, Arua, Kanungu and Tororo. Resistance intensity and synergist monitoring is being performed at each site. Results from 2017 surveys are shown in Table 8. In addition in 2017, PMI Uganda also tested susceptibility of *An. gambiae* s.l. to two newer insecticides (clothianidin and chlorfenapyr) in Tororo and Soroti. The mortality of *An. gambiae* s.l. to clothianidin in Tororo was 96.6 percent at seven days post exposure (July 2017) while the mortality of *An. gambiae* s.l. to chlorfenapyr in Soroti was 99.7 percent and in Tororo was 100 percent at three days post exposure (October 2017). Clothianidin was only tested in Tororo due to the presence of an insectary in that district; Soroti, which was the comparison non-IRS district, does not have an insectary. Additional tests are planned for August 2018.

Table 8: Results of the September to October 2017 national susceptibility survey of *An.gambiae* s.l.* against select insecticides from four surveillance sites across Uganda (24-hour holding mortality %)

Insecticide tested	Apac			Arua			Kanungu			Tororo		
	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>	<i>An. gam.</i>		<i>An. fun.</i>
	A	L	A	A	L	A	A	L	A	A	L	A
Organochlorine:												
DDT 4%		98			15		26					100
Carbamate:												
Bendiocarb 0.15%		100			88			97				100
Propoxur 0.1%												100
Organophosphate:												
Pirimiphos-methyl 0.25%		100			100			100				99
Malathion 5%							100					100
Pyrethroid:												
Alphacypermethrin 0.05%		75			7			15				83
Deltamethrin 0.05%		24			2			27				84
Permethrin 0.75%		69			6			9				83
Confirmed resistance			Probable resistance				Susceptible					

KEY: *An. gam.* = *An. gambiae* s.l.; *An. fun.* = *Anopheles funestus*; A = adult morning resting collections; L = adults reared from larvae

Advanced entomological monitoring: During the determination of insecticide resistance mechanism, pre-exposure of *An. gambiae* s.l. to PBO for one hour prior to exposure to discriminating doses of alphacypermethrin and deltamethrin WHO-impregnated papers restored the efficacy of these insecticides in Apac and Tororo and to alphacypermethrin in Arua. This indicates oxidase enzymes are involved in the resistance of *An. gambiae* s.l. to these insecticides in these districts. Pre-exposure of *An. gambiae* s.l. to PBO before exposure to deltamethrin and permethrin in Kanungu and Arua and to alphacypermethrin in Kanungu resulted in near full restoration of the efficacy of these insecticides indicating that oxidase enzymes were involved in *An. gambiae* s.l. resistance; other resistance mechanisms may also be involved to a minor extent. Presence of oxidative enzyme detoxification in IRS zone mosquitoes is shown in Table 9. Analysis of intensity bioassays conducted by PMI in 2017 show that in Apac, low frequency of 2x resistance in *An. gambiae* s.l. to permethrin (8 percent) was observed, and limited resistance at the 1x diagnostic dose was seen for deltamethrin (20 percent). No tests were conducted with alphacypermethrin due to insufficient vectors. In Arua and Tororo, no serious resistance was found to any of the tested insecticides at 1x in *An. gambiae* s.l. In Kanungu, moderate frequency of 2x resistance in *An. gambiae* s.l. to deltamethrin (20 percent) and permethrin (20 percent) was observed, while low frequency resistance at the 1x diagnostic dose was seen for alphacypermethrin (11 percent) as shown in Table 10.

Table 9: Mortality (%) results of synergist bioassays for mechanism testing of oxidase enzyme activity at selected sites, October 2017

Insecticide	Apac	Arua	Kanungu	Tororo
Alphacypermethrin	75	7	15	83
Alphacypermethrin + PBO	100	100	80	100
Deltamethrin	24	2	27	84
Deltamethrin + PBO	100	92	80	100
Permethrin	69	6	9	83
Permethrin + PBO	100	87	75	100

Table 10: CDC intensity bioassay showing survival of *An. gambiae* s.l. exposed to pyrethroids at different doses in four districts, September-October 2017

District	Insecticide	Vector Survival (%) by Insecticide Concentration			
		1X	2X	5X	10X
Apac	Alphacypermethrin	-	-	-	-
	Deltamethrin	20	0	0	0
	Permethrin	20	8	0	0
Arua	Alphacypermethrin	0	0	0	0
	Deltamethrin	0	0	0	0
	Permethrin	0	0	0	0
Kanungu	Alphacypermethrin	11	0	0	0
	Deltamethrin	32	20	0	0
	Permethrin	32	20	0	0
Tororo	Alphacypermethrin	0	0	0	0
	Deltamethrin	0	0	0	0
	Permethrin	0	0	0	0

Plans and justification for proposed activities with FY 2019 funding:

PMI will continue to monitor malaria mosquito indoor and outdoor biting activity, time of feeding, indoor density, and species composition at one site in each of five districts associated with IRS (one non-IRS, three IRS, and one former IRS). Techniques including PSCs, light traps, and HLCs will occur monthly. PMI has signed a memorandum of understanding with Gulu University to provide PCR identification of *An. gambiae* and *An. funestus* complex mosquitoes to species and to determine *kdr* status, thus providing more rapid analysis than shipping samples and increasing in-country capacity. Work began in late 2017.

PMI added two additional sites, one in southern Uganda (Rakai) and mid-western Uganda (Kamwenge District) in addition to those added earlier in 2016 northwest Uganda (Arua District, West Nile Sub-region) to the eight eco-epidemiological zones for insecticide resistance monitoring in Uganda. The addition of these sites is in response to an NMCP request to obtain more geographically representative data, thus providing a more comprehensive understanding of the extent of insecticide resistance in Uganda. Kamwenge was surveyed for the first time in 2018, while Rakai will be surveyed in 2019. These surveys will be altered yearly, five zones one year and the other five the next. Intensity and resistance mechanism testing will occur at all sites. Monitoring time was increased from two to three weeks to allow adequate time to gather sufficient numbers of mosquitoes to maximize information gathering.

In addition, four IRS zone districts (Bugiri, Lira, Soroti, and Gulu) will be surveyed for intensity, oxidase mechanism, and routine susceptibility testing of an organophosphate, a carbamate, and three pyrethroid insecticides once a year. PMI will include resistance testing of new insecticides that may be recommended for future use in IRS, including clothianidin and chlorfenapyr. Four IRS districts (Kaberamaido, Lira, Pallisa, and Tororo) will include monthly decay rate monitoring with laboratory susceptible mosquitoes on three types of wall surface until mortality falls below 80 percent for two consecutive months.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.

b. Insecticide-treated nets

Progress since PMI was launched

There was a strategic shift in Uganda in 2009 from targeted mass ITN distribution campaigns focused on pregnant women and children under age five to UCCs where one ITN is distributed for every two people. The UMRSP calls for mass distribution campaigns to be repeated every three years along with continuous ITN distribution through ANC, EPI, and schools to maintain high levels of coverage. With support from the Global Fund, PMI, and DFID, Uganda's first UCC was launched in May 2013 and completed in August 2014. The campaign successfully distributed more than 22 million ITNs reaching more than 7 million households. The GoU provided security coverage to ensure the nets reached their intended distribution sites from the central, district, and sub-county warehouses, and that ITNs were distributed in a safe and secure manner at each point of distribution. For the second UCC campaign, which began in February 2017, 26.3 million nets were distributed to households upon its completion in March 2018.

Since 2006, PMI has procured 15,144,123 ITNs and has distributed 77,147,784 ITNs. Distribution has mainly occurred through the UCC campaigns of 2013/14 and 2017/18, and ANC/EPI clinics. There has also been limited distribution by NGOs, civil service organizations, The AIDS Support Organization, large company corporate social responsibility programs, and Peace Corps. PMI has also supported SBCC efforts to increase demand for and promote correct and consistent use of ITNs.

In 2015, a two-phase evaluation of the 2013/14 UCC was conducted to assess the effectiveness, efficiency, and impact of the distribution to inform future campaigns. Findings from this evaluation indicated that the UCC significantly increased net ownership, and "net use culture." The campaign was found to be cost-effective, and its contribution to the impressive decline in malaria incidence was significant. However, the data management, SBCC, and M&E at all levels were not adequately performed. As a result, these areas were noted as key areas to strengthen during the 2017/18 UCC.

Another PMI supported review (Table 13)¹ showed that due to the 2013/14 universal coverage campaign, the 2014 MIS results vastly improved in all indicators, and the ITN use to access ratio increased for most regions from 2011-2016. The percent of the population with access to a net was one of the highest seen among PMI countries. For the majority of regions, wealth quintiles, and residence types, net access and use both increased through MIS 2014 but dipped slightly according the 2016 DHS. Earlier trends of wealthier households having better ownership, access, and use of ITNs were reversed in 2014. The trend of urban residences having lower ownership, likely reflecting challenges with campaign implementation in urban areas, have been erased in recent surveys; access and use seem more similar among residence types.

¹ PMI's VectorWorks *ITN Access and Use Report - April 21 2017*

Table 11. ITN ownership, use, and ratio of use versus access: 2009-2016

	2009 MIS	2011 DHS	2014-15 MIS	2016 DHS	2009 MIS	2011 DHS	2014-15 MIS	2016 DHS	2009 MIS	2011 DHS	2014- 15 MIS	2016 DHS	2009 MIS	2011 DHS	2014-15 MIS	2016 DHS
	% of households owning ≥1 ITN				% of population with access to an ITN within own household				% of population that used an ITN the previous night				Ratio of use: access			
Region																
Central1 [§]	35	59	81	79	24	49	72	70	17	35	59	59	0.71	0.71	0.82	0.84
Central 2	24	60	82	75	14	49	71	65	9*	37	59	53	0.64	0.76	0.83	0.82
Kampala	49*	57	86	75	45*	52	78	66.1	38*	44*	71*	60	0.84	0.85	0.90	0.91
East Central	34	38*	82	75	21	25*	67	61	18	19*	62	52	0.86	0.76	0.92	0.86
Mid-Eastern	59*		95*		36		79		31*		71*		0.86		0.90	
North East	77*		97*		53*		81*		50*		81*		0.94		1.00	
Eastern		56		77		38*		58		35		53		0.92		0.91
North		67		80		46		61		36		56		0.78		0.92
Karamoja		57		55		37*		36.2		35		33		0.95		0.91
Mid Northern	64*		94*		43*		84*		31*		75*		0.72		0.90	
West Nile	52	82*	96*	92	32	60*	85*	77.0	31*	46*	72*	71	0.97	0.77	0.86	0.92
Western		69*		77		52		63		41		53		0.79		0.84
Mid-Western	34		94*		22		81		16		76*		0.73		0.94	
Southwest		58	97*	86		43	90*	76		30	63	55		0.70	0.70	0.72
South	44				31				23				0.74			
Wealth Quintile																
Poorest [§]	47	55	91	71	30	37	77	52	27	33	72	49	0.90	0.89	0.94	0.94
Poorer	44	58	94*	76	30	42*	82*	60	24	33	73	51	0.80	0.79	0.89	0.85
Middle	49	60	93	80	33	43*	80	70	26	33	70	52	0.79	0.77	0.87	0.74
Richer	45	62*	88	81	29	47*	79	70	21	34	64*	57	0.72	0.72	0.81	0.81
Richest	49	63*	85*	84	36	54*	76	76	29	42*	64*	65	0.81	0.78	0.84	0.86
Residence																
Urban [§]	46	59	84	79	37	51	76	70	30	42	65	61	0.81	0.82	0.86	0.87
Rural	47	60	92*	78	31	44*	79	63	25	34*	69	53	0.81	0.77	0.87	0.84

*p-value ≤ 0.05 compared to reference group (denoted with §)

Though MIS 2014 reported high net coverage (90 percent ownership of at least one net; 62 percent coverage considering one net for two people) and use by children under age five years (74 percent) and pregnant women (75 percent) following the UCC of 2013/14, the DHS survey carried out two years later in 2016 noted a decline in net coverage (78 percent ownership of at least one net; 51 percent coverage, considering one net for two people) and use the night before the survey (62 percent of children under age five; 64 percent of pregnant women). These data show the changes in net ownership and use between UCC cycles, highlighting the importance of continuous net distribution. However, long-term trends show Uganda has made great progress in net ownership and use since PMI began. Between 2006 and 2016, household ownership increased from 16 percent to 78 percent, use among children under age five increased from 10 percent to 62 percent, and use among pregnant women increased from 10 percent to 64 percent (DHS 2006, DHS 2016).

Progress during the last 12-18 months

In February 2017, the second UCC campaign was launched and concluded in March 2018 and reached several million households in 122 districts with 26.3 million ITNs provided by Global Fund, PMI, AMF, and DFID. During 2017 and 2018, PMI provided technical input and oversight at the national level for campaign planning, and supported household registration, distribution, and post-distribution SBCC and follow up in three high-burden districts (Arua, Koboko, and Nebbi) where PMI provided more than 1 million nets to the UCC campaign. The campaign design included several committees and protocols, including operations, oversight, M&E, logistics, and budget. Through the oversight committee, PMI assisted in identifying and communicating critical issues to help the campaign remain successful.

In addition, PMI provided technical assistance and feedback to the ITN randomized control trial to assess the impact of ITNs with and without PBO on malaria indicators in Uganda. This study is being implemented within the UCC and funded by AMF, see operational research (OR) section. PMI is keenly interested in the results, which may inform future ITN procurement decisions.

Results from the last end-use verification (EUV) survey show that ITN availability on the day of the visit increased to 60 percent (EUV8) from 33 percent (EUV7), while 80 percent of the facilities had ITNs in stock in the last three months, which is a significant improvement compared to the last EUV survey. A quarter of facilities were overstocked. PMI also supported an in-depth dipstick survey in 2017 that surveyed individuals (50 from rural areas and 50 from urban areas) in 100 households in five PMI focus districts. Results were consistent with the most recent DHS in terms of high ITN ownership (90 percent) and reported ITN use (83 percent).

To reinforce PMI's support for nationwide ITN coverage, during 2017 and 2018, PMI distributed 2,136,270 ITNs through various channels, including the UCC, pregnant women through ANC, and children under one year of age via EPI clinics in PMI focus areas and via partners like Global Fund and DFID to geographic areas that PMI does not reach. Ongoing challenges include reporting of ITNs distributed to children via EPI clinics as this is not yet included in DHIS2. Also, ensuring that pregnant women receive a net on their first ANC visit remains a challenge in places where health workers believe it is most valuable to provide a net to pregnant women after a certain number of ANC visits as an incentive.

PMI began implementing traditional school-based ITN distribution in June 2018. PMI targeted 2,712 public schools and distributed more than 600,000 ITNs through this channel. This distribution was conducted according to the MoH-approved Uganda National School-based Long-Lasting Insecticidal Nets Distribution 2016 Guidelines. This process began with the approval and dissemination of the new school guidelines to national-level stakeholders, a process that was led by PMI in support of the MoH. PMI

supported the NMCP to print 3,140 copies of the guidelines, which were disseminated to schools involved in the distribution. In addition, involved districts have drafted comprehensive plans and teachers, health workers, and district officers were trained in school net distribution. PMI will assess the recent implementation of school-based net distribution to determine whether this channel meets the coverage goals envisioned, and to identify opportunities for improvement in future rounds as well as to explore opportunities for scale up in additional districts.

In addition to procurement and distribution of ITNs, PMI continues to support increased ITN use through SBCC activities using regionally based programs. The 2017 PMI-supported dipstick survey found that knowledge about nets was good and that many people started using ITNs after listening to messages about net use, especially after receiving instructions on how to prevent allergic reactions from hospitals, VHTs, and the radio. However, even though people own ITNs, a fair number of respondents reported finding it difficult to use nets regularly because of heat discomfort when sleeping under the net (especially during the dry seasons), not enough ITNs are provided by the GoU, skin irritation, strong chemical smell, and worn out or poor condition of the mosquito net.

PMI also seeks to ensure that the ITNs distributed are viable and enduring to protect against mosquito vectors. To monitor the survivorship, attrition, durability, and bio-efficacy of ITNs, PMI will initiate a new prospective net durability study using nets distributed at the end of the 2017/18 UCC. The three-year study will administer serial cross-sectional surveys and sample 400 households in Tororo, Apac, and Mubende districts. Following the protocol review, this study is expected to begin in the fall of 2018.

Commodity gap analysis

Table 12. ITN gap analysis

	2018	2019	2020
Total Targeted Population	38,981,604	40,151,052	41,355,583
Continuous Distribution Needs			
Channel #1: ANC	1,910,099	1,987,477	2,067,779
Channel #2: EPI	1,676,209	1,726,495	1,778,290
Channel #3: School-based distribution	600,000	600,000	400,000*
<i>Estimated Total Need for Continuous</i>	<i>4,186,308</i>	<i>4,313,972</i>	<i>4,246,069</i>
Mass Distribution Needs			
2020 mass distribution campaign	0	0	25,272,857
<i>Estimated Total Need for Campaigns</i>	<i>0</i>	<i>0</i>	<i>25,272,857</i>
Total Needs:	4,186,308	4,313,972	29,518,926
Partner Contributions			
ITNs carried over from previous year	187,137	0	0
ITNs from Government	0	0	0
ITNs from Global Fund	68,792	105,672	18,293,648
DFID	1,000,000	1,000,000	1,000,000
AMF	819,000	843,570	868,877
ITNs planned with PMI funding	1,575,000	500,000	1,038,000
Total ITNs Available	3,649,929	2,449,242	21,200,525
Total ITN Surplus (Gap)	(536,378)	(1,864,731)	(8,318,401)

1- UBOS census report 2014, growth rate of 3%

2- 5% of the population is made up of pregnant women (2016 UDHS report); average ANC coverage per UDHS 2016 is projected to be 98% (2018), 99% (2019), and 100% (2020)

3- 4.3% of the population is made up of children under age 1 (UBOS report 2014). EPI coverage is assumed at 100%

4 - 1 net for 1.8 persons in endemic areas (WHO recommended). 10% buffer included because of old census data

5 - Beginning stock extracted from PNFP pipeline January 2018. Stock data for public sector nets currently not available

*Decrease in ITNs allocated to school-based distribution due to additional net need for 2020 UCC. So far, no other donor has expressed interest in supporting school-based distribution, but PMI will continue to work with the NMCP to advocate support.

Plans and justification for proposed activities with FY 2019 funding

PMI will continue to support the NMCP in maintaining high ownership and use to achieve 85 percent net ownership through continuous distribution channels in 2020, including ANC, EPI, and traditional school-based distribution. These complementary methods will help to reinforce continuous distribution and lessen the reliance on UCCs. PMI will also support the 2020 UCC through procurement and distribution of nets. Currently, there is a shortage of nets needed to supply all ITN distribution channels in 2020; however, PMI is actively discussing with other donors to see how best to meet the 2020 needs.

PMI proposes to procure and distribute approximately 640,000 ITNs for continuous distribution through ANC and EPI clinics and school-based distribution including the shipping, transportation, country clearances, and warehousing of nets. PMI will also procure and distribute approximately 400,000 ITNs for distribution through the 2020 UCC.

PMI will continue its efforts to increase net usage through community-based SBCC at schools and health facilities, and will support the NMCP to strengthen the Integrated Vector Management TWG to harmonize ITN programs across stakeholders.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities for FY2019 funding.

c. Indoor residual spraying

Progress since PMI was launched

The first IRS pilot project in Uganda began in the 1940s and consisted of spraying urban areas, particularly Kampala, resulting in a dramatic reduction of disease transmission.¹ IRS using DDT was conducted in Kigezi District in southwest Uganda from 1959-1961 and was highly successful in reducing transmission but, unfortunately, IRS was only sporadically used in the 1960s.² In 2006, PMI supported a large-scale IRS program in the epidemic-prone southwestern highland district of Kabale and achieved good coverage and impact results. The following year, PMI shifted operations to Kabale's high-risk sub-counties and extended support to the neighboring district of Kanungu and northern districts Lamwo, Kitgum, Pader, Agago, Gulu, Amuru, and Nwoya to protect large numbers of internally displaced people.

From 2009-2014, PMI supported blanket IRS in the 10 northern districts of Kitgum, Agago, Lamwo, Pader, Amuru, Nwoya, Gulu, Oyam, Kole, and Apac, achieving consistently high coverage (above 90 percent). IRS transitioned to carbamate insecticides in mid-2010 due to the emergence of widespread pyrethroid resistance. Resistance to carbamate insecticides was detected in one site and suspected resistance was found in another two sites during the 2013 national susceptibility survey, prompting a change to an organophosphate insecticide for the 2016 spray season.

Data from PMI-supported reference centers and HMIS (2010-2014) showed a strong downward trend of malaria cases in PMI's original 10 northern IRS districts at the time of IRS transition. As further evidence of the impact of IRS in Uganda, the 2011 anemia and parasitemia survey comparing IRS to non-IRS districts showed significant improvements in both parasitemia (45 percent reduction) and anemia (32 percent reduction) in the IRS districts.³ In 2015, PMI transitioned to nine new IRS districts in the southeast (Lira, Tororo, Butaleja, Namutumba, Kibuku, Budaka, Pallisa, Bugiri, and Serere). Prior to the transition, UCC with ITNs was completed, which included these 10 previously sprayed districts. In 2015/16, an upsurge in malaria cases was reported in the 10 former IRS districts in the north and the Global Fund supported an IRS campaign in all 10 districts in 2016/17 in response. No further IRS support has been provided by the Global Fund.

In 2015 the NMCP planned to spray two districts (Kumi and Ngora) contiguous with PMI-supported IRS districts with one round of carbamate IRS; however, only Kumi was sprayed and there are no further plans for government-funded IRS at this time.

¹ WHO Regional Office for Africa. 2007. Implementation of IRS of Insecticides for Malaria Control in the WHO African Region Report. Vector Biology and Control Unit Division of Healthy Environments and Sustainable Development.

²The economic effects of malaria eradication: Evidence of an intervention in Uganda. 2011. Barofsky et al. Program on the Global Demography of Aging. PDGA Working Paper No. 70, Harvard.

³ Steinhardt LC, Adoke Y, Nasr S, Wiegand RE, Rubahika D, Serwanga A, Wanzira H, Lavoy G, Kamya M, Dorsey G, Filler S: The effect of indoor residual spraying on malaria and anaemia in a high transmission area of northern Uganda. *Am Trop Med Hyg* 2013, 88:855-861 doi:10.4269/ajtmh.12-0747.

An Integrated Vector Management TWG chaired by PMI supports IRS efforts in Uganda, and works with the NMCP to review and develop national malaria surveillance and control strategies.

Progress during the last 12-18 months

In 2017, IRS was conducted in Budaka, Bugiri, Butaleja, Namutumba, Kibuku, Lira, Pallisa, Serere, and Tororo districts in two phases from May 2 to August 19. Overall, PMI sprayed 892,217 houses, achieving a coverage rate of 95 percent and protecting 3,322,222 people; a moderate increase on 2016 levels (Table 13). The long-lasting organophosphate insecticide, Actellic CS, was used in all nine districts. The current average residual efficacy for Actellic CS is close to eight months based on 2017 wall bioassays studies.

Table 13: PMI-supported IRS activities 2016 – 2020

Calendar Year	Number of Districts Sprayed	Insecticide Used	Number of Structures Sprayed	Coverage Rate (%)	Population Protected
2016	9	8 Organophosphate, 1 Carbamate	863,983	96	2,976,779
2017	9	Organophosphate	892,217	95	3,322,222
2018 ¹	10 ²	Organophosphate	900,000	95+	~3,300,000
2019 ¹	10	TBD long-lasting non pyrethroid	900,000	95+	~3,300,000
2020 ¹	10	TBD long-lasting non pyrethroid	900,000	95+	~3,300,000

¹ Represents targets based on the 2018 IRS work plan, and/or projected targets based on national strategic plan and/or discussions with the NMCP.

² Increase from 9 districts to 10 districts reflects district restructuring which created two districts out of the existing Pallisa district. No overall geographic expansion of activities occurred.

DFID funded PMI to continue to spray five contiguous districts (Alebtong, Dokolo, Amolatar, Kaberamaido, and Otuke) in 2017, covering 333,427 structures and protecting 905,014 more people with Actellic CS. No districts were sprayed with support from GoU or Global Fund in the past 12 months.

Overall, 3,940 people were trained to conduct IRS operations in 2017, including spray operators, mobilizers, storekeepers, supervisors, wash people, and data clerks. Of those trained, 37 percent were female, which is an increase of 8 percent from the 2016 campaign as PMI continues to focus on gender equity in its programs.

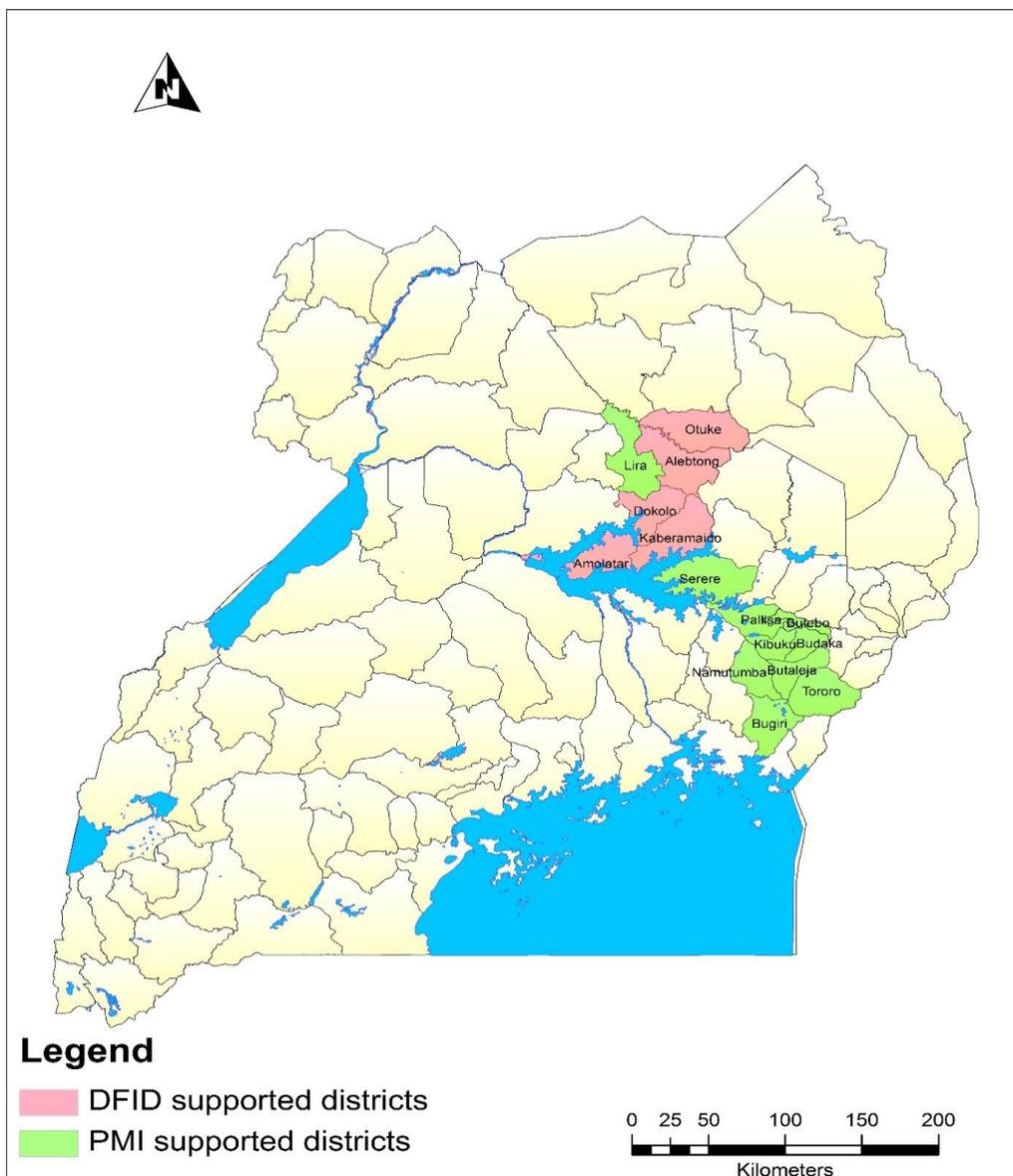
Implementation challenges in 2017 included a delay in the arrival of the insecticide, which resulted in a three-week delay of the second phase of the spray campaign. In addition, refusals due to misconceptions around IRS, including the belief that it increases bed bugs were present in three districts in particular. There were also misconceptions about the interaction of IRS and organic farming leading to resistance to IRS in two organic farming districts. These misconceptions still exist in places but are being successfully addressed through SBCC messages and dialogues with local leaders.

In 2018, PMI will spray 10 districts (formerly nine districts, however, one district was split into two prior to the spray campaign) with the organophosphate Actellic CS in two phases from April-July, targeting approximately 900,000 structures and 3.3 million people. In addition, PMI continued to receive DFID funding in 2018 to support the spraying of the same five contiguous districts.

PMI is working closely with existing IRS districts to develop a transition strategy to prepare for the undetermined time when IRS is withdrawn. A meeting in 2017 between the NMCP and stakeholders reviewed best practices and needed actions before exiting IRS from an IRS zone, and district sustainability plans are being drafted in each of the 15 supported districts. In addition, a Gates-funded OR study is currently ongoing in Katakwi, which is looking at whether proactive community case management (ProACT) as compared to iCCM can maintain the gains achieved post-IRS and mass drug administration (MDA). Results from this study are expected to inform any future PMI withdrawal strategy.

In the face of newly available insecticides, increasing public discourse from political, economic, and social actors on the need for IRS, and the potential for a change in DFID support for malaria in the next five years, PMI will work with the NMCP and other stakeholders to plan for a two-day symposium on mid-term and long-term plans for Uganda’s vector control activities.

Figure 9. Map showing PMI and DFID-funded IRS operations in the Mid-North Sub-Region and Eastern Region of Uganda



Plans and justification for proposed activities with FY 2019 funding

With FY 2019 funds, PMI will continue to support the NMCP to implement IRS in 10 high-burden districts in Uganda, targeting approximately 900,000 structures and 3.3 million people to further drive down parasitemia rates. DFID support for IRS will be gradually phased out prior to their withdrawal from bilateral funding in 2021. PMI will ensure the withdrawal of IRS in some districts will be evidence-based, not donor-based. Through DFID support, a third-party assessment will be conducted in current IRS districts to, in part, determine which districts are ready for IRS withdrawal. PMI believes it is essential to replace one form of effective vector control with another, and thus will work with other partners to ensure next-generation ITNs are distributed in the areas where IRS is withdrawn to the greatest extent possible. To prepare for the removal of IRS, PMI will also work with other partners to ensure adequate stocks of ACTs and RDTs are in place, intensify iCCM efforts, strengthen MIP, and conduct SBCC and epidemic surveillance. Geographically, PMI and DFID-funded districts connect Lira and Tororo, which make a northwestern to southeastern transect forming an IRS corridor targeting high-burden districts (Figure 9). With FY 2019 funds, PMI will continue to spray a long-lasting non-pyrethroid insecticide, and plans to implement an insecticide rotation policy with any WHO-recommended insecticide on the market at that time to mitigate insecticide resistance.

PMI is currently participating in the UNITAID-sponsored Next Generation Indoor Residual Spraying Project (NGenIRS). Uganda received NGenIRS support in 2017 and 2018, which reduced the cost of insecticides procured and enabled an expansion of long-lasting IRS insecticides. NGenIRS is scheduled to conclude in 2019 and thus participation in NGenIRS is not included in this MOP.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.

2. Malaria in pregnancy

NMCP/PMI objectives

- Ensure every pregnant woman sleeps under an ITN throughout her pregnancy and thereafter
- Ensure pregnant women receive a minimum of three IPTp doses
- Ensure pregnant women receive early diagnosis and prompt management of malaria episodes with an appropriate antimalarial medicine

MIP significantly increases the risk of maternal anemia, miscarriage, stillbirth, prematurity, and low birth-weight babies. The 2011 National Malaria Control Policy calls for all pregnant women to have access to cost-effective preventive interventions including ITNs and IPTp and those with fever shall receive prompt diagnosis and effective case management. In 2011, nearly 250,000 pregnant women in Uganda contracted malaria. As a result, the GoU launched an addendum to the country's national malaria policy. With PMI support, the addendum to the country's national policy on malaria was adopted in 2014, which is in line with the WHO 2012 recommendations for provision of MIP:

- Three or more SP doses for IPTp-SP in DOT as early as the 2nd trimester (after 12 weeks gestation); subsequent doses should be given at each scheduled visit up to delivery (40 weeks)
- Administration of 0.4 mg folic acid; guidelines state that IPTp-SP should not be given with high-dose folic acid (daily doses of ≥ 5 mg), but shall be given in low-dose folate (<5 mg daily)
- NMCP and the Reproductive Health Division (RHD) promote implementation of the addendum

The current policy guidelines direct health providers to give one ITN to every pregnant woman during the first ANC visit (or later if she has not yet received one) and advise pregnant women to sleep under ITNs as early as possible in pregnancy and continue to remind them during subsequent ANC visits.

The policy addendum recommends quinine together with clindamycin (if available) for uncomplicated MIP during the first trimester. WHO is expected to communicate its recommendation of ACT use in the first trimester and the national guidelines update will follow this communication. ACT is recommended for the second and third trimesters for uncomplicated MIP as first-line treatment and quinine is an alternative. For severe MIP, intravenous artesunate is recommended as first-line treatment and quinine as the alternative. All MIP cases are recorded in ANC registers, summarized in HMIS 105, and reported through DHIS2.

There is a national multi-stakeholder MIP TWG which feeds into the Malaria Case Management TWG and MCH cluster meetings. Both NMCP and RHD technical teams participate in the TWG meetings. Using the prevention of mother-to-child transmission forum, prevention of MIP has been integrated into HIV interventions such as mentor mothers, Family Support groups and patient care, counselling and follow up. This integration includes a tuberculosis (TB) assessment using the TB intensified case finding tool and follow up of pregnant mothers with TB through the DOTS program. Nutritional assessment and counselling is integrated into the MIP programs at all levels. The MIP guidelines have recommendations for management of HIV-positive pregnant women with IPTp-SP, if they are not taking cotrimoxazole.

Progress since PMI was launched

PMI supports strengthening and expanding preventive activities for MIP as part of a partnership among NMCP, RHD, and MCH programs. PMI also supports strengthening the ANC delivery platform to fully implement SBCC activities to improve the uptake of IPTp and ITNs by pregnant women and for early diagnosis and treatment when they are febrile, along with the implementation of supportive supervision. The percent of pregnant women who slept under an ITN the previous night has increased from 10 percent to 64 percent in 2006 and 2016 DHS, respectively.

Since 2006, PMI has supported the development of a comprehensive MIP training module that was incorporated into the ANC training. PMI has also supported training and on-the-job supervision of 25,103 health workers on IPTp. Additionally, PMI has provided job aids such as pregnancy wall charts and gestational wheels in all facilities providing ANC, and supported the adoption of a MoH nationwide advocacy plan for IPTp and supported dissemination in 47 districts.

PMI has purchased and distributed 171,033 and 107,270 SP treatments, respectively, since the start of PMI for use previously in public and recently in PNFP facilities. The GoU has taken over responsibility for supplying SP to all public health facilities in the country; however, frequent stockouts have impaired the performance of IPTp. A midterm review of the national malaria reduction strategic plan indicated that SP is not a free commodity like ACTs, forcing facilities to use their limited credit line to procure SP. This has led to stockouts of SP in some facilities, as they do not often prioritize SP in their orders. PNFP facilities do not regularly receive SP from the government, and have no incentive to procure SP given their limited budget.

Since 2006, PMI has leveraged MCH and reproductive health activities through collaboration with PEPFAR. For example, PMI focused on integrating IPTp services with prevention of mother-to-child transmission services offered through ANC services at public and private facilities. PMI continues to provide safe water and drinking cups for DOT. ANC attendance by pregnant women in Uganda was

high, according to the 2016 DHS results, which showed that 97 percent of pregnant women made at least one ANC visit, and 60 percent made four or more visits.

Despite the high ANC attendance rates reported in the 2016 DHS, there still remains a large gap in IPTp uptake, (45 percent of women ages 15-49 received 2+ doses of IPT during an ANC visit, DHS 2016). The most likely cause of this gap may be due to the frequent SP stockouts resulting in missed opportunities for IPTp. PMI procured 250,000 treatment doses of IPTp-SP in 2017 as a short-term solution while continuing to advocate that the GoU ensure full availability of this commodity in the future to ensure IPTp efforts are successful. With PMI support, the NMCP recently quantified IPTp-SP needs and prepared a comprehensive malaria commodity plan for the next three years that facilitates implementation of the new IPTp3+ policy. As part of this plan, SP is budgeted for and procured at the national level rather than as a commodity that health facilities take out of their individual budgets. While under the old system facilities were not prioritizing SP leading to stockouts, this new policy is expected to allow for a consistent supply of SP to facilities and therefore additional SP procurement with PMI funds is not required.

Progress during the last 12-18 months

Through PMI support, the NMCP and RHD were able to facilitate the MIP TWG to advocate for: 1) revising, updating, and dissemination of the ANC guidelines; 2) the training of newly recruited staff and retraining of health workers at all levels on the WHO 2012 recommendations for provision of MIP; 3) regular supportive supervision at all levels; and 4) ensuring that 0.4mg folic acid and 30-60mg iron are included in the essential medicine lists to be procured and distributed by GoU/MoH to ANC facilities. The country adopted the 2012 WHO IPTp policy recommendations in 2014 through an addendum to the MIP policy in 2015. Through PMI support, the addendum was reproduced, disseminated, and distributed throughout the country in 2017/18.

PMI facilitated the dissemination of the updated MIP guidelines in 47 focus districts, provided 82 percent of 1,325 targeted health facilities supportive supervision, and mentored 9,842 (target 9,000) health workers. Health workers were trained in the new guidelines by cascade through training-of-trainers by the NMCP and DHMTs. Instructive circulars from senior MoH leadership were sent to all district health officers for on-site mentorship of health workers. These are being reinforced through IMM mentorship and MIP grand rounds for regional referral hospitals and high-volume health facilities. The main challenge to updating data tools (registers and monthly summaries) has been met as recently DHIS2 was reconfigured to capture IPTp3+.

The MoH is currently in the process of revising the ANC guidelines to adopt the 2016 WHO ANC recommendations for positive pregnancy outcomes. With PMI support, the revision is in an advanced stage and should be available for dissemination by early 2019. The 2011 National Malaria Control Policy has also started to be updated and should be available for dissemination by mid-2019.

In 2017, PMI procured 250,000 treatment doses of SP as a buffer to cover the gap in public and PNFP facilities, while continuing to engage GoU regarding its commitment to supply SP to both public and PNFP facilities. As the results of these efforts, the IPTp3+ coverage, in PMI focus districts, has increased from 4 percent in October 2017 to 15 percent in March 2018 (DHIS2).

In 2017, PMI supported the NMCP in the quantification of essential MIP commodities for appropriate stock management through providing 378 MIP supportive supervision visits and mentoring 1,516 health workers. PMI in collaboration with the NMCP and RHD conducted MIP pharmaceutical and commodity supplies data collection to drive a national MIP commodity quantification and plan. The data was

collected from the DHIS2, district reports, and health facility population reports. The information collected includes consumption data for SP, folic acid, projected pregnancies over the next year, and ANC 1-4 use data. PMI is advocating, through the commodity security group, for the inclusion of MIP commodities (SP and 0.4mg folic acid) to the essential medicines and health supplies list. PMI continues to actively promote IPTp in public and private facilities by giving updates from the EUV survey findings and continuously sharing stock status updates.

PMI also supported DHMTs to coordinate and facilitate the redistribution of SP from overstocked to understocked districts as a stopgap measure while building facilities' capacity for monitoring consumption and placing correct orders as well as supporting districts to carry out redistribution as necessary. In addition, PMI supports the DHMTs and health facilities to send SMS reminders to 298 pregnant mothers who did not complete their IPTp regimen; 347 health workers in 178 facilities were trained to remind and follow up with mothers.

In collaboration with partners including PMI, the NMCP carried out a midterm review of the UMRSP 2014-2020 in October/November 2017. The review identified several opportunities including the availability of recently approved and disseminated MIP policies and guidelines and the existing health service delivery system that provides a platform for provision of MIP services in Uganda.

The midterm review highlighted some challenges with MIP:

- While SP is readily available at NMS, it is not a free commodity like ACTs forcing facilities to use their limited credit line to procure SP. This has led to stockouts of SP in some facilities, as they do not often prioritize SP in their orders.
- The wide gap between ANC attendance and IPTp doses, resulting in missed opportunities to provide SP, as well as pregnant women attending first ANC late.
- While guidelines for MIP have been updated, their dissemination is limited across the health service levels.

The midterm review recommended that, as part of MAAM, VHTs, community leaders, and spouses should mobilize and sensitize pregnant women to attend ANC as scheduled, the GoU should provide SP as a free commodity like ACTs to eliminate stockouts, NMCP should complete dissemination of MIP guidelines and job aids to all health workers in the country, and local governments should monitor and respond to stock outs of SP with the same priority as is given to ACTs and RDTs.

Table 14. Status of IPTp policy in Uganda

PMI and Beneficiaries	Status of training on updated IPTp policy			Updated IPTp guidelines available at the facility level?	ANC register updated to capture 3 doses of IPTp-SP?	HMIS/DHIS2 updated to capture 3 doses of IPTp-SP?
	Completion Status	Completion Date	# or % health workers trained on new policy			
PMI Focus Districts	Training completed; supportive supervision ongoing	July 2017, supportive supervision ongoing	9,842 health workers mentored; supportive supervision ongoing in 82% of health facilities	Yes	In progress	DHIS2 database reconfigured to accept IPTp3+ ; reporting from health facility to districts still improvised
PMI: MIP Grand rounds conducted at 7 regional referral hospitals and Nurses and Midwives Training School	Complete	March 2018	1,985 health workers, including student nurses and midwives	Yes	In progress	DHIS2 database reconfigured to accept IPTp3+ ; reporting from health facility to districts still improvised
PMI in North- Acholi	In progress; 7 facilities reached via on site mentorship	NA	18 health workers supported at site level through on site mentorship	Yes	In progress	DHIS2 database reconfigured to accept IPTp3+ ; reporting from health facility to districts still improvised
PMI in North-Lango	Not yet started	NA	NA	NA	In progress	DHIS2 reconfigured to accept IPTp3+
PMI- East Uganda	In progress; complete in 20/25 districts	NA	1,927 health workers	Yes	In progress	DHIS2 reconfigure to accept IPTp3+
PMI- East Central	In progress; rolled out in 11 districts	NA	590	Yes	In progress	DHIS2 reconfigure to accept IPTp3+
PMI-South West	In progress	NA	588 midwives trained (75%)	20% ANC sites have copies of latest guidelines; all 16 district health offices have hard copy of policy	No. Health workers record in the register using codes- 3,4,5 to for the extra IPTp dose given	DHIS2 reconfigure to accept IPTp3+

Commodity gap analysis

Table 15. SP Gap analysis for MIP

Calendar Year	2018	2019	2020
Total Population	38,981,604	40,151,052	41,355,583
SP Needs			
Total number of pregnant women attending ANC	1,949,080	2,007,553	2,067,779
Coverage target by year based on the National Strategic Plan	98%	99%	100%
Number of pregnant women to be targeted annually	1,910,099	1,987,477	2,067,779
Total SP Need (in treatments)	5,730,296	5,962,431	6,203,338
Partner Contributions			
SP carried over from previous year	46,667	0	0
SP from GoU	5,433,629	5,962,431	6,203,338
SP from Global Fund	0	0	0
SP planned with PMI funding	250,000	0	0
Total SP Available	5,730,296	5,962,431	6,203,338
Total SP Surplus (Gap)	0	0	0

¹ UBOS census report 2014, growth rate of 3%

² 5% of the population is made up of pregnant women (2016 UDHS report).

³ UDHS 2016 reports ANC coverage at 97% with a 1% annual percentage point increase since 2006; this has been assumed to continue over the years

⁴ IPTp3, an average of 3 doses are given to a pregnant mother with 1 month between the doses until delivery (Addendum to the Uganda National MIP Policy Guidelines 2015)

⁵ Obtained from NMS December 2017 stock status Report

⁶ Assumed that GoU meet 100% need for SP for the National Need

⁷ PMI funded SP in FY18 (COP 17) i.e. 250,000 doses. These are expected in August 2018 and will be utilized in both PNFP and Public sector facilities

Plans and justification for proposed activities with FY 2019 funding

With FY 2019 funds, PMI will continue to provide assistance in strengthening the MoH's capacity to coordinate and implement MIP activities, including supporting the full implementation of the revised MIP policies in all ANC facilities and support for the MIP TWG. With PMI support, NMCP/DHMTs will continue to train health workers in the 47 PMI focus districts in the newly developed MIP policy documents. There will also be a renewed focus on strengthening health worker performance related to MIP as a comprehensive component of ANC services. This includes providing supportive supervision specifically for MIP, and integrating MIP trainings with other programs (MCH, HIV, etc.). PMI will also continue to invest in data quality and management improvement activities to help address issues with data accuracy and management.

With FY 2019 funds, PMI will continue to: 1) strengthen the delivery of MIP services, increasing ITN use, IPTp uptake, and early diagnosis and treatment in public and private sectors; 2) coordinate with the NMCP/DHMTs to bring onboard all RBM partners to fully adopt and implement the 2016 WHO ANC recommendations for positive pregnancy outcomes; and 3) support the update and dissemination of the National Malaria Control Policy 2011.

PMI will support the NMCP and DHMTs to continue ensuring the correct dose of 0.4mg folic acid and 30-60mg iron supplements procured and distributed by GoU/MoH, and promote the recommended dosage by pregnant women at ANC clinics. The MoH is expected to procure and distribute the required quantity of SP, folic acid, and iron supplementation for 2020. This drug is included in the list of the MoH's supply of essential medicines and PMI will support the NMCP to advocate that 0.4mg of folic acid is available as a stand-alone drug for those who may not require the combined iron folate tablet.

The NMCP has recently initiated a plan in which SP is budgeted for and procured at the national level, rather than as a commodity that health facilities take out of their individual budgets, which is expected to increase the supply of SP to facilities to adequate levels.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.

3. Case management

NMCP/PMI objectives

The UMRSP objective for case management is that by 2020 at least 90 percent of malaria cases in public and private sectors and at the community level receive prompt diagnosis and treatment. The following are the main areas identified in the UMRSP to improve malaria case management:

1. Rapidly scale-up the test, treat, and track initiative to ensure early detection, prompt treatment with effective drugs and ensure that a good surveillance and reporting system is available for accurate reporting of cases and measuring disease burden
2. Roll out iCCM to all villages across the country in a phased manner
3. Ensure consistent and sustainable supply and access to all malaria commodities at all levels including the community
4. Strengthen support supervision and clinical audits to address issues of adherence to policies and guidelines, quality assurance for diagnostics to all districts
5. Conduct therapeutic efficacy studies to continuously monitor ACT efficacy to better manage treatment failures and drug resistance
6. Strengthen referral systems from lower levels, community, and private sector to improve management of severe malaria
7. Provide free or highly subsidized ACTs and RDTs to the private sector

Parasite-based diagnosis with RDTs or microscopy is prioritized in all health facilities and at the community level through iCCM for children under five years of age. Microscopy remains the “gold standard” for malaria diagnosis at level III HCs and above, while RDTs are used in level II HCs and below, and whenever microscopy is not possible. The responsibility for the coordination, monitoring, and supervision of all HC III and IV laboratories resides with the Central Public Health Laboratory and Uganda National Health Laboratory Services.

Malaria microscopy external quality assurance (EQA) activities are based on the approved National QA Manual. EQA involves cross-checking of blood slides by expert microscopists with proven competency. QA of RDTs is done through RDT field stability monitoring to assess any detrition of RDT performance under field conditions. Field stability monitoring is overseen by a highly qualified laboratory technician, identified in collaboration with the Central Public Health Laboratory, National Health Laboratory Services, and the NMCP.

In line with WHO recommendations and as a means of ensuring that the national policy for the recommended first-line drugs are appropriate, the UMRSP provides strategic guidance for studies to routinely monitor ACT efficacy. Current first-line drugs for uncomplicated malaria are artemether/lumefantrine (AL) and artesunate/amodiaquine (AS/AQ), while the second-line is dihydroartemisinin piperazine (DP).

The GoU recognizes the importance of the community's participation; The Health Sector Strategic Plan 2015-2020 adopted VHTs to promote the health and wellbeing of all village members and reduce the continuing gap in health service provision between households and health providers. VHT members each serve approximately 25-30 households within their communities and receive minor incentives, such as official recognition at local events, transportation refunds, etc. VHTs provide iCCM at the village level after receiving a six-day training on management and referral of children under five years of age. The new cadre of CHEWs, once functional, will supervise and support VHTs, including in the implementation of iCCM. VHT reporting was recently integrated into the DHIS2 system, which occurs on a quarterly basis through the health facilities they are attached to. MoH and partners are currently reviewing the HMIS tools, including the VHT register and reporting forms to capture more data elements on community health services, including malaria. The revised reporting tools are expected to be in use in 2019.

According to the MoH annual health sector performance report 2016/2017, Uganda has 45,029 health workers. A total of 36,757 health workers are deployed at district and service delivery levels. The MoH 2012 Health Facility Inventory also shows that there are approximately 5,229 health facilities in Uganda. The public sector owns more than half (55 percent) while the private sector, including PNFP and private-for-profit (PFP), owns and manages 45 percent of all health facilities. With a large proportion (40-60 percent) of febrile patients, seeking care in the private sector there is a need for more evidence on how to increase access to and demand for high-quality fever case management services in the private sector with malaria RDTs.¹

PMI's overall strategy for supporting case management in the private sector is based on the NMCP's national malaria control policy that supports private sector engagement for optimized coverage and quality of malaria case management activities. The GoU recognizes the importance of the private sector and provides a subsidy to PNFP facilities, some private hospitals, and PNFP training institutions with grants to cover commodities and human resources. PMI has been supporting all 646 PNFP facilities in Uganda by providing training in case management, as well as procuring and distributing malaria commodities through the JMS. PMI will continue this support while the Global Fund will continue to subsidize ACTs for the PFP sector through a co-payment mechanism negotiated with ACT manufacturers. In collaboration with PMI and other partners, the NMCP is currently updating its malaria control policy, which will include an updated strategy for supporting case management in the private sector (PNFP and PFP). This will guide PMI's efforts to maximize synergy and impact in collaboration with other actors

¹ McCombie SC (1996) "Treatment seeking for malaria: A review of recent research." *Social Science & Medicine* 43:6: 933-945

Table 16. Status of case management policy in Uganda

Status of Case Management Policy in Uganda according to National Malaria Control Policy 2011		Currently implemented (yes/no)? Plans to modify recommendations?
What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria*?	AL is first-line treatment and AS/AQ is the alternative	Yes. Although the policy is currently under review, there are no plans to modify.
What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria*?	Dihydroartemisinin Piperaquine (DHA-PQ)	Yes. Although the policy is currently under review, there are no plans to modify.
What is the first-line treatment for severe malaria?	Intravenous Artesunate is the first-line treatment and IV Quinine or IM Artemether are the alternatives to be used when IV Artesunate is not available.	Yes. Although the policy is currently under review, there are no plans to modify
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester*?	Quinine	Yes. The policy is currently under review and there are plans to modify to AL.
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters*?	AL	Yes. Although the policy is currently under review, there are no plans to modify.
In pregnancy, what is the first-line treatment for severe malaria?	Intravenous Artesunate	Yes. Although the policy is currently under review, there are no plans to modify.
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	Pre-referral treatment is recommended at peripheral health facilities Rectal Artesunate	There are no plans to modify the recommendation
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	Pre-referral treatment is recommended for community health workers Rectal Artesunate	There are no plans to modify the recommendation
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years)	Rectal artesunate is recommended for children under 6 years of age	Policy is currently under review, and any revisions will follow international guidelines

Progress since PMI was launched

PMI has invested in the training and supervision of health workers on malaria diagnosis and treatment, procurement of RDTs, ACTs, artesunate, and drug quality testing to improve malaria case management in Uganda. Since 2006, PMI purchased more than 12.4 million ACT treatments, 8.1 million RDTs, and 2 million injectable artesunate treatments. PMI has supported the rollout and use of RDTs in health facilities without laboratory services, microscopy training at health facilities with laboratory services, and both types of diagnostic tests to facilities with limited laboratory services. PMI has trained a total of 46,477 health workers in ACT use and 18,435 in malaria diagnosis since 2006.¹ This training includes health workers working in the private sector. In Uganda, on average more than 85 percent of public and PNFPs have benefited from PMI-supported training for case management since 2006.

To improve access to diagnosis and treatment of malaria, Uganda has developed considerable experience in using iCCM, which was first implemented in nine districts of the Mid-West Region in 2009 with funding from the Canadian International Development Agency. In 2010, Uganda adopted an iCCM strategy that indicates that two of the five VHT members are responsible for diagnosis and treatment of common childhood illnesses (malaria, pneumonia, and diarrhea). Partners that support iCCM are responsible for supporting supervision of VHTs through staff from the nearest health facility. VHT-collected data are reported to the supporting health facility and captured through the HMIS. Several partners have scaled up iCCM over the past eight years. However, the roll out and scale-up has been piecemeal based on the availability of funding. So far, approximately 58 percent of villages (approximately 35,000 villages) have benefited from some level of iCCM implementation. An evaluation from Uganda found that districts with iCCM experienced a 21 percent increase in care-seeking for fever compared with districts without an iCCM policy in place.

The current goal for iCCM is to ensure quality and complete services targeting children under age five in all villages already covered, and to cover a gap of approximately 25,000 villages. The GoU plans to train two VHTs per village in addition to developing a CHEW model, which is likely to be implemented in the coming few years. Under this model, CHEWs will be positioned at the parish level and will have conventional health posts. The MoH plans to train 4,500 CHEWs by 2019, and an additional 10,500 CHEWs by 2021, totaling 15,000 CHEWs in four years. A CHEW will supervise approximately 10-20 VHTs and be responsible for about 500-1,000 households and 2,500-5,000 people. By 2022, it is expected that every village (approximately 60,000 villages) in Uganda will have at least 1-2 VHTs and every parish will have at least 1-2 CHEWs.

VHTs will be supplied with commodities by the nearest health facility located within their respective catchment areas. In other words, the health facilities that supervise and monitor the iCCM activities will also supply and monitor ACT, RDT, and rectal artesunate stocks at the community level. PMI will work closely with the NMCP to monitor the scale up of iCCM and its impact on commodities and will be ready to increase its support for RDT procurement (and/or work with other donors to adjust procurements) if the needs are greater than planned contributions.

Uganda has monitored first-line antimalarials since 2001, and PMI has supported this work since 2006. Studies conducted in 2006 and 2009 compared AL, AS/AQ, and DP. The most recent PMI-funded therapeutic efficacy study (TES) from 2014 comparing AS/AQ and AL in Apac, Mubende, and Kanungu found that both ACT regimens were efficacious in treating uncomplicated malaria, with AS/AQ treatment

¹ PMI Twelfth Annual Report to Congress, April 2018

being associated with a slightly lower risk of recurrent parasitemia than AL treatment.¹ Discussions regarding updating the NMCP policy in response to the lower rates of recurrent parasitemia with ASAQ and DP are ongoing. However, a final conclusion has not yet been reached and it is expected that the results of the upcoming TES will provide additional data to inform a decision.

Starting in 2011, PMI supported training of private health practitioners in the revised antimalarial drug policy. This training is often integrated with sessions on HIV/AIDS, family planning, and child survival. In addition, PMI has supported small-to-medium-sized private clinics (approximately 266) and has worked with large private corporations to leverage additional funds for malaria control through their corporate social responsibility programs. These private clinics are located in all geographical zones of the country. Large private corporations such as Kampala Pharmaceuticals Industries, Norvik Pharmaceuticals, Coca Cola, and Vestergaard have provided antimalarials, RDTs, and ITNs, respectively. PMI support mainly includes technical assistance through onsite mentorships and focused classroom trainings on topics such as integrated management of childhood illness and building capacity in logistics and supply chain for malaria commodities. These corporations also provide free or subsidized health services to their employees and surrounding communities. PMI has worked with these businesses on a cost-sharing basis for ITNs, IPTp, and laboratory diagnostics. The NMCP also provides refresher trainings in case management and diagnostics with support from PMI. In turn, clinical audit approaches have been adopted to promote high quality and operational efficiency at all levels of health service provision.

Progress during the last 12-18 months

In FY 2017, PMI procured 947,600 RDTs, 2.7 million ACT treatments, and 585,384 artesunate injections. PMI continued supporting the printing and dissemination of the approved national IMM training manual, the parasite-based diagnosis guidelines, and training guidelines for malaria diagnosis and diagnosis QA in line with the ongoing updating of the national malaria control treatment policy 2011. QA measures are implemented throughout the malaria testing process, prior to performing the test, while conducting the test, and after completing the test, to assure accurate and reliable test results. A number of meetings with Central Public Health Laboratory and the NMCP were carried out to implement the recently approved QA manual in malaria diagnostics. The manual encompasses retraining, validation, and the development of competency standards designed to ensure the quality of diagnosis necessary for a successful malaria program. PMI has carried out 7 quality assurance cycles in 200 facilities and the quality of malaria diagnosis has improved from a discordance rate of 12.2 percent to 5.7 percent. According to the DHIS2, in PMI focus districts, the proportion of malaria suspected cases tested for malaria before treatment has increased from 61 percent (January 2017) to 88 percent (March 2018); and the proportion of tested negative for malaria but receiving antimalarial medicine has reduced from 51 percent (April 2017) to 16 percent (March 2018).

The PMI-supported 2016/17 health facility assessment, which was conducted in 1,406 public and PNFP facilities, informed the direction of future case management investments in ensuring high-quality malaria services in health facilities at all levels, but with particular consideration to lower levels. In general, the assessment recommends an uninterrupted supply of malaria commodities, relevant equipment, trained human resources, and systems for provision of appropriate services in PMI focus districts. The program trained 5,613 health workers (5,000 targeted) in IMM over the past 3-6 months. In addition, PMI

¹ Adoke Yeka, Ruth Kigozi, Melissa D. Conrad, Myers Lugenwa, Peter Okui, Charles Katureebe, Kassahun Belay, Bryan K. Kapella, Michelle A. Chang, Moses R. Kanya, Sarah G. Staedke, Grant Dorsey, and Philip J. Rosenthal.

“Artesunate/Amodiaquine Versus Artemether/ Lumefantrine for the Treatment of Uncomplicated Malaria in Uganda: A Randomized Trial,” The Journal of Infectious Diseases 2016 Apr 1;213(7):1134-42.

conducted malaria diagnosis EQA training of 200 laboratory personnel (300 targeted). The IMM curriculum includes management of uncomplicated and severe malaria, management of MIP, and parasite-based diagnosis with RDTs or microscopy, including how to manage a patient with fever and a negative RDT or microscopy result. PMI provided supportive supervision to 4,528 health workers including 485 laboratory personnel. No PMI-supported iCCM occurred in the past 12-18 months; however, PMI has analyzed relevant datasets in its focus districts and also conducted a literature review of iCCM implementation in 20 countries (17 in Africa, 2 in Asia, and 1 in South America) to determine the optimal locations to begin implementation of iCCM using VHTs in the next 6-12 months. So far, PMI has trained 200 district trainers who will in turn train 586 health workers in 293 health facilities to cascade training and QA to 9,581 VHTs for iCCM implementation in 5,181 villages across 11 districts, with iCCM implementation expected to begin in the next few months. The trained health workers will be responsible for providing supportive supervision and identified facilities will be referral sites for VHTs trained in the 11 districts.

Results from other actors that supported TES in 2016 (in press) showed that AL and DHA-PQ are still effective for the treatment of uncomplicated malaria. The risk of recurrent parasitemia was lower in the DHA-PQ arm compared to AL at Arua (40 percent vs 17 percent; $p < 0.001$), Mbale (34.5 percent vs 23.6 percent; $p < 0.02$) and Gulu (70 percent vs 37.1 percent; $p < 0.001$). Recrudescence infections were uncommon in both the AL and DHA-PQ arms at Arua (0 percent vs 1.1 percent; $p=0.79$), Mbale (2.3 percent vs 1.2 percent; $p=0.45$) and Gulu (5.1 percent vs 1.1 percent; $p=0.11$). Median parasite clearance was 2.7 hours for both regimens. Neither regimen selected for *pfprt* or *pfmdr1* polymorphisms associated with altered drug sensitivity. The next PMI-funded TES will be conducted in August 2018.

Table 17. PMI-funded TESs

Year	Site name	Treatment arms	Funder	Published/Journals If Yes, please indicate the journals
Completed TES Studies				
2013-14	Apac	AL, AQ+AS	PMI and the Gates Foundation, via WHO	Adoke Yeka et al, AS/AQ vs AL for the Treatment of Uncomplicated Malaria in Uganda: A Randomized Trial. ¹
2013-14	Mubende	AL, AQ+AS		
2013-14	Kanungu	AL, AQ+AS		
Planned TES Studies FY 2018				
2018-19	Busia	AL, DP, AQ+AS	PMI and WHO	To be published
2018-19	Apac	AL, DP, AQ+AS		
2018 -19	Mubende	AL, DP, AQ+AS		
2018-19	Kanungu	AL, DP, AQ+AS		

¹ J Infect Dis. 2016 Apr 1;213(7):1134-42. doi: 10.1093 /infdis /jiv551. Epub 2015 Nov 23.

Commodity gap analysis

Table 18. RDT gap analysis

	2018	2019	2020
RDT Needs			
Total country population ¹	38,981,604	40,151,052	41,355,583
Population at risk for malaria ²	38,981,604	40,151,052	41,355,583
Total Estimate fever episodes ³	65,138,260	67,092,408	69,105,180
Number of fever cases reduced by vector control interventions ⁴	3,256,912	4,025,544	4,146,310
Total Estimate fever episodes after vector reduction ⁵	61,881,347	63,066,863	64,958,869
Percentage of fever cases projected to be tested ⁶	46,411,010	53,606,833	61,710,925
Total number of fever cases in Public + PNFP sector ⁷	33,880,037	39,132,989	45,048,976
Total number of fever cases in Community (iCCM) ⁸	2,320,551	5,360,683	9,256,639
Total Number of Fever cases in Public + PNFP sector + iCCM ⁹	36,200,588	44,493,672	54,305,615
Fever cases tested with an RDT (Public + PNFP sector coverage) ¹⁰	29,645,033	34,241,365	39,417,854
Fever cases tested with an RDT Community (iCCM) ¹¹	2,320,550	5,360,683	9,256,638
Total RDT Needs	31,965,583	39,602,048	48,674,493
Partner Contributions			
Global Fund & GoU - Public Sector Only (Facility-based case management)			
Public Sector Need for RDTs ¹²	26,680,529	30,817,229	35,476,068
RDTs carried over from previous year ¹³	804,000	-	-
RDTs from Government ¹⁴	-	-	-
RDTs from Global Fund ¹⁵	25,861,164	21,618,381	22,625,096
RDTs Available in Public Sector¹⁶	26,665,164	21,618,381	22,625,096
Public Sector RDT Surplus (Gap)¹⁷	(15,366)	(9,198,847)	(12,850,972)
PMI - PNFP Sector Only (Facility-based case management)			
PNFP Sector Need for RDTs ¹⁸	2,964,503	3,424,137	3,941,785
RDTs carried over from previous year ¹⁹	773,050	-	-
RDTs planned with PMI funding ²⁰	1,800,000	2,400,000	2,850,000
RDTs Available in PNFP Sector²¹	2,573,050	2,400,000	2,850,000
PNFP Sector RDT Surplus (Gap)	(391,453)	(1,024,137)	(1,091,785)
Community based management			
Community (iCCM) need for RDTs ²²	2,320,551	5,360,683	9,256,639
RDTs carried over from previous year ²³	-	3,307,252	4,097,352
RDTs from PMI (*)	200,000	500,000	-
RDTs from DFID/UNICEF (*)	1,586,589	1,626,741	1,641,248
RDTs from Malaria Consortium (*)	1,252,570	1,284,269	1,295,722
RDTs from World Vision, Save the Children (*)	334,019	342,472	345,526
RDTs from Global Fund (*)	2,254,626	2,397,302	2,505,063
RDTs Available in Community Management (*)	5,627,803	9,458,035	9,884,911
iCCM RDTs Surplus (Gap)	3,307,252	4,097,352	628,272

	2018	2019	2020
Facility + Community based management (Public + PNFP)			
Total RDT need (Facility + Community)	31,965,583	39,602,048	48,674,493
RDTs carried over from previous year ²⁴	1,577,050	3,307,252	4,097,352
RDTs based on available funding ²⁵	33,288,967	30,169,164	31,262,655
Total RDTs Available²⁶	34,866,017	33,476,417	35,360,007
Total RDT Surplus (Gap)	2,900,434	(6,125,632)	(13,314,486)

Footnotes:

1. Population percentages per age category based on UBOS 2014 Population Projection Trends
2. Assumes 100% at risk due to malaria endemicity
3. Projected number of fever episodes per age group per year (Under 5 yrs (4.3 episodes), 5-9 yrs (2 episodes), 10-14yrs (1 episode) & Above 14yrs (0.5 episodes)
4. Uganda MIS 2014/2015 suggests a 5% annual reduction to vector control between 2009 and 2014 based on parasitemia prevalence rates; this is assumed to increase by 1% per year with increased interventions
5. Total fever episodes after vector control
6. National testing coverage targets as per the UMRSP (75% (2018), 85% (2019) & 95% (2020)
7. Assumes that 55% & 18% of the fever cases will be tested in public and PNFP sector respectively
8. Percentage of fever cases that will be tested in community - 5% iCCM (2018), 10% iCCM (2019), 15% iCCM (2020)
9. Total number of fever cases to be tested in public + PFNP + community
10. Assumes that 87.5% of the fevers in the facilities will be tested using RDTs and 12.5% using microscopy
11. Assumes that 100% of the fevers in the community will be tested using RDTs only
12. Public sector need obtained by subtracting PNFP sector contribution and iCCM from national need
13. January 2018 Beginning stock extracted from pipeline (includes public only; surplus for each year is assumed to be carried forward to the subsequent year
14. GoU currently not procuring RDTs
15. Global fund grant public commitments for the period 2018 to 2020
16. Total public sector commitments + opening stock for RDTs
17. Deficit in 2018 based on current projections + epidemic response
18. PMI is expected to cover the PNFP sector estimated at 10% of the national facility need for RDTs
19. January 2018 Beginning stock extracted from pipeline (includes PNFP sector only); surplus for each year is assumed to be carried forward to the subsequent year
20. PMI MOP 17 (1,800,000) and MOP 18 (2,400,000) commitments for RDTs for the PNFP sector included
21. Total PMI commitments + opening stock for RDTs
22. Percentage coverage in community 10.3% (2018), 12.3% (2019), and 12.1% (2020); 100% of testing in community will be done using RDTs
23. Surplus for each year is assumed to be carried forward to the subsequent year
- *for iCCM (community), commitment to be confirmed
24. January 2018 Beginning stock extracted from pipeline database (includes PNFP + public sector stock); surplus for each year is assumed to be carried forward to the subsequent year
25. Total national commitment for RDTs (facility + community management)
26. RDTs available national (opening stock + commitments)

Table 19. ACT gap analysis

Calendar Year	2018	2019	2020
ACT Needs			
Total country population	38,981,604	40,151,052	41,355,583
Population at risk for malaria	38,981,604	40,151,052	41,355,583
Projected malaria cases ¹	32,474,152	33,485,977	34,737,010
ACT need for Public + PNFP Health Facilities	25,167,468	20,426,446	21,189,576
ACT need for Community Case Management	3,344,838	4,118,775	4,203,178
Total ACT Needs (Public + PNFP + Community)	28,512,305	24,545,221	25,392,754
Contributions - Public Sector Only (Facility based case management)			
Public Sector Need for ACTs	22,650,721	18,383,801	19,070,618
ACTs carried over from previous year	7,943,093	7,147,804	6,167,260
ACTs from Government	1,571,885	1,571,885	1,571,885
ACTs from Global Fund	20,283,547	15,831,373	14,286,848
ACTs Available in Public Sector	29,798,525	24,551,061	22,025,992
Public Sector ACTs Surplus (Gap)	7,147,804	6,167,260	2,955,374
Contributions - PNFP Sector Only (Facility based case management)			
PNFP Sector Need for ACTs	2,516,747	2,042,645	2,118,958
ACTs carried over from previous year	1,655,375	207,702	486,576
ACTs planned with PMI funding	1,475,000	1,875,000	1,168,000
ACTs Available in PNFP Sector	3,130,375	2,082,702	1,654,576
PNFP Sector ACTs Surplus (Gap)	613,629	40,057	(464,382)
Contributions - Community based management			
Community (iCCM) need for ACTs	3,344,838	4,118,775	4,203,178
ACTs carried over from previous year	0	312,734	212,604
ACTs from PMI	125,000	425,000	200,000
ACTs from DFID/UNICEF	1,052,937	1,054,541	928,955
ACTs from Malaria Consortium	831,266	832,532	733,386
ACTs from World Vision, Save the Children	221,671	222,009	195,570
ACTs from Global Fund	1,426,697	1,484,563	1,341,771
ACTs Available in Community Management	3,657,572	4,331,379	3,612,286
iCCM ACTs Surplus (Gap)	312,734	212,604	(590,892)
Total ACTs Available	36,586,472	30,965,142	27,292,854
Total ACT Surplus (Gap)	8,074,166	6,419,921	1,900,100

*The same assumptions are used as in the RDT gap analysis table.

¹Projected number of fever episodes per age group per year (Under 5 yrs (4.3 episodes), 5-9 yrs (2 episodes), 10-14yrs (1 episode), and Above 14yrs (0.5 episodes))

Quantification of microscopes: According to the National Health Laboratory Strategic Plan 2010, the National Health Laboratory, a semi-autonomous agency of the MoH, has been mandated to provide stewardship of health laboratory services as well as specialized testing. The National Health Laboratory has developed mechanisms for equitable distribution of laboratory services provision. Malaria microscopic diagnosis is done from HC level III and above since HC IIIs are required in reporting on number of malaria tests done by microscopy in the bimonthly malaria report. Despite the high preference to use RDTs in-country, it is expected that all health facilities above HC IIIs have functional microscopes and laboratory supplies for microscopic malaria diagnostic as required.

Table 20. Quantification of IV artesunate/IM artemether

			No. of severe cases by year		
			2018	2019	2020
Product	%	Average Vials	1,092,395	1,041,221	930,911
Inj. Artesunate ¹	95	4.5	1,037,775	989,159.51	884,365.36
IV Quinine ²	3	3.0	32,772	31,236.62	27,927.33
IM Artemether ³	2	4.5	21,848	20,824.41	18,618.22

Comment (Ref: Expert opinion NMCP case management team):

1. 95% of severe malaria cases to receive injectable artesunate as preferred 1st line
2. 3% of severe cases intolerant to artesunate to require IV quinine
3. 2% of severe cases will be treated with IM artemether

Quantification of rectal artesunate: Rectal artesunate is used for children under six years of age who present with fever and have any danger signs as pre-referral treatment by VHTs in iCCM sites and in peripheral health facilities (at HC II and sometimes HC III levels). All iCCM sites and HC II facilities need to have access to rectal artesunate. A total of approximately 67,258 VHTs (including 6,363 for the private sector) and 2,331 health workers have been trained across the 71 districts (public sector) and 1,357 health facilities (HC II and III levels) to carry out supportive supervision within their catchment areas. It is expected that an average of 60,000 VHTs trained in iCCM will be available between 2018-2020 and each VHT needs about five doses of 100 mg formulation. The estimated amount of rectal artesunate needed is 300,000 doses of 100 mg formulation each year.

Plans and justification for proposed activities with FY 2019 funding

PMI will work closely with the NMCP to support the scale-up of an appropriate QA/QC system for diagnostics and continue to support strengthening treatment for uncomplicated and severe malaria through training, supportive supervision, clinical audits, and on-the-job mentoring. This will be done in public and private facilities. PMI support will complement Global Fund and PEFPAR funding for general laboratory and microscopy strengthening.

PMI is implementing blind slide cross-checking to address quality of microscopy in line with the approved national QA guidelines. Monthly slide checking will be scaled up with PMI support in 47 districts and will include support to set up regional slide banks and strengthen the national malaria reference laboratory. Highly technical areas such as malaria microscopy strengthening will receive proper oversight from the PMI team to ensure they are implemented correctly, on-time, and well. The district laboratory focal point acts as the slide coordinator, ensuring the transportation of slides from peripheral laboratories and the blinded reading of slides at district laboratory hubs. These individuals also collect all slides that are discordant between two readers for tie breaking by expert slide readers. Lastly, they are also responsible for sharing feedback with the laboratories during the next monthly slide collection/supervision. With EQA being done at the district level, close to laboratories, real-time feedback provided monthly during slide collection at the laboratory level and quarterly at the district level is achievable. This targeted mentorship has helped improve malaria smear quality, staining and personnel accuracy.

PMI will support the scale up of case management activities in a phased approach: QA/QC activities will be implemented in a total of 450 high-volume health facilities in 47 districts and a total of 250 iCCM sites. In FY 2019, PMI is supporting iCCM in 11 PMI focus districts and the procurement of approximately 2.9 million RDTs and 1.4 million ACTs for PNFP facilities. The overall RDT needs in public health facilities and other iCCM activities will be also covered by other major donors (DFID and the Global Fund).

4. Crosscutting and other health systems strengthening

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

a. Pharmaceutical management

NMCP/PMI objectives

Strategic objectives of pharmaceutical management are:

1. Identify needs and plan for needed supplies
2. Procure the most cost-effective drugs in the right quantities
3. Select reliable suppliers of high-quality products
4. Ensure timely delivery
5. Monitor stock movement and stockouts
6. Build capacity through mentorship of health workers in management and use of health commodities

PMI provides strategic guidance and support to strengthen the capacity of the NMCP and pharmacy division for procurement and supply chain management of malaria commodities. The various levels of the supply chain system receive different levels of technical support including identifying commodity gaps as well as completing and reviewing national forecasting of needed supplies to increase availability of malaria commodities. PMI supports the MoH/NMCP to monitor commodity procurement and supply plans between the sectors. PMI provides most of its malaria commodities to PNFP through JMS. There are 646 PNFP and 3,077 public health facilities in the country (JMS and MoH national health facility master list, respectively). The system of JMS to PNFP facilities is a “pull system” where malaria commodities move based on consumption data. In public facilities, NMS uses a “push system” for HC IIIs and IIs, and a pull system based on consumption for HC IVs and hospitals. Therefore, the ordering system in public facilities depends on the level of care and the product. Further, a recently concluded push-pull study revealed that health facilities were capable of requesting/pulling all their commodities. Therefore, the country plans to roll out the pull system at all health facilities in the near future.

In collaboration with malaria stakeholders, PMI supports district health teams to conduct dedicated technical supportive supervision as well as integrated supervision to ensure commodity management at health facilities for public, private, and PNFP sectors. This support introduces mentorship and supervision from locally employed health workers, referred to as medicine management supervisors, using five indicators (dispensing, prescription, store management, stock management, and reporting).

Progress since PMI was launched

Together with PEPFAR and other USG health programs, PMI continues to strengthen the national pharmaceutical management system by improving performance and financial management, strengthening

and clarifying pharmaceutical policy, and increasing the transparency and use of the logistics management information system (LMIS). However, improvements continue, especially in the supply of ACTs and other commodities to districts and lower-level health facilities; according to the NMCP midterm review of 2017, stockout rates for ACTs have reduced from 15 percent in 2013/2014 to 8 percent in 2017.

National ACT supplies have been more stable in the last five years due to procurements from the Global Fund, DFID, and the GoU. The ‘push’ kit introduced by the MoH and the NMS eight years ago has helped to improve stock levels of ACTs routinely available at all lower-level public health facilities. The ‘push’ kit, however, does not take into account the actual needs of individual health facilities, particularly in the case of the upsurge in malaria cases the country recently experienced, thus some facilities have stockouts while others are oversupplied. Efforts have been made by the districts, MoH, and PMI to redistribute supplies in these cases as well as document the under- and over-supply of ACTs to assist the central commodity store in revising the contents of the kits.

Uganda’s National Drug Authority conducts quality control at ports of entry as well as post-marketing surveillance. Multiple partners provide support including the Global Fund and PMI through a wider USG partnership. There is no official communication from the authority through their post-market surveillance system that confirms or alludes to any poor-quality antimalarials in the Uganda market at this time.

The National Pharmaceutical Sector Strategic Plan 2015-2020 and the National Medicines Policy, updated in July 2015, address the medicine supply chain, financing, pricing, and appropriate use of medicines in Uganda. This package will be used to advocate the Ministry of Finance and Economic Development, the MoH, and Parliament for increased financial commitments from the GoU to ensure that essential health commodities are accessible to all Ugandans. The policy is expected to provide a sustainable platform for accessing high-quality medicines.

Progress during the last 12-18 months

PMI provided technical assistance to the NMCP, district health teams, and facilities to improve supply chain management and develop accurate stock inventories of AL, RDTs, SP, ITNs, and severe malaria drugs. In the past 12-18 months, progress continued stabilizing supplies of malaria commodities at PMI-supported health facilities and improving stock management and reporting.

PMI supports biannual EUV surveys. The most recent survey was conducted in January 2018 in 75 randomly selected facilities in 15 districts, of which 59 were public and 16 were PNFs. Health facilities were selected using a multistage random sampling process. Findings from the EUV show that the percentage of malaria cases (single or with co-morbidities) as a proportion of total outpatient department cases had dropped from 36 percent to 18 percent, but increased from 25 percent to 32 percent for children under five years of age compared to the July 2017 survey. However, it is important to note that data were collected for a period during the dry season, which has a lower incidence of cases. The trend for overall cases is consistent with the national surveillance data, which shows a lower number of cases compared to the same period of last year.

The survey indicated a slight decline in RDT testing rate from 82 percent during the July 2017 survey to 80 percent in January 2018. RDT availability on the day of the visit slightly increased from 80 percent in July 2017 to 85 percent in January 2018, but ACT availability on the day of the visit slightly decreased from 97 percent to 95 percent. In January 2018, 37 percent of facilities visited were stocked out of SP on the day of the survey, a slight increase compared to 33 percent in July 2017. Less than half of facilities (45 percent) surveyed at the time of the EUV received the quantities of commodities ordered, 43 percent

received less and 12 percent received more than ordered. The most undersupplied commodity was artesunate, and the most oversupplied were ACTs 1x6 and 2x6 presentations. Overall, the situation was better for the PNFP facilities supported by PMI compared to public facilities. Data coming from PMI-funded EUV surveys will be used to crosscheck data coming out of the LMIS, and any discrepancies will be investigated to ensure the accuracy of both systems and approaches.

In addition, PMI conducted a data quality assessment (DQA) in 2016 for malaria orders and reporting from PNFP sites and supported the mass distribution of ITNs through technical assistance to the NMCP, specifically in warehousing and distribution of nets and data collection and management. DQA results showed that accuracy is a major problem at all levels of care. Over-reporting of dispensed data was on average 67 percent, which leads to an oversupply of commodities to health facilities. It was found that patient numbers were also over-reported. PMI field monitoring and a desk review revealed that DQA challenges in Uganda are linked with human resources and organizational factors at facility, district, and national levels. However, an improvement can be seen in a number of the data quality indicators. For example, the health facility and district weekly malaria reporting rate reached 70-83 percent in 2016 from 20-30 percent in 2006 as a result of partners' investments, including PMI. Some issues still remain; particularly pertaining to the denominators and possible over-reporting of numerators for the number of malaria reported cases as indicators. To address the issue of data quality, PMI in collaboration with the NMCP and other partners will continue to support the national SM&E TWG. This TWG is the highest technical structure that provides support to improve the quality of data at district and facility levels. In addition, PMI will support the technical resource people (TRPs) approach to identify poor performing districts and facilities and provide direct one-on-one mentoring to biostatisticians working on data management, support data review meetings with the introduction of the "positive deviant approach" where good performing districts and facilities will present their approach and achievements for the benefit of poor and average performers, and work with the NMCP to reinforce the policy on the responsibilities of biostatisticians including data collectors, organizers, analyzers, interpreters, and reporters, and the right to receive feedback at all levels.

While there have been improvements in strengthening the LMIS, there still remain significant issues that hinder the ability to extrapolate data to compare to HMIS. Currently, the LMIS in Uganda consists of a manual and electronic system. All health facilities still use manual LMIS (stock cards, issue/requisition vouchers, dispensing logs) and the electronic systems are being scaled up for PEPFAR to include web-based ART ordering and reporting from all health facilities and incorporated into DHIS2. A pilot for TB commodities ordering and reporting under this same web-based system is ongoing. PMI is involved in the development of all supply chain systems as a major MoH stakeholder and is monitoring the PEPFAR and TB system and will consider adding PMI commodities to help strengthen the supply chain system. However, significant improvements and functionality of the LMIS are needed especially at the intra-facility level regarding data quality and use.

In 2017, stockouts of major malaria commodities continued to be an issue in public facilities for various reasons. Based on monthly HMIS data, it was observed that the number of ACTs provided were higher than the number of malaria cases captured in the health information system. In addition, in 2017, the commodity situation in PNFP facilities continued to be stable compared to public facilities. PNFP facilities were appropriately stocked, i.e., between minimum and maximum stock levels with almost no stockouts experienced during the year. This is largely because JMS uses a pull system, hence PNFP facilities receive stock based on their needs. PNFPs have generally been appropriately stocked as a result, and have not been impacted by the issue of providing ACTs higher than the number of malaria cases.

In 2017, USAID/Uganda initiated important mechanisms to improve the internal controls and accountability at NMS through two implementation letters to provide more than \$18 million of ARVs to meet public sector gaps. Letter #2 provided \$8.6 million in ARVs together with a fiduciary activity to track commodity movement, while letter #3 provided \$18.6 million in ARVs and other supply chain systems strengthening interventions. For example, \$2 million was included for procurement of an electronic LMIS on the enterprise resource planning tool for NMS. The signing of letter #2 led to the establishment of an inter-ministerial task force to govern the reform of the health commodities supply chain system. This task force was charged with overseeing operationalization of the letter and overview of the reform of the entire supply chain system for all commodities, including malaria drugs and supplies.

The enterprise resource planning tool will allow NMS greater efficiency, effectiveness, and transparency in its internal operations and with partners. As the ‘order and receipt’ module is rolled out to health facilities, NMS will be able to order and track all pharmaceuticals through the NMS system online. The current rollout plan foresees completion of the tool at NMS and testing of the order and receipt module in Year 1; the module in 65 hospitals or HC IVs in Year 2; and the module in 550 facilities by Year 3. PMI also drafted a malaria-specific implementation letter that has been reviewed by the MoH and is in the final stages of approval. The letter outlines the roles of the different malaria stakeholders including the MoH; NMCP; Ministry of Local Government; Ministry of Finance, Planning, and Economic Development; NMS; Global Fund; and DFID in several areas including supply chain management, information and monitoring systems, work planning, records and auditing, and reporting. Once signed, it will serve as the basis for transfer of PMI commodities to the public sector through NMS that had been previously been halted, in addition to defining the involvement of major malaria stakeholders in this process.

A two-year UNITAID-funded lot testing of private sector RDTs continues. Given that there are approximately 60 types of RDTs in the country’s private sector currently, and there are many issues with quality, lot testing should improve the quality of and trust in RDTs by patients and providers in the long run. However, uncertainty remains in policy regarding who is legally mandated to enforce diagnostics regulatory systems in the private sector not only for malaria RDTs but also for other diseases and this may affect access and availability of RDTs. RDTs imported through private sector are not tested by the National Drug Authority as they are imported through different entry points where there are no established testing laboratories. The capacity of a prequalified laboratory for testing RDTs continues to be limited. In addition, lot testing of RDTs in the private sector remains to be streamlined and a gap continues to exist. The NMCP is currently strengthening supervision of RDT testing at all levels until an appropriate positive control well becomes available based on WHO guidance. Working with the National Drug Authority, post-market surveillance including sampling of RDTs from health facilities for testing at a WHO-accredited laboratory may be considered, especially when there are field quality concerns.

Plans and justification for proposed activities with FY 2019 funding

PMI is continuing to work with PEPFAR and other USG partners on necessary reforms to NMS supply chain operations. PMI is also looking to offer support to the overall strengthening of the NMS, improving not only their technical capacity to implement an effective LMIS, but also ensuring that systems are transparent and accountable. PMI will provide technical assistance to strengthen the lower-level supply chain through trainings in stock management, improving ordering systems, stock flow information, space planning, location, and management. PMI investment in supply chain management leverages more than \$5 million from other health funding streams (including PEPFAR) to strengthen the entire supply chain system. To optimize access to donated malaria commodities, PMI will harmonize cost recovery mechanisms used by PNFPs to minimize potential impact of high user fees while maintaining sustainability. PMI will also continue to support EUV surveys every six months.

b. Social and behavior change communication

NMCP/PMI objectives

Strategic objectives of SBCC are:

1. Develop and implement national malaria SBCC guidelines
2. Implement comprehensive SBCC activities
3. Monitor the impact of SBCC interventions supported by the NMCP

PMI has provided support for the establishment and functioning of the national SBCC TWG. The TWG was established in 2008 to coordinate SBCC activities across partners, and to play a role of reviewing the technical content of all SBCC messages pertaining to malaria, ensuring accuracy and harmonization. The main audiences for focused PMI SBCC programs have been beneficiary communities, opinion leaders, elders, pregnant women, child caretakers, health workers, and drug dispensers. Although this TWG has become more active, a recent midterm review of the UMRSP 2014-2020 highlighted the need for overall increased SBCC monitoring and measurement of behaviors that determine and drive risk reduction. PMI-supported activities currently monitor standard malaria indicators such as ITN use and health seeking, and measure intermediate outcomes like behavior intentions and message comprehension. Beyond these indicators, PMI is also working with SBCC implementing partners to monitor behavioral determinants (such as individuals' perceived risk) throughout the project lifecycle as appropriate.

Table 21. Behavioral and communication objectives for key malaria-related behaviors

Behavioral Objective	Baseline	Target
Sleep under an ITN every night	75%	85%
Communication Objectives	Baseline	Target
Increase the proportion of people who believe that using an ITN is an effective way to protect themselves and loved ones from malaria	75%	85%
Increase the proportion of people who believe that the insecticides used in ITNs are safe	75%	85%
Increase the proportion of people who feel able to use and maintain ITNs correctly and consistently	75%	85%
Increase the proportion of people with positive attitudes to ITNs	75%	85%
Behavioral Objective	Baseline	Target
Seek and receive prompt and appropriate care at the health facility if experiencing signs of malaria	75%	85%
Communication Objectives	Baseline	Target
Increase the proportion of people who have accurate knowledge of the signs and symptoms of malaria	75%	85%
Increase the proportion of people who are aware of their malaria risk, particularly vulnerable groups	75%	85%
Increase proportion of people who believe the consequences of malaria are serious and can lead to death if not properly diagnosed and treated	75%	85%

Behavioral Objective	Baseline	Target
Get tested for malaria before taking treatment	75%	85%
Communication Objectives	Baseline	Target
Increase the proportion of people who know that the consequences of self-diagnosing and treating malaria are serious	75%	85%
Increase the proportion of people who believe it is important to test before using a malaria medication	75%	85%
Increase the proportion of clients who trust and accept the test results	75%	85%
Increase the proportion of prescribers who trust the laboratory test results and treat malaria accordingly	75%	85%
Increase the proportion of target population who know the appropriate treatment for malaria is ACTs	75%	85%
Increase the number of target population who believe that ACTs are safe and effective malaria treatment products	75%	85%
Behavioral Objective	Baseline	Target
Seek and receive prompt and appropriate care at the first sign of newborn or child illness	75%	85%
Communication Objectives	Baseline	Target
Increase the proportion of parents and caregivers of children under age five who recognize the signs of malaria, including severe malaria	75%	85%
Increase the proportion of parents and caregivers of children under age five who believe malaria to be a serious childhood illness that can be fatal if they do not access prompt treatment at a health facility	75%	85%
Behavioral Objective	Baseline	Target
Receive three or more doses of IPTp to prevent malaria	75%	85%
Communication Objectives	Baseline	Target
Increase the proportion of pregnant women and their partners who believe that attendance at a full course of ANC is important for the health of mother and baby	75%	85%
Increase the number of pregnant women who know that they should receive at least three doses of IPTp, beginning in the second trimester	75%	85%
Increase the proportion of pregnant women and their partners who believe that IPTp is a safe and effective malaria prevention method	75%	85%
Increase the number of pregnant women and their partners who have accurate knowledge of the dangers of acquiring malaria when pregnant	75%	85%
Increase providers' knowledge on the benefits and correct timing of IPTp doses	75%	85%

Source: Uganda national SBCC strategy, 2015-2020

Progress since PMI was launched

Past PMI-supported SBCC efforts have reached nearly all Ugandans with key malaria messages on the importance of net use, malaria testing, timely treatment, and prevention of MIP. PMI progress on SBCC to date includes the development of the NMCP's national SBCC strategy and training materials used for SBCC activities working in malaria prevention and treatment. Vector control, case management, and MIP training for health workers and VHTs includes an SBCC component and VHTs are given job aids and storyboards to conduct sensitization sessions on malaria prevention and treatment in their communities. The national SBCC strategy, training materials, and tools are used not only in the PMI target areas, but also by Global Fund implementers in the remaining areas of the country. PMI has also supported training

of NGO staff on SBCC related to malaria prevention, and supported Peace Corps Volunteers (PCVs) to work with local NGOs on implementing malaria SBCC activities in various districts.

SBCC messages are disseminated via a variety of complementary channels, including interpersonal communication (IPC), radio, and print. Results from the MIS 2014 show that, of women aged 15-49 years who had heard or seen a malaria message within six months before the survey, 82 percent got the message from radio and 34 percent from community health workers. PMI has used RBM indicators of malaria control progress as our best proxies for success. PMI has not conducted specific behavior change surveys in silo in Uganda but monitors and tracks progress in SBCC uptake via national household surveys.

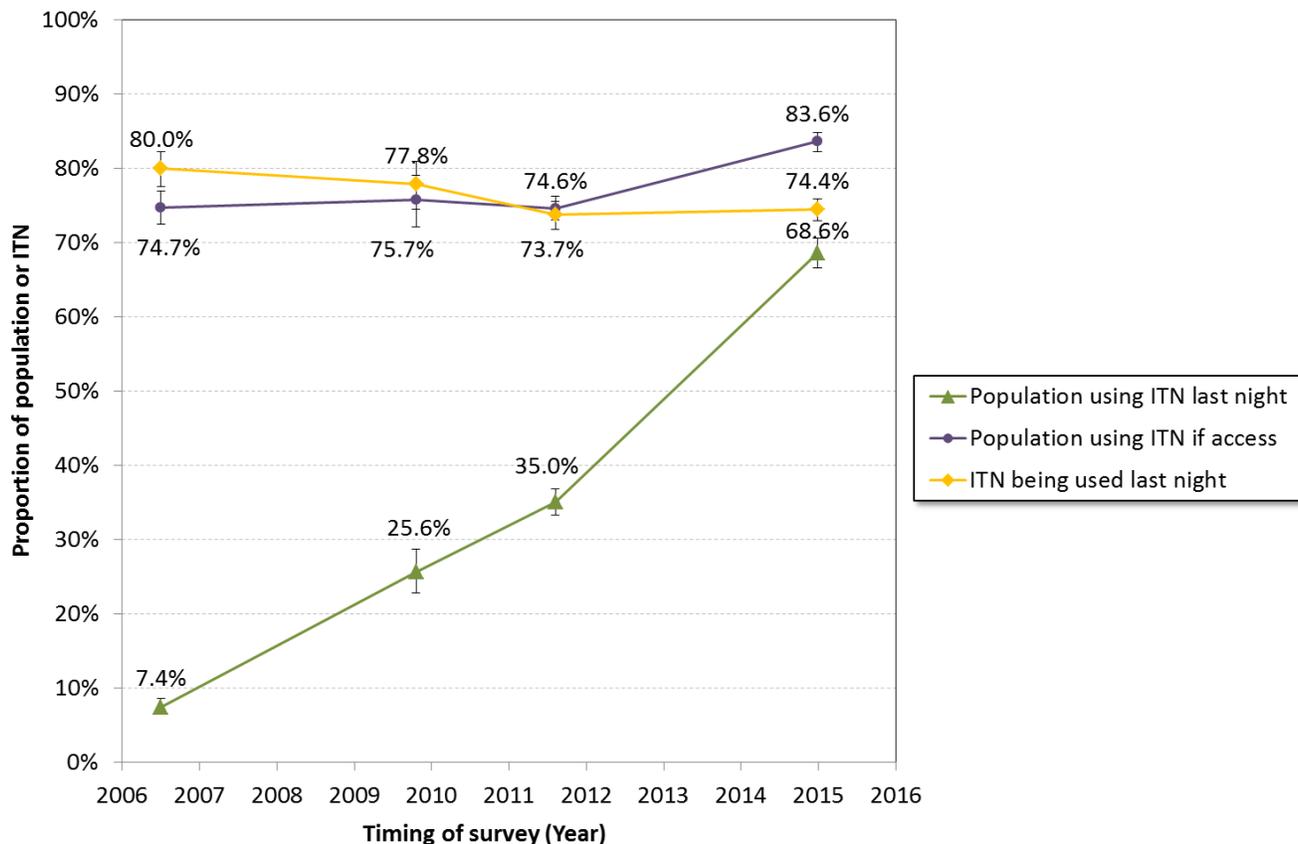
All USAID/Uganda health-related SBCC activities (including for malaria, HIV, and family health) are implemented through one SBCC Mission-wide strategy and all are coordinated by the MoH. Health messages are packaged under one umbrella as the “Chase Malaria for Good” campaign, which seeks to address social determinants for malaria prevention and control including skills, access, negative norms, risk perception, motivation, and male involvement.

Most SBCC activities are implemented nationally through PMI’s national-level partner. Regional mechanisms also implement SBCC activities specific to their geographic areas of focus. At the national level for example, PMI supports the SBCC TWG to discuss behavior change campaign updates such as the *Obulamu* (life) campaign and the Chase Malaria campaign and how this is building on the goals set forth in the national SBCC strategy, what changes need to be made to the messaging or the targeting of the messaging, etc. This is done through organizing quarterly meetings at the MoH and supporting supportive supervision visits by MoH and local government staff such as district health officers and malaria focal points. PMI regularly supports M&E, and knowledge management review meetings in which national-level stakeholders brainstorm demand creation interventions implemented by different malaria actors, changes observed in service uptake, and SBCC value addition (i.e., what are the perceived and real changes observed as a result of the SBCC activities implemented). In 2017, PMI spearheaded the drafting of a policy paper on demand creation interventions that was passed by the TWG and has since been used to guide SBCC activity implementation. PMI conducts pulse surveys to gauge audience exposure to campaign messages to identify recall and generate feedback to feed into follow up actions such as revised messaging or method used. In 2017, for example, the recognition of the *Obulamu* campaign was at 67 percent among 2,000 respondents reached by a pulse survey and at 47 percent for the response to the questions: 'how's your life?' and 'how's your pregnancy?'

In 2015, a two-phase evaluation of the 2013/2014 UCC was conducted. Key SBCC findings included: (i) there existed very limited data on actual planning and implementation of SBCC, (ii) although a draft SBCC strategy existed, it was not followed, (iii) there was strong emphasis on media (mainly radio) but implementation was late and partially of poor quality, and (iv) media had the highest impact in reaching targeted populations. In addition, the evaluation concluded that (i) in spite of the limitations in SBCC implementation, ITN use was very good and favored the most vulnerable population groups and (ii) the evaluation established a sufficiently strong net use culture that does not depend on a single message or SBCC exposure but rather on long-term experience and reinforcement through IPC. The evaluation made the following recommendations which have been incorporated into ongoing SBCC activities: (i) decentralize the planning and implementation of SBCC to the districts (which has been incorporated into the current UCC and into other current SBCC activities implemented at district level, and (ii) focus on IPC that positively enhances the existing net use culture and presentation of messages on net care and repair (which has been incorporated into the current PMI-supported projects and SBCC activities implemented at district level).

A meta-analysis of available data on net ownership and use culture commissioned by PMI in 2017 indicated that despite some persisting gaps in access, it is clear that a strong net use culture has developed in Uganda. The analysis looked at data from all previous surveys in Uganda retrospectively (2006 to 2015). It showed that the proportion of net use the previous night is generally high, and even higher if you look at ITN use among those who have access. Further, the analysis did not observe any significant barriers to ITN use or common misuse of ITNs, denouncing the popular view of nets not being used or misused. Below is a graph showing trends in population ITN use the previous night, ITN use among those with access to an ITN within the household, and ITNs being used last night (from 2006 to 2014-15).

Figure 10. Meta-analysis of ITN use in Uganda, 2006-2015



Progress during the last 12-18 months

A qualitative evaluation of the PMI-supported Obulamu campaign was conducted between September and December 2017, which generated additional data on the effectiveness of overall health and specifically PMI's SBCC activities. The evaluation report showed that the campaign design was driven by international best practices, including branding, positioning, and target audience segmentation. By adopting these practices, the project was able to successfully integrate six different disease areas and communicate to four segments of the population simultaneously (e.g., from child to older adult). The GoU has since adopted this approach of segmenting by life stage and included it in the national SBCC strategy. The report also showed that media saturation was among the most effective strategies and led to high levels of recall in the target audience. The project also implemented a participatory research approach to material development and targeted community events, especially community shows that offered beneficiaries the opportunity to learn about and discuss health issues and sample health services including

malaria. However, the evaluation found that the component most in need of strengthening is IPC and its link to media, with not enough trained agents in communities and facilities to meet the demand for ongoing information and counseling, which will be a priority focus for PMI moving forward.

The qualitative evaluation further revealed changes in behavioral factors beyond effective strategies. In the evaluation, most respondents indicated that they were sensitized by the Obulamu campaign about malaria and this increased their knowledge on the benefits of using bed nets and prompt treatment of all fevers. Respondents also indicated that they were aware of the risks associated with malaria, highlighting that children under the age of five and pregnant women were more at risk. They noted that malaria causes miscarriages among pregnant women. They alluded to the prime motivators for bed net use to include prevention of malaria and reduced spending on malaria drugs and treatment. They highlighted that the economic gain of saving money is to use it to pay school fees and improve family status. Other respondents highlighted additional motivational factors such as mosquito nets giving them warmth and protection against other harmful creatures like snakes. Audience monitoring data captured beyond reach for the dipstick survey included general knowledge of malaria, knowledge of malaria prevention (i.e., ITN use and ownership) health-seeking behavior, and case management.

A dipstick survey conducted by PMI in November 2017 showed that the majority of the participants had heard messages about malaria and ITNs. In general, 80.8 percent reported that they had been exposed to PMI-supported radio messages at least once a week. Notably, 59.2 percent claimed to have heard the messages about ITNs on a daily basis and 21.2 percent reported to have heard messages at least once every week. Only 14 percent mentioned having heard the messages at least once in the past one month while 5.5 percent could not remember. Message retention on malaria and ITNs among respondents was considerably high with the majority of respondents being able to recall messages on: (i) ensuring that every household member sleeps under an ITN and taking children under five years of age for testing upon onset of fever and (ii) testing for malaria before treatment.

PMI supported SBCC as a crosscutting activity for all interventions: case management, ITNs, IRS, and MIP. In 2017, PMI supported the finalization and adoption of Uganda's national SBCC strategy. The strategy is based on the UMRSP and incorporates available technical evidence on SBCC, findings of the midterm review, and the MIS 2014/15. PMI supported the NMCP to continue reaching approximately 10 million Ugandans with key messages on correct and consistent use of nets, care-seeking behavior, and IPTp through radio talk shows, radio spots, and as part of IPC, worked with a network of more than 20,000 village health workers to conduct 5,938 home visits, 9,952 small group discussions, and 9,418 one-on-one sessions, thereby directly reaching 65,011 community members with malaria messages.

SBCC is a critical component of PMI's IRS campaigns. In the last year, PMI continued to support enhanced SBCC in the nine IRS districts focusing on IPC; radio; and information, education, and communication to encourage people to open their houses for spraying, continue to sleep under ITNs, and seek prompt diagnosis and treatment in the event of a fever. These messages help to ensure a strong net culture is built in all IRS areas and households are aware of their risk for malaria when IRS is withdrawn and the need for prompt treatment seeking. In the organic farming areas, PMI supported advocacy and dialogue to encourage community members to open their houses for IRS while maintaining separate non-sprayed areas for their organic produce. In that way, organic farming communities benefitted from the health benefits of IRS as well as higher prices from organic products.

Some examples of barriers addressed through PMI-supported SBCC activities include: limited knowledge on net use (many people do not know how to apply the ITNs onto beds or how to care for and repair

them); myths about side effects of the insecticide (many people claim the chemicals used to treat the nets smell bad and can cause breathing difficulties); and a misconception that ITNs can make men impotent.

In the last year, PMI also supported an integrated communication strategy that targets audiences nationwide through IPC, radio, and print materials. This integrated SBCC mechanism leverages resources from other USG initiatives, particularly from PEPFAR as well as MCH, and continues to use consistent design and messaging tailored using a life stage approach. There are four stages in this approach. Life stages one and four target all household members, particularly youth and adolescents, and focus on correct and consistent net use, care of nets, prompt diagnosis and treatment, and IRS acceptance/adherence in selected districts. Life stage two targets pregnant women and their partners and focuses on MIP (e.g., sleeping under ITNs, IPTp uptake, and prompt diagnosis and treatment). Life stage three focuses on the caretakers of children under five years of age and, in addition, sleeping under nets, recognizing malaria symptoms, and seeking prompt diagnosis and treatment.

Plans and justification for proposed activities with FY 2019 funding

PMI will continue supporting targeted and evidence-based SBCC interventions at national, district, and community levels for correct and consistent use of ITNs, increased IPTp uptake, acceptance of IRS where applicable, and early diagnosis and treatment of malaria. As the malaria epidemiology in Uganda shifts, PMI will tailor its messages as appropriate (i.e., increased focus on fever management by providers when malaria burden is low). PMI will continue enhancing SBCC in all districts by promoting the correct and consistent use of ITNs, MIP, IPTp uptake, and prompt malaria diagnosis and effective treatment. PMI will work closely with partners providing integrated SBCC to ensure that malaria-focused activities and interventions are based on relevant behavioral data and there is a strategy to measure the desired behavioral change.

PMI will use the time patients are waiting at ANC to provide health education sessions, which will include televised education sessions supported by additional explanation, feedback, and direction from health workers. In addition, male partners of pregnant women (key influencers of ANC attendance and compliance) will be targeted through the use of male-friendly audio-visual interpersonal tactics at health facilities. In addition, community-led SBCC will engage men as decision-makers, promoting their understanding of the importance of ANC and IPTp3+ and how it benefits them and their families.

PMI will continue increased focus on IPC with 70 percent or more of available SBCC resources spent on IPC activities, continue encouraging malaria messaging in PEPFAR programs, continue supporting coordination and scale-up of SBCC in all malaria projects, and continue ensuring a strong SBCC TWG at the national level with the objective of continued use of SBCC to drive down malaria prevalence in Uganda. Messages will be targeted to enhance the existing net use culture and further encourage net care, with primary emphasis on promoting preventive behaviors that protect the net from damage.

PMI will continue to use community mobilization and mass media approaches, including integrated health outreach, radio talk shows, radio spots, community meetings, and IPC. These interventions will address existing barriers to uptake of malaria prevention and treatment services related to limited knowledge and skills and social and gender norms as well as target interventions to get the right exposure and intensity required to achieve behavior change.

PMI will continue supporting targeted community outreach in areas with high prevalence and low uptake of services and will print, distribute, and orient health workers and VHTs on the use of IPTp job aids and informational materials to increase demand and use of IPTp. Promotion of prompt care-seeking behaviors

for suspected malaria, recognition of symptoms of severe malaria, parasitological-based diagnosis, and appropriate treatment for those with confirmed malaria will also continue to be emphasized. Focus will continue to be placed on creating demand for diagnostics by health workers and patients, appropriate treatment, and adherence to prescribed treatment by health providers. PMI will continue to support the NMCP's prevent, test, treat, and track campaign to increase demand for testing for malaria followed by appropriate treatment. In addition, PMI will support effective communication on iCCM in districts where iCCM will be added. This activity will also leverage resources from the private sector.

Overall, PMI's SBCC funding will continue going towards district and lower-level SBCC activities, with a heavy focus on IPC at the community level and health workers. Support provided at the national level will allow PMI to have a broader impact, particularly as this level has been traditionally weak with respect to SBCC. SBCC materials developed at the national level will be rolled out to all projects and activities to help facilitate malaria prevention and care-seeking behaviors, not just to increase knowledge. To ensure that national-level SBCC activities are addressing the appropriate barriers and facilitators of malaria behaviors, PMI uses globally recognized messages that have been translated as appropriate to reflect the Ugandan context. PMI will continue to measure the impact of SBCC activities on increasing key malaria-related behaviors through national surveys (such as the 2018 MIS).

In terms of measuring the impact of SBCC activities on increasing key malaria-related behaviors, PMI will continue to measure impact through national surveys, dipstick surveys, and qualitative evaluations conducted at different points during implementation. While audience recall, usually measured through national household surveys every two to five years, is important, it is also very important that behavioral factors are measured at different time points throughout activity implementation. Behavioral factors to be measured at different time points of activity implementation include perceived risk and severity, self-efficacy, response efficacy, norms, and attitudes. Measurement at different time points allows the program to use the information to adjust activities mid-stream.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.

c. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The primary aim of the M&E plan within the UMRSP 2014-2020 is to provide a joint framework for a well-coordinated, systematic, and holistic tracking of progress in malaria control, informing refinement and guiding decision-making for program improvement. The goals of the plan are to: 1) describe the types of data and data sources, and how data will flow from the primary source to a central repository through appropriate decision-making layers and to all relevant stakeholders; 2) provide a framework for the collection, processing, reporting, analysis, and use of malaria data in Uganda; 3) provide standard indicators, targets, and frequency of reporting in a standardized format for all malaria implementers and stakeholders; 4) guide the routine and periodic documentation of planned activities and measure expected outputs, outcomes, and impact; and 5) define implementation arrangements with clear responsibility centers.

Table 22. SM&E data sources

Data Source	Survey Activities	Calendar Year								
		2012	2013	2014	2015	2016	2017	2018	2019	2020
National-level household surveys	DHS					X				
	MIS			X				(X)		
Health facility and other surveys	EUV survey			X	X	X	X	(X)	(X)	(X)
Malaria surveillance and routine system support	Support to malaria sentinel surveillance	X	X	X	X					
	Support to HMIS	X	X	X	X	X	X	X	(X)	(X)
Therapeutic efficacy monitoring	<i>In vivo</i> efficacy testing		X	X			X	(X)	(X)	(X)
Entomology	Entomological surveillance and resistance monitoring	X	X	X	X	X	X	X	(X)	(X)
	ITN durability monitoring				X			(X)	(X)	(X)
Other malaria-related evaluations	Northern Uganda Anemia and Parasitemia study		X							
Other data sources	Malaria Impact Evaluation			X						
	Baseline, midline, and endline HF evaluation						X		(X)	

(X) indicates an activity is planned

*Non-PMI funded

Progress since PMI was launched

Population-based surveys: PMI has supported the use of the following tools to measure malaria burden as a result of ongoing control and prevention efforts:

- 2010 Anemia and Parasitemia Survey, collected December 2010 to January 2011: Provided information on anemia and parasitemia in children under five years of age and district-level coverage data in two districts with and without IRS in northern Uganda, with a similar distribution of ITNs and case management support.
- 2011 ITN Coverage Survey: Provided information on net coverage at the district level in the Central Region of Uganda after the targeted mass ITN distribution campaign in early 2010.

- 2011 Uganda DHS, collected June to November: The DHS provided data comparable to the 2006 DHS, which assessed anemia levels in children under five years of age.
- 2014 MIS, collected December 2014 to February 2015: This survey, which was designed to ensure comparability with the previous MIS (2009) and DHS (2011), provided data on the status of net ownership and use after the UCC among children under five years of age and pregnant women, as well as IPTp uptake in ANC. Through oversampling the 10 previous IRS districts in the north and the 14 new IRS districts in the east, the MIS demonstrated the impact of IRS in the north, and provided a pre-spray baseline for the new IRS districts.
- 2016 Uganda DHS, collected June to December 2016: provided information on anemia levels in children under five years of age, ownership of ITNs, use of ITNs by pregnant women and children, IPTp uptake in ANC, fever management in children, and malaria prevalence in children.

Impact evaluation: In 2014, an impact evaluation looking at the plausible contribution of malaria interventions to under-5 mortality was completed. This evaluation looked at the period 2000-2011, during which the under-5 mortality dropped by 41 percent in Uganda. During the same period, Uganda made substantial progress towards implementing malaria control interventions, particularly distribution of ITNs, IRS, and IPTp for prevention and ACTs for case management. The results showed that malaria interventions plausibly contributed to the reduction of under-5 mortality during this period. Of note is that the largest period of the scale-up corresponded to the biggest drop in the under-5 mortality (2006-2011).

Sentinel surveillance: From 2006-2015, PMI supported the establishment and maintenance of malaria sentinel surveillance sites in different malaria transmission zones. In addition to central-level use for programmatic decision-making and dissemination, such as the 2000-2011 impact evaluation, data from surveillance sites have positively influenced case management practices by health workers at HC IVs and hospitals through regular monitoring, supervision, and data dissemination workshops. A robust quality control system for microscopists has been initiated in these sites and the results indicate excellent performance in the accuracy of blood slide readings across all sites. Although these sentinel sites are no longer supported by PMI, they continue to serve as a resource that provides high-quality longitudinal data used by PMI, NMCP, and other malaria stakeholders to facilitate TES, conduct OR to improve case management, and pilot methods to improve surveillance.

Routine health information system strengthening: In 2014, PMI implemented a targeted HMIS strengthening activity to improve HMIS malaria data quality and use by building cost-effective, sustainable data collection and reporting capacity at 26 level IV MRCs. In this first step of a targeted, phased approach to improve national and district level HMIS surveillance capacity, facilities in districts receiving IRS were prioritized to monitor and inform IRS decisions, including selection of sites and timing of spray rounds. The 26 facilities were provided with additional resources and supervision to ensure high levels of testing for suspected cases and adherence to test results. The facilities received computers and staff received training and supervision on data collection, management, and reporting. These centers developed and piloted the enhanced outpatient registers that captured for the first time suspected malaria cases, testing, testing results, and treatment in the same place. This pilot served as a basis for the revision of the national recording and reporting forms to include fever, malaria tests done, and malaria test results in the outpatient registers and enabling reporting of the confirmed malaria cases as a stand-alone data element in the monthly summary reports. The revised registers and reporting forms have been introduced by the MoH nationwide in July 2015, accompanied by training, and have been in use since then.

In early 2017, PMI helped support an NMCP-led DQA of health facility-level DHIS2 data. The DQA examined the accuracy and reliability of the data, and ascertained the data management processes and the quality of the malaria data in the primary HMIS data collection tools, which are reported through the national DHIS2 system. The assessment revealed a wide variation in data quality across different primary and secondary sources suggesting a real need for continued data strengthening and scaling up activities that have strengthened the HMIS data reporting process in Uganda. This may be done, for example, through NMCP-led, PMI-supported, regional data strengthening workshops using the data reference centers as a model. PMI-supported HMIS strengthening efforts also include district-level support in the 47 focus districts by working with district health officers, district biostatisticians, and district malaria focal points in data analysis and use workshops. PMI will assist in coordinating and standardizing SM&E activities, including HMIS strengthening, in regions outside of the 47 focus districts as well. PMI has also leveraged PEPFAR strategic information resources through the newly commissioned national data reviews that are a platform for the MoH to clean facility level data, including malaria data.

PMI also supports national-level surveillance capacity building and HMIS strengthening. Since 2013 PMI has funded at least one FETP fellow to be assigned to the M&E unit at NMCP each year; part of their duties has included drafting Uganda's Quarterly Malaria Bulletin. The bulletin has proved to be a useful tool for reviewing malaria data reported through HMIS, and has been well received by RBM partners at the international, national, and district levels. Another FETP project has been to help map HMIS data (incidence and test positivity rates) to help the MoH monitor trends over time and space to better direct public health resources. FETP fellows have continued to play a key role in NMCP responses to malaria upsurges and to provide critical entomological and epidemiologic expertise within the MoH.

Progress during the last 12-18 months

HMIS Strengthening: PMI-supported HMIS strengthening efforts assisted the NMCP and the MoH's Division of Health Information to update HMIS data collection forms to include improved malaria indicators (fever, malaria test, test results, and treatment) in outpatient health facilities across the country. While these indicators are included in the DHIS2, and completeness at the facility level has been steadily improving, efforts in assessing and promoting these indicators will greatly improve the national HMIS system to collect and report standardized malaria-related indicators, which were not previously captured. National dissemination of these improved outpatient registers began in 2015; however, preliminary results indicate that the training accompanying the roll out of registers was not sufficient. In mid-2017, PMI provided a thorough training on the revised MoH tools at each health facility in PMI focus districts.

The proportion of PFP facilities contributing to HMIS data remains small, but is growing. Large donors, such as the Clinton Health Access Initiative, have been actively engaged in pushing private sector data into the HMIS through various methods including tying registration/accreditation to reporting. Given the continued support from other partners, efforts by PMI continue to include data quality support at district-level private facilities.

Currently, the DHIS2 covers all districts in Uganda. HMIS reports are entered at district level for onward submission to the national level. Weekly text-based data collected at the facility level now feed directly into the DHIS2. Thus far, surveillance data from previous HMIS strengthening efforts have been used to monitor the effect of a UCC, to evaluate the effect of a shifting IRS strategy, and to make evidence-based decisions in the face of an upsurge.

A PMI-funded study evaluating the efficacy of the collaborative improvement approach for improvement of malaria surveillance data quality, as a HMIS strengthening activity, concluded in January 2017. The

study found that implementing collaborative improvement in five health facilities in Kayunga District resulted in considerable improvements in data completeness and accuracy over the nine months of the collaborative improvement intervention and for three months after the intervention. In addition to the evaluation of the method, the study produced a document (‘change package’) recommending the most effective interventions used during this study. Study results and the change package were disseminated to in-country stakeholders, including the MoH, and can be a resource for health facilities aiming to improve HMIS-strengthening activities by the NMCP.

In 2017, PMI began implementing malaria SM&E activities and capacity building at the district level for at least 47 PMI focus districts. PMI is building on the successes of the targeted HMIS strengthening to date and continuing to strengthen HMIS/DHIS2 data collection and analysis at facility, district, and national levels. This will be realized through onsite facility- and district-level coaching by SM&E experts to help train health facility and district staff to monitor and improve data quality.

In addition to the SM&E work being done in PMI’s focus districts, PMI will help coordinate, reinforce, and standardize SM&E efforts in other districts to essentially achieve national coverage. PMI will support a national synthesis of all HMIS data to ensure that high-quality and meaningful information is collected and shared among all partners.

HMIS strengthening will also be furthered through the existing MRCs, high-volume level IV/III public health facilities which serve as centers of excellence and learning for malaria surveillance. Specifically, MRCs will support regional performance review meetings and help reinforce a ‘minimum package for strengthening HMIS’ – a set of guidelines to implement at the district and health facility levels, including: 1) standardizing compilation of HMIS data; 2) streamlining standards for routine DQA; 3) building basic capacity for HMIS data analysis ; and 4) promoting HMIS data use for action.

In June-August 2017, PMI implemented a baseline assessment of health facilities to correspond with the launch of the new five-year project focused on malaria control and prevention in at least 47 focus districts. Overall, the baseline assessment showed good coverage of malaria control interventions and high availability of commodities, particularly in vector control. However, there were some gaps, particularly in MIP. Findings also revealed that there was no malaria-specific supportive supervision occurring in Uganda and recommended that investing in supportive supervision with a strong malaria component could address some of the gaps identified by the baseline assessment, especially regarding management of MIP, practices to improve client satisfaction, and quality of data reporting and recording. The most significant weakness for the NMCP and DHMTs was their ability to use data, specifically HMIS data, therefore hindering evidence-based decision-making. The assessment therefore recommended that PMI should coordinate training for the NMCP and DHMTs on malaria M&E and should support DHMTs to regularly check the quality of routine data. The evaluation will be repeated at mid-term and end-term to document the impact of PMI and trends in malaria indicators over time.

PMI is supporting the 2018 MIS to be conducted in November. PMI is supporting planning and protocol writing, and will play a critical role on the technical and oversight committees. The 2018 survey will be comparable to the previous MIS (2009) and DHS (2011), providing data on the status of net ownership and use after the 2017/18 UCC among children under five years of age and pregnant women, as well as IPTp uptake in ANC. The sampling frame will match the recent 2016 DHS, as the sampling will be based on 15 regional areas but data comparisons to the 2009 and 2014 MIS regions will still be possible for trend analysis and comparisons.

Data use: PMI continues to promote and support HMIS data use by supporting and mentoring FETP fellows to analyze HMIS data to produce Uganda's Quarterly Malaria Bulletins. In February 2018, the eighteenth bulletin was published and disseminated to key stakeholders at the national and district levels. Reference center data from PMI-supported facilities was shown to be representative of the entire surrounding districts, and because of the high testing and reporting rates, it was often praised by the MoH as the most reliable and informative malaria data in the country. Only approximately half of the cases reported to HMIS from health facilities not receiving PMI support are confirmed malaria cases. However, PMI-supported facilities, in addition to reporting on malaria cases, regularly reported test positivity rates that prove to be more stable than case data.

The national M&E TWG meets monthly, with regular participation from NMCP, PMI, and partners, to discuss pertinent issues and is increasingly charged with leading the planning and review of key NMCP research and critical scientific inquiries and studies, including analyses of data from malaria outbreaks. These meetings inform the NMCP program manager, the Division of Health Information, and quarterly RBM meetings.

Implementing partner M&E: PMI contributes to a USAID/Uganda Mission-wide data collection mechanism for all USAID health projects. This project assists other health projects in developing performance management plans, collecting and tracking data on key program indicators, and conducting DQAs. The project also provides continuous external monitoring and evaluation of all Mission projects. PMI will work with all Mission projects that include malaria control and partners supported by PMI to implement SM&E activities in a way that fosters congruity.

Plans and justification for proposed activities with FY 2019 funding

PMI support will focus on improving the quality, completeness, timeliness, and use of HMIS malaria data at all levels: national, district, and facility. There are challenges in collecting data from a number of PFP facilities, as there are no updated records either at central or district levels to locate and identify PFP facilities as they frequently change their names and locations. It has been reported by the Division of Health Information of the MoH that small and medium level PFP facilities are reluctant to report. However, PMI, in collaboration with RBM partners, will continue to support the Division of Health Information to update its database on PFP facilities. PMI funds will also support training the following people to include PFP data: people involved in collecting and analyzing malaria data at the subnational and health facility levels; malaria focal points who perform data audits at the regional and district levels; and district biostatisticians. The DHMT is responsible for monitoring data collection and analyzing and reporting data for all health facilities, including PFP and PNFP facilities. Additionally, PMI is working on a proposal with DFID to cross-reference epidemiological data at MRC sites with entomological data collected around those sites. This proposal is being discussed with stakeholders to finalize an approach that will lead to useful data which can help set the direction for Uganda's vector control interventions. PMI will be working towards the goal of using epidemiologic data to inform the LMIS.

Though the long-term vision is to achieve high-quality HMIS functionality in the entire country, PMI will prioritize the districts that are currently receiving or recently transitioned from IRS due to the need to more closely monitor changes in malaria burden in areas with changing vector control strategies. In addition, PMI is leveraging integrated efforts to strengthen HMIS data, such as those led by PEPFAR, to contribute to surveillance strengthening in most districts in Uganda. Plans for strengthening HMIS and promoting data use for programmatic management are summarized below.

PMI will continue to support SM&E of malaria activities, including using HMIS/DHIS2 data to monitor program activities and track system development at national, regional, district, and health facility levels. To ensure activities in the regions are harmonized and coordinated across partners, PMI will continue to support the Quarterly Malaria Bulletin and national-level efforts to promote data dissemination, and will actively participate in the NMCP's M&E TWG.

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.

d. Operational research

NMCP/PMI objectives

The national M&E plan for malaria control in Uganda reinforces the need for OR, with an emphasis on therapeutic efficacy testing and insecticide susceptibility studies. Understanding the importance of OR as an integral strategy to identify gaps and weaknesses to improve program implementation and measure impact of malaria interventions, the NMCP restarted the Uganda Malaria Research Center (UMRC). A draft OR strategy outlining country-specific priority research activities was developed in 2017 and finalized in the fall of 2018. Currently, the UMRC five-year strategic plan is near finalization pending review by partners. PMI will work with the NMCP, UMRC, and others to collaborate and help implement OR that is synergistic with PMI-defined OR priorities. Studies completed and proposed with PMI support are identified jointly by the NMCP and have focused not only on identifying and assessing insecticide and drug resistance, but on improving effectiveness and scale-up of existing interventions, and improving program efficiency to address bottlenecks in malaria program interventions.

Progress since PMI was launched

Since 2006, Uganda has been involved in various OR studies that have helped inform malaria prevention and control programmatic policies. Prior to 2006, Uganda was implementing a home-based malaria treatment package, called *Homapak*, consisting of a combination of chloroquine and SP. The package was distributed through community drug distributors for treatment of fever in children under five years of age within 24 hours of onset at home. With the change to AL as the first-line treatment for malaria, PMI supported a study to evaluate the process of rolling out community ACTs in one district. Results showed that there were some problems with the change in treatment schedule for AL and issues surrounding packaging for certain age groups. As a result, PMI supported the scale-up of supportive training and supervision and comprehensive monitoring of drug distributions.

Early OR done in Uganda on verbal autopsy was influential in PMI's decision to no longer use verbal autopsies to determine malaria-specific mortality. In 2007, PMI supported a prospective study to examine the validity of verbal autopsies for determining deaths due to malaria in children under five years of age in three different epidemiological settings in Uganda. The cause of death was compared using results of a verbal autopsy survey (a follow-on to the 2006 DHS), and the "gold standard" of health facility medical records. Results showed the sensitivity of verbal autopsy procedures were variable. Sensitivity was 63 percent (95 percent CI: 46-80) in the high transmission setting of Tororo and 57 percent (95 percent CI: 43-71) in the medium transmission setting of Kampala. Specificity was high at both sites (89 percent and 90 percent, respectively). The positive predictive value for verbal autopsies was very different in Tororo and Kampala (83 percent vs 34 percent; difference 49 percent [95 percent CI: 31-67], $p < 0.001$). In the low transmission setting of Kisoro, no deaths were attributable to malaria on review of the medical records.

These results reiterated that verbal autopsies are not useful for all settings, and should not be used to determine malaria-specific mortality within acceptable bounds.

A PMI-core funded study was completed in 2011 to evaluate the effectiveness of a post-campaign door-to-door hang-up and communication intervention to increase net usage. The three-arm study compared net hang-up and use after: 1) two visits to households by a VHT; 2) three visits to households by a VHT; and 3) no visits. All three study arms showed an increase in net deployment from 56-63 percent at baseline to 67-74 percent at follow-up. Likewise, the three arms showed increases in the proportion of household members sleeping under the net the previous night of the follow-up survey. However, there was no statistical effect of household visits post-campaign on the hang-up or use of nets.

In March 2013, a cluster randomized household survey was carried out to evaluate iCCM implementation for malaria, pneumonia, diarrhea, and maternal and newborn health in eight districts of central Uganda. Results showed that the proportion of children under five years of age with a fever who were treated the same day with an ACT improved from 19.4 percent at baseline to 44.7 percent at endline. In the intervention area, timeliness of treatment for fever and acute respiratory illness was significantly higher in the intervention area than in the comparison area.¹

In 2014, a core-funded PMI study was conducted to understand the knowledge, attitudes, beliefs, and practices that motivate or impede net care and repair behaviors and to use these findings to inform an SBCC intervention. The evaluation showed that the SBCC program resulted in improved knowledge and attitudes of respondents, which impacted positively on net condition. This was likely the result of overall better care for the nets, as repairing did not contribute to improved net condition.

Also in 2014, a randomized control trial on DP for the prevention of MIP was undertaken in Tororo District, an area of high SP resistance, to compare the efficacy and safety of three IPTp regimens (SP, a three-dose regimen of DP, and monthly DP). The study found that “the burden of MIP was significantly lower among adolescent girls or women who received IPTp with DP than among those who received SP, and patients who received a monthly treatment with DP were superior to those who received a three-dose SP treatment with regard to several outcomes.” The use of a higher dosing frequency of DP (every 4 weeks starting as early as 16 weeks of gestation) provided more protection, which is in line with updated WHO policy recommendations that IPTp should be given at every ANC visit if visits are at least one month apart. It is important to note that the more frequently dosed DP regimen was also started earlier, which may have contributed to the improved outcomes. Additional and larger evaluations in different settings are needed to inform important questions regarding safety and the potential risks for selection of drug-resistant parasites as a result of an increase in drug pressure.²

Progress during the last 12-18 months

An OR pilot study to evaluate the collaborative improvement method applied to improving malaria surveillance data quality in five health facilities in Kayunga District in eastern Uganda was completed. Primary objectives of the study included: 1) evaluating the effectiveness of a combined intervention (in-service training plus the collaborative improvement approach) in improving the quality of malaria surveillance data in Uganda; and 2) to describe the inner processes of collaborative improvement,

¹ Mubiru et al. 2015. Evaluation of Integrated Community Case Management in Eight Districts of Central Uganda, PLOS ONE | DOI:10.1371/journal.pone.0134767, August 12, 2015

² Abel Kakuru et al. 2016. Dihydroartemisinin–Piperaquine for the Prevention of Malaria in Pregnancy, N Engl J Med 2016;374:928-39

including formal and informal practices that support and undermine the approach. The study concluded in January 2017, with considerable improvements in data completeness and accuracy achieved over the nine-month intervention. Specifically, completeness of clinically relevant fields (17-34 percent at baseline) improved by 69 percentage points (95 percent CI: 65-72 percent) immediately post-intervention to 98 percent and remained high for the duration of follow-up. Relative differences between the laboratory registers and monthly reports in reporting proportion of positive malaria tests ranged from 9-57 percent at baseline, and improved by 77 percentage points (95 percent CI: 35-120 percent) with the intervention. All improvements were sustained over the short term (three months) post intervention. Qualitative results of the intervention suggested the collaborative improvement approach helped health workers understand that it is important and possible to improve health facility data. In addition to the evaluation of the method, the study produced a document (change package) outlining specific recommended interventions implemented by the facilities that were most effective. Study results and the change package were disseminated to in-country stakeholders, including the MoH, and can be a resource for health facilities aiming to improve HMIS strengthening activities by the NMCP. The change package is currently being field tested by the partner involved in the OR. Manuscripts are under development.

With funding from AMF, the NMCP is currently implementing a study to assess the impact of ITNs with and without PBO on malaria indicators in Uganda in a cluster randomized trial, which includes 104 health sub-districts in 48 districts in the eastern and western regions. The study area was embedded within waves two to four of the seven-wave UCC. The primary objective of this study is to evaluate the impact of combination ITNs (with PBO) compared with conventional ITNs (without PBO) on parasite prevalence in eastern and western Uganda. The study will test the hypothesis that parasite prevalence will be lower in intervention clusters (health sub-districts randomized to receive PBO nets), than in control clusters (health sub-districts randomized to conventional nets) overall, and plan a sub-group analysis stratified by region (eastern and western). Initial results from the cross-sectional prevalence surveys will be shared after the 18-month survey in September 2019.

The recent large-scale ITN distribution in Uganda has led to discussions on the most appropriate and cost-effective way to deal with expiring ITNs that are accumulating in communities. In addition, concerns about net misuse, especially among fishing communities, are persistent. For these reasons, net repurposing has been an increasing focus of discussions among malaria stakeholders in Uganda. The NMCP has specifically expressed interest in the evaluation of net repurposing as a housing modification method in an effort to explore sustainable, cost-effective interventions that can reduce the reliance on IRS in Uganda and sustain gains when IRS transitions. Although RBM recently (2017) drafted a consensus statement that promotes repurposing expired nets for housing modifications, the utility of this recommendation has not been evaluated. While it is expected that net repurposing is going to show high cost-effectiveness, the feasibility, acceptability, effectiveness, and durability in comparison to other housing modification methods is unknown. PMI is proposing to support OR with FY 2017 funds that will enhance our understanding of multiple aspects of net repurposing, and explore its use for housing-level vector exclusion, compared to other housing modification methods in high-endemicity settings in Uganda. The effectiveness and acceptability will be outcomes of interest to be measured through qualitative, survey, and entomological methods. If approved, the findings will help PMI to determine whether this type of intervention should be considered in Uganda.

Given the long-term challenges and sustainability related to maintaining IRS, more effective IRS transition strategies remain a critical need. To meet this need, the Bill and Melinda Gates Foundation is currently implementing a prospective study to evaluate the impact of IRS in combination with chemotherapy on key malaria indicators in a high-transmission setting in north-eastern Uganda. Phase I evaluates the impact of IRS in combination with MDA as compared with no MDA on clinical and

entomological malaria indicators (prevalence of asexual parasitemia, parasite positivity rate, and entomological inoculation rate) in Katakwi District. Working in partnership with the Gates Foundation, using FY 2017 funds, PMI will support the implementation of Phase II of the study to evaluate the impact of ProAct compared to iCCM as a transition strategy to maintain gains from MDA plus IRS and IRS alone. Through ProAct, VHTs will conduct weekly door-to-door sweeps to identify people with fever, test them with RDTs, and treat positive cases. The primary research question of Phase II will address whether or not implementing ProAct will maintain prevalence of asexual malaria parasitemia and malaria transmission following withdrawal of IRS and MDA compared to standard iCCM as being currently scaled up in Uganda. In both study arms, other standard malaria interventions (ITNs, case management, and MIP) will be optimized. The study will also evaluate and compare the feasibility and cost-effectiveness of ProAct compared to the standard iCCM approach. The concept note describing our contribution to the study has been submitted and approved by the PMI OR committee.

Table 23. PMI-funded OR studies

Title	Start date	End date	Budget
Completed OR Studies			
Home-based management of fever ¹	2007	2007	\$100,000
Validation of verbal autopsies ²	2007	2007	\$300,000
Effectiveness of post-campaign door-to-door hang-up and communication interventions to increase ITN utilization ³	12/2010	07/2011	\$230,000
Net care and repair behaviors: formative research in Uganda ⁴	03/2013	04/2014	\$175,000
Improving the quality of health facility data to monitor trends in malaria burden: effectiveness of the collaborative improvement approach ^{5,6}	05/2015	01/2017	\$500,000
Ongoing OR Studies			
A pilot intervention to assess the impact and cost-effectiveness of ProAct as a post-IRS withdrawal strategy	2018	2019	\$300,000
Planned OR Studies FY 2019			
No new operational research studies planned with FY2019 funding			

¹Nsungwa-Sabiiti, J., Peterson, S., Pariyo, G., Ogwal-Okeng, J., Petzold, M.G., Tomson, G. (2007) Home-based management of fever and malaria treatment practices in Uganda. *Transactions of The Royal Society of Tropical Medicine and Hygiene*, Volume 101, Issue 12, 1 December 2007, Pages 1199–1207, <https://doi.org/10.1016/j.trstmh.2007.08.005>

²Mpimbaza, A., Filler, S., Katureebe, A., Quick, L., Chandramohan, D., & Staedke, S. G. (2015). Verbal Autopsy: Evaluation of Methods to Certify Causes of Death in Uganda. *PLoS ONE*, 10(6), e0128801. <http://doi.org/10.1371/journal.pone.0128801>

³Kilian, A., Balayo, C., Feldman, M., Koenker, H., Lokko, K., et al. (2015) The Effect of Single or Repeated Home Visits on the Hanging and Use of Insecticide-Treated Mosquito Nets following a Mass Distribution Campaign - A Cluster Randomized, Controlled Trial. *PLOS ONE* 10(3): e0119078. <https://doi.org/10.1371/journal.pone.0119078>

⁴Scandurra, L., Acosta, A., Koenker, H., Kibuuka, D. M., & Harvey, S. (2014). “It is about how the net looks”: a qualitative study of perceptions and practices related to mosquito net care and repair in two districts in eastern Uganda. *Malaria Journal*, 13, 504. <http://doi.org/10.1186/1475-2875-13-504>

⁵Westercamp, N., Staedke, S., Maiteki-Sebuguzi, C., Ndyabakira, A., Okiring J.M., Kigozi, S.P., Dorsey, G., Broughton, E., Massoud, R., Rowe, A. (2018) Effectiveness and sustainability of a collaborative improvement method to increase the quality of routine malaria surveillance data in Kayunga District, Uganda. *Implementation Science* (in press)

⁶Hutchinson, E., Nayiga, S., Nabirye, C., Taaka, L., Westercamp, N., Rowe, A.K., Staedke, S.G. (2018) Opening the ‘Black Box’ of Collaborative Improvement: A qualitative evaluation of a pilot intervention to improve quality of surveillance data in public health centres in Uganda. *Implementation Science* (in press)

Proposed activities with FY 2019 funding

No new OR studies are planned with FY2019 funding.

e. Other health systems strengthening

NMCP/PMI objectives

The GoU has been implementing a decentralization program as a way of improving the efficiency and effectiveness of service delivery since 1993. Services are decentralized to districts and within districts to health sub-districts with each level having specific roles and responsibilities. Health system strengthening is the cornerstone of Uganda's health sector development plan 2015-2020. PMI supports health sector competitiveness through strengthening health service delivery systems, health information, health workforce, and health infrastructure.

Progress since PMI was launched

Over the last 12 years, PMI has provided significant support to complement the efforts of other USG programs supported by USAID, CDC, PEPFAR, and the GoU. In collaboration with PEPFAR and other USAID health programs, PMI supports improvement in workforce policy, planning, and management through: 1) strengthening human resource units and information systems in ministries of health, education, and sport, in health professional councils, and in districts; 2) development and implementation of evidence-based human resource strategies; 3) advocating for increased funding and support for the health workforce that has increased staffing levels, retention, and productivity; and 4) developing in-service and pre-service training plans.

The availability of human resources for health (HRH) has significantly increased from 58 percent of positions filled in 2012 to 73 percent by May 2018. To sustain and catalyze HRH achievements, the USG conducts quarterly joint USG/MoH meetings on HRH to provide leadership and technical guidance on achievement of HRH priorities. In the past, quarterly meetings have successfully negotiated for appropriation of funds to support the recruitment of 2,504 health workers for HC IIIs and IVs in 96 districts and the absorption of 421 USG-supported health workers. The USG is now working through the HRH initiative to expand performance management implementation to cover all 122 districts in the country with a focus on improved quality of care and coverage, negotiation for absorption of 1,505 unabsorbed contract health workers, and recruitment of 2,000 new health workers. As a result, HRH staffing has increased to 73 percent of positions filled by the end of May 2018.

Capacity building of the NMCP has been continuously supported by the two PMI RAs and two malaria program management specialists on all aspects of malaria control activities and programming. These advisors have played key roles in the country's malaria TWGs, RBM partners' forums, and coordination task forces. Since 2008, PMI has also equipped the NMCP with computers, scanners, and photocopiers.

As part of the wider health system, the private sector continues to play an important role in the delivery of health services in Uganda; per the 2014/15 MIS, among children under five years of age with fever for whom advice or treatment was sought, 49 percent were taken to a private source and 8 percent to other sources such as shops, traditional practitioners, or markets. PMI has been supporting the private sector and increased private sector involvement in malaria control and is currently engaging six major corporations that invested their own funds to provide malaria services to their workers and surrounding communities.

Progress during the last 12-18 months

PMI supported the NMCP to strengthen coordination with malaria stakeholders through the RBM forum, TWGs, malaria scientific sessions, review meetings, assessments (capacity and VHTs) and surveys (e.g., MIS 2014 and DHS 2016), and review of policies, guidelines, manuals, and job aids (e.g., MIP). PMI provided technical assistance to revitalize five major TWGs focused on M&E, integrated vector management, case management, MIP, and SBCC. PMI also supported the USAID/Uganda sector-wide initiative to address human resource shortages and develop the capacity of the health workforce at national and district levels, and the sector-wide private health sector activity.

Re-emphasizing the importance of systems strengthening across vertical programs, USAID/Uganda has recently strengthened its health systems strengthening team and appointed a member to be a part of the PMI/Uganda team. PMI contributed greatly to formulating the health system strengthening strategy for USAID/Uganda, which is focused on four elements: HRH including formalizing CHEWs, health financing, health information, and supply chain. In the last year, continued relationships with the Community Health Department to support the MoH CHEW Strategy (2015-2020) as well as with the Department of Planning at the MoH contributed to finalization of the newly updated health financing strategy 2015/16-2024/25. The GoU has pledged to create a dedicated Presidential Malaria Fund and to mobilize an additional \$785 million for malaria control by 2020 at the Commonwealth Heads of Government Meeting Malaria Summit in April 2018.

Dialogue between the Ministry of Finance and MoH regarding increases to the overall health budget has also been fostered; improving absorption of released funds from the Global Fund and modifying underspent line items in the malaria budget to shift them towards IRS. PMI and the MoH developed the malaria implementation letter, which addresses key policy and implementation focus to achieve common objectives towards malaria control in Uganda.

PMI, in the last year, trained 599 TRPs to conduct malaria mentorships directly with health workers at health facility sites and 5,613 health workers were mentored by TRPs in 534 health facilities. TRPs are not malaria-specific; they have a broader integrated mandate, which includes MCH, TB, leprosy, EPI, etc. TRPs receive didactic/classroom training aimed at building their skills to an expert level so that they can mentor other health workers through on-site, hands-on training. PMI uses this TRP model to effectively address performance problems within the local context of health facilities. Further, through PMI support the NMCP distributed 2,000 job aids in MIP and malaria case management, and printed and distributed 800 guidelines and 500 SBCC materials (brochures for health facilities, key influencers, and IPC agents).

PMI supports strengthening human resource systems for improved healthcare quality and health workforce management practices at the NMCP, DHMT and facility level by contributing to the following activities: 1) Technical assistance for wage analysis and recruitment plans for health workers; 2) drafting of workforce performance management guidelines, which were approved and implemented in 112 districts to improve health worker productivity; and 3) development of attendance tracking tools, which were established in 112 districts and resulted in the absenteeism rate decreasing from 50 percent in 2015 to 11.9 percent in September 2017, thereby improving productivity. In addition, in the last year, PMI worked with the MoH and districts to develop three-year recruitment plans for 2016-2019. PMI also supported the recruitment of 903 new health workers to increase staffing levels, particularly in general and referral hospitals in 27 districts with budget provision for wage payments. The total cumulative contract staff recruited with USG support is 2,687, of which 1,469 (55 percent) have been transitioned and absorbed into public service. Further, the activity supported the drafting of performance management guidelines, which were approved and implemented in 112 districts covering 14 regional referral hospitals, general hospitals,

HC IVs and IIIs to improve health worker productivity. Furthermore, attendance tools for tracking and reporting attendance to duty were established in 112 districts at all HC levels and, as a result, the rate of absenteeism decreased from 50 percent (2015) to 11.9 percent (September 2017), thereby improving productivity.

PMI supported the NMCP to recruit two fellows under CDC's Public Health Fellows Program/FETP. This program offers training for the fellows in epidemiology and disease outbreak investigation. One fellow supports the NMCP's vector control and M&E units and the second fellow supports multiple malaria activities, including coordinating with partners and districts at the subnational level.

As focus shifted from sentinel surveillance to HMIS strengthening, there has been an increasing emphasis on improving case management, data management, surveillance, and reporting at the health facility, district, and national levels using GoU personnel, thus greatly increasing the sustainability of these efforts.

Wherever practical, PMI has implemented malaria control activities together with other major health programs, particularly those for MCH, immunizations, HIV/AIDS, TB, and other vector-borne diseases. PMI focused on the following areas:

- Strengthening health information systems
- Building leadership and technical capacity in the NMCP
- Linking and integrating malaria and MCH health services
- Supporting pharmaceutical and supply chain management
- Improving laboratory diagnostic services
- Coordinating with the proposed health system strengthening initiative to be supported by the Global Fund
- Continuing to seek institutionalization of policies that support rollout of iCCM at the national level
- Linking with the USG effort to advocate local resources to increase national ownership of malaria programming
- Exploring innovative financing that includes performance-based financing
- Exploring more cost-effective options for delivering malaria services at the community level
- Institutionalizing a CHEW system in Uganda

In addition, in the past year, PMI supported placement, training, and small-scale malaria projects through PCVs and their counterparts at the community level. In the last 12 months, PCVs distributed 5,550 ITNs, helped in monitoring net use during the current UCC, participated in IPC, and continued moving house-to-house in the 14 IRS districts as part of SBCC to increase IRS acceptance levels.

PMI continued to coordinate closely with DFID in their focus districts including Mid-North (Apac, Oyam, Kole, Kitgum, Amuru, Agago, Gulu, Lamwo, Nwoya, Pader, and Omoro) and IRS districts (Alebtong, Amolatar, Dokolo, Otuke, and Kaberamaido) to continue to build capacity for diagnosis and treatment in the public and private sector, scale up and strengthen iCCM, and strengthen management of MIP.

Further, in the past two years, DFID supported the implementation of the capacity building plan developed in 2015. The capacity development plan was adopted by MoH in 2016 with four main strategic objectives: 1) strengthen human resource capacity at the NMCP; 2) strengthen planning, programming, supervision, monitoring, and evaluation of malaria control activities; 3) improve coordination and implementation of activities; and 4) revamp the malaria research center to improve its ability to support evidence-based

programming. DFID committed funds through UNICEF and WHO to support MoH/NMCP in the recruitment of four staff to fill staffing gaps, four vehicles to enhance supportive supervision, office space, and supplies including computers and stationery. In terms of staff support, one of the four staff recruited is an advocacy specialist who supports the MoH/NMCP with coordination of RBM activities in the country such as quarterly RBM meetings and follow up of RBM actions; the second staff member is an M&E specialist who helps with HMIS and DHIS2 data, generating trend data that informs NMCP work in the country; the third staff member is an epidemiologist who also works as the deputy program manager, and supports the epidemic response and preparedness function; and the fourth staff member is a drug policy and case management specialist that helps align NMCP activities with the MoH malaria policy and the UMRSP. Further, DFID also committed funds for enhanced surveillance through PMI, and provided funds for nationwide supportive supervision of malaria control and treatment activities.

Plans and justification for proposed activities with FY 2019 funding

PMI will continue supporting the capacity of the NMCP to manage and coordinate multi-sectoral malaria reduction efforts at all levels, including the continuation of regular NMCP technical and management meetings, RBM in-country partnership coordination meetings, and review and planning meetings. PMI will also work with the NMCP to conduct an assessment and develop a long-term strategy for Uganda's HMIS strengthening activities to determine how PMI's investments can best contribute to improving surveillance capacity in Uganda.

In collaboration with PEPFAR and other USG health programs, PMI will continue to support regions and districts to improve health worker productivity, and staff training (pre-service and in-service). PMI will further engage the GoU to increase commitment, transparency, and accountability for resources for malaria control and to mainstream malaria activities into the health sector response. PMI will work with USAID's health system strengthening team through PEPFAR funding to improve efficiency and transparency in the current MoH allocated resources. To enhance the responsiveness of the health infrastructure and increase access to services, PMI will strengthen systems through the expansion of VHTs and iCCM in selected hard-to-reach areas.

PMI will continue supporting the USAID/Uganda sector-wide initiative to address human resource shortages and develop the capacity of the health workforce at national and district levels. The evaluation of this initiative pointed to the need to enhance the performance of the health workforce in terms of the quality of healthcare provision and productivity. In addition, PMI will continue to support performance-based financing, strengthen leadership and management, and harness private sector pre-service training capacity to meet priority HRH needs for malaria control. In addition to continued support for volunteer health workers, PMI will support the implementation of a formal CHEW program in Uganda. The GoU will implement the CHEW structure alongside the existing VHT structure; PMI's iCCM activities will be implemented through the existing VHT structure. USAID/Uganda's district-based programs will implement the HRH support package including leadership capacity development and performance management developed by the HRH initiative. PMI's investment leverages over \$2 million of PEPFAR and other USG health investments for this area of health system strengthening. This activity will also include support for national MoH leadership training.

Furthermore, PMI will continue supporting updating of the curriculum for malaria case management in key institutions that train clinical staff. This will include each cadre of health worker potentially addressing malaria (e.g., doctors, clinical officers, different levels of nurses, midwives, etc.). Once the curriculum is developed, it will be incorporated into the education curriculum in schools across Uganda. PMI also plans to support a platform for health teaching staff to share notes in formal and informal forums

across public and private health worker training institutions to increase the body of knowledge and encourage uniformity in training and practice around malaria case management, which anecdotal reports have shown to be a gap in the country.

PMI will also support the strengthening of national capacity for program planning, management, and monitoring through practical field placements of recent graduates in well-performing malaria programs where they can be mentored by experienced program managers in GoU and NGO institutions. Through these placements, graduates will receive on-the-job training. This initiative will fund two new fellows to follow the malaria track in the two-year FETP.

PMI will continue to support placement, training, and small-scale malaria projects through PCVs at the community level. Small-scale projects enable PMI through PCVs to build and sustain local capacity at the community level. The projects usually meet a pressing community need such as a gap in net distribution or IRS acceptance, and PCVs work with community members on how best to address the gap. The community usually identifies the gap and works with PCVs to arrive at a solution. The projects implemented demonstrate sustainability with communities being involved in design and implementation and taking charge at project closure.

PMI will finalize the recruitment of two staff at the NMCP as part of its contribution to the implementation of the NMCP capacity development plan. In addition, DFID, through UNICEF, will continue its support to the NMCP's capacity building plan, while the Global Fund will continue supporting one staff member. The long-term plan is for these staff to be rolled into the mainstream GoU/MoH payroll after three years of external support.

5. Staffing and administration

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

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

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

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

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

Starting with FY 2016 funds, PMI's Administration & Oversight (A&O) contribution to the Mission was calculated based on total bilateral funding coordinated through the USAID Mission. This includes PMI funding plus funds from additional donors to which A&O costs cannot be directly withdrawn (i.e., DFID). In FY 2016 and FY 2017 this option was exercised for DFID supplemental funding. However, in 2018 a change in the DFID-USAID contract now allows A&O to be withdrawn directly from DFID funding. Therefore, starting in FY 2018, PMI will no longer supplement DFID A&O costs.

Proposed activities with FY 2019 funding

Please see Table 2: Budget Breakdown by Activity for a detailed list of proposed activities with FY 2019 funding.