PMI Insights Project

Malaria Operational Research and Program Evaluation Priorities for the sub-Saharan Africa Region
Full Report

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PMI | U.S. PRESIDENT'S MALARIA INITIATIVE
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Abbreviations

AEA	average expert agreement
ACT	artemisinin-based combination therapy
AFRO	World Health Organization Africa Regional Office
ANC	antenatal care
CE	community engagement
CHW	community health worker
D&A	delivery and access
DR	document review
FA	funding agency
GMP	Global Malaria Programme
GTP	global technical partners
HMIS	health management information system
HSS	health systems strengthening
IPTi	intermittent preventive treatment in infants
IPTp	intermittent preventive treatment in pregnancy
IRS	indoor residual spray
ITN	insecticide treated net
KII	key informant interview
LMIS	logistics management information systems
LSM	larval source management
MDA	mass drug administration
malERA	Malaria Eradication Research Agenda
MESA	Malaria Eradication Scientific Alliance
NMP	national malaria program
OR	operational research
PE	program evaluation
PMI	President's Malaria Initiative
RI	research institution
RPS	research priority score
SBC	social and behavior change
SC	supply chain
SGD	small group discussion
SMC	seasonal malaria chemoprevention
SME	surveillance, monitoring, and evaluation
SP	sulfadoxine/pyrimethamine
SSA	sub-Saharan Africa
TS/CE	targeting and stratification of interventions and cost-effectiveness

Foreword from the Research Prioritization Evaluation Committee Co-Chairs

While substantial progress has been made over the past two decades in the fight against malaria, many endemic countries have seen progress stall or reverse in the last few years due to emerging threats and stagnant funding. To overcome these challenges and reignite gains, national malaria programs and their partners need clear guidance on effective strategies to achieve and maintain high levels of intervention coverage. For improved efficiency and effectiveness, guidance is also needed on how best to deploy new tools and approaches and how to optimize the implementation of selected interventions. Moreover, given the changing transmission landscape over recent years, with even greater heterogenous transmission, many endemic countries are shifting to more tailored and targeted approaches for intervention deployment to optimize the use of available resources and improve overall effectiveness and equity. High-quality research and evidence generation will be critical to guide subnational tailoring of intervention packages, address persistent gaps in coverage, inform timely changes in intervention packages as new tools become available, and ultimately reignite progress and ensure sustained gains in malaria control and elimination.

The U.S. President's Malaria Initiative (PMI) Insights Project, in collaboration with the Université Cheikh Anta Diop of Dakar (UCAD), recently carried out a research prioritization process to identify pressing evidence gaps in malaria control and elimination policy, strategy, and guidance across sub-Saharan Africa (SSA), and to develop a list of broadly relevant, country-driven operational research (OR) and program evaluation (PE) topics to address the persistent challenges faced by national malaria programs. To identify priority OR and PE questions, the Insights Project and UCAD engaged with national malaria programs, local research institutions, and other partners who support malaria programming to discuss what they see as the most pressing operational challenges and bottlenecks. Stakeholders further identified priority research areas, which, if addressed, would have the potential for substantial impact across several country programs. These stakeholders' inputs are critical, as they know best the challenges on the ground and are best positioned to identify potential solutions. Ensuring leadership from national malaria programs and other local researchers in defining the priorities, as well as designing and implementing research to test solutions, will be critical for the successful translation of research to use.

This research prioritization effort represents an important step in the right direction for defining a set of country-driven research priorities. It serves as a

good foundation upon which to build and expand participation and leadership from stakeholders from malaria endemic countries. What is critical now is to ensure strong investment in the identified research priorities and continued partnership with stakeholders from malaria endemic countries to prioritize, design, and implement OR and PE. Their investments will be the true demonstration of the different funding agencies' commitment to locally led and driven malaria programming and research.

Professor Evelyn Korkor Ansah
University of Health and Allied Sciences
Ghana

Professor Roger Tine
Université Cheikh Anta Diop
Senegal

Foreword from funding agencies

The U.S. President's Malaria Initiative, the Bill & Melinda Gates Foundation, and The Global Fund to Fight AIDS, Tuberculosis and Malaria ***share a common goal and commitment to partner with national malaria programs and country stakeholders to reignite and accelerate progress toward ending malaria faster***. To achieve this, our institutions are committed to working with countries to conduct high-quality operational research (OR) and program evaluation (PE) that will address persistent operational challenges and bottlenecks and close key evidence gaps that are impeding achievement of high and sustained coverage of effective malaria interventions. Generating evidence to guide the optimization of current tools and effective deployment of new emerging tools will be critical to the achievement of national malaria strategic plan goals and targets and to moving more countries closer to elimination.

To guide our work, we commissioned a broad stakeholder consultation process across sub-Saharan Africa to identify a set of country-driven OR and PE priorities that, if addressed, could contribute to improved coverage of effective malaria interventions and greater impact on the malaria burden across malaria-endemic countries in the region. This effort aims to build on other recent research prioritization initiatives to guide decision-making on research investments, but with a dedicated focus on addressing the most pressing operational bottlenecks and evidence gaps in malaria policy, strategy, and implementation guidelines identified by malaria-endemic country stakeholders. ***The impetus behind this research prioritization effort comes out of a shared objective across our institutions to improve the collaboration, coordination, efficiency, and impact of our collective research investments, and to ensure our investments are in country-identified research priority areas***. To make clear our institutions' shared commitment to this endeavor, we signed a memorandum of understanding that outlines our vision for jointly defining, prioritizing, and supporting country-led implementation of OR and PE moving forward.

The set of defined priorities identified through this prioritization will serve as a key resource for informing our institutions' decision-making around investments in OR and PE. Our hope is that the defined list of priorities will also serve as a valuable resource for country national malaria programs and partners as they identify areas of alignment with their own individual country priorities and support the broader aims for greater collaboration, shared learning, and impact of research efforts across the region. ***We recognize that defining this list is an important starting point; however, our true commitment will be demonstrated through continued partnership with national malaria programs to address key OR and PE priorities within their context and***

ensuring strong local leadership in the prioritization, design, and implementation of OR and PE. To this end, we commit to continued dialogue and engagement with country partners to refine and improve upon the process for defining OR and PE priorities, to ensure the process is country-driven, inclusive, and remains relevant for country national malaria programs. To measure the use and success of the prioritization effort, our institutions —will broadly disseminate, track, and share progress against the defined set of priorities with the broader malaria community.

We are committed to a lasting partnership with national malaria programs and country stakeholders to continually define and invest in country-driven research priorities to ensure the greatest impact. To achieve the shared goal of ending malaria faster, we must work together with countries through partnerships that are both strong and equitable.

Julie Wallace
Acting U.S. Global Malaria Coordinator
U.S. President's Malaria Initiative

Philip Welkhoff
Director, Malaria
The Bill & Melinda Gates Foundation

Scott Filler
Head of Malaria
The Global Fund to Fight AIDS, Tuberculosis and Malaria

Acknowledgments

The malaria operational research (OR) and program evaluation (PE) prioritization process was carried out by the U.S. President's Malaria Initiative (PMI) Insights Project in collaboration with the University Cheikh Anta Diop of Dakar (UCAD) in Senegal. The process involved a broad stakeholder consultation process to gather malaria experts' inputs to define a set of priority operational research and program evaluation topics. We are incredibly grateful for the valuable inputs that were provided by several representatives from national malaria programs and research institutions in sub-Saharan Africa, World Health Organization (WHO) country offices and African Regional Office (AFRO), funding agency staff from PMI within the U.S. Agency for International Development and the Centers for Disease Control and Prevention, National Institutes of Health, the Bill & Melinda Gates Foundation, and The Global Fund to Fight AIDS, Tuberculosis, and Malaria, and other technical partners who support malaria implementation and research within sub-Saharan Africa.

An external evaluation committee was formed to support the evaluation and prioritization of the identified OR and PE topics. Committee members were responsible for individually evaluating and scoring the identified OR and PE topics across a set of defined evaluation criteria and then engaging is two sessions to review and discuss the evaluation scores and provide inputs on the phrasing of the research topics. We are extremely appreciative of the time, commitment, and invaluable contributions made by the committee members into this process. The committee was served by two co-chairs: Professor Evelyn Ansah (University of Health and Allied Sciences of Ghana) and Professor Roger Tine (University Cheikh Anta Diop of Dakar, Senegal). Committee members included: (1) Alassane Dicko (Malaria Research and Training Centre at the University of Bamako, Mali); (2) Baltazar Candrinho (National Malaria Control Programme in Mozambique); (3) Busiku Hamainza (National Malaria Elimination Centre in Zambia); (4) Catherine Maiteki-Sebuguzi (National Malaria Control Program in Uganda); (5) Charles M'bogo (Kenya Medical Research Institute and Pan-African Mosquito Control Association); (6) Corine Karema (Independent Consultant, Quality and Equity Healthcare, Kigali-Rwanda); (7) Corine Ngufor (Conotou Entomological Research Centre (CREC)/London School of Hygiene and Tropical Medicine (LSHTM) Collaborative Research Programme); (8) Don Mathanga (Malaria Alert Centre within the College of Medicine at the University of Malawi; (9) Dorothy Achu (National Malaria Control Program in Cameroon); (10) Elizabeth Juma (WHO/Ghana); (11) Fitsum Tadesse (Armauer Hansen Research Institute in Ethiopia); (12) Jaishree Raman (Malaria Research Unit at South African Medical Research Council); (13) Khoti Gausi (WHO/South Sudan); (14) Perpetua Uhomoibhi (National Malaria Elimination Programme in Nigeria); and (15) Rose Leke (University of Yaoundé in Cameroon).

The PMI Insights Project designed and carried out the research prioritization process in collaboration with UCAD. From the PMI Insights team at PATH, Samantha Herrera led the design of the protocol and stakeholder consultation tools, the synthesis of the inputs across the different stakeholder groups, and oversaw the implementation of the research prioritization process, with invaluable guidance and technical inputs from Megan Littrell, Larry Slutsker, and Kamm Schneider. From the PMI Insights team at the University of California, San Francisco Malaria Elimination Initiative, Kyle Daniels and Cara Smith Gueye led the stakeholder consultations with representatives from the Gates Foundation, the Global Fund, the National Institutes of Health (NIH), PMI, and WHO, and led the synthesis and writing up of the key findings from the consultations. From UCAD, Roger Tine led the stakeholder consultations with the national malaria programs and malaria-endemic research institutions, and the synthesis and writing

up of the inputs, with support from Pascal Ndiaye (Mabouyas Solutions), Mouhamed Badjii (UCAD), and Fassiatou Tairou (UCAD). Valuable inputs into the protocol and process were provided by Jimee Hwang, Jenny Carlson, Rick Steketee, and Frank Burkybile from the PMI Operational Research Management Team, Abigail Pratt from the Gates Foundation, and Roopal Patel from the Global Fund.

Executive summary

Background

In a time of stalled progress and multiple threats to effective malaria control, national malaria programs (NMPs) and their partners need clear, evidence-based guidance for best practices for control and elimination, achieving and maintaining high levels of coverage, and deploying new tools and approaches. Limited opportunities exist to coordinate and identify pressing issues that have broad relevance across malaria-endemic countries and that, if addressed, have the potential for substantial impact across multiple country programs. Given the limited resources available for operational research (OR) and program evaluation (PE), providing a platform to bring together key malaria stakeholders to discuss and prioritize potential research may contribute to improved collaboration, coordination, efficiency, and impact of efforts. Policy, strategy, and operational decisions must be grounded in high-quality evidence to reignite gains and accelerate progress toward the goals and targets outlined in the World Health Organization (WHO) Global Technical Strategy for Malaria 2016-2030 and Sustainable Development Goal 3.

To address this critical need, the US President's Malaria Initiative (PMI) Insights Project, in collaboration with the Université Cheikh Anta Diop in Dakar, facilitated a stakeholder consultation process to identify pressing knowledge and implementation gaps in malaria control and elimination policy, strategy, and guidelines, and to develop a priority list of OR and PE topics to address the identified gaps for the sub-Saharan Africa (SSA) region. The overall aim of this effort is to foster greater alignment of priority research areas identified by NMPs and malaria-endemic country stakeholders with funding agency priorities, thereby facilitating a more coordinated and impactful approach to future OR and PE funding investments.

Methodology

The research prioritization setting process used a mixed methods approach, consisting of a document review followed by a consultative process with individuals from five key stakeholder groups: (1) NMPs from PMI focal countries in SSA, (2) malaria-endemic research institutions within SSA, (3) funding agencies (PMI, the Gates Foundation, and The Global Fund), (4) WHO representatives from the African Regional Office (AFRO) and country offices in SSA, and (5) global technical partners supporting malaria programming and research.

Stakeholders from the five groups were engaged to provide inputs through a mix of key informant interviews, small group discussions, and an online survey. The focus of the consultations was on gathering stakeholder inputs on key operational challenges faced by NMPs in the implementation of their programs; pressing evidence gaps in malaria policy, strategy, and implementation guidance; and priority OR and PE questions to address the challenges and gaps. PMI Insights developed an organizing framework consisting of thematic areas that guided the information gathered through the document review and the data capture and synthesis of stakeholder inputs.

Emerging OR and PE priority topics were identified through the synthesis of the stakeholder consultations and document review and then underwent an evaluation process. To carry out the evaluation, an external evaluation committee was formed of 17 members of NMPs, malaria-endemic research institutions, and WHO country staff from SSA. Committee members were identified through a solicitation of interest; of those that expressed interest, a shortlist of candidates was selected to ensure

diverse representation across geographic areas in SSA, malaria area(s) of technical expertise, gender, and type of institution. The committee was responsible for evaluating and ranking the identified priority OR and PE topics across a set of six defined evaluation criteria: (1) broad relevance, (2) high impact on malaria burden, (3) improves efficiency, (4) addresses inequities, (5) scalability and sustainability, and (6) feasibility of the research. Evaluation scores across the criteria were aggregated across evaluators, resulting in an overall ranking across topics. Evaluation committee members convened to review and discuss the scores and to provide inputs on the rephrasing of selected research topics to improve clarity and precision.

Findings

Altogether, 47 interviews (a mix of key informant and small group discussions) were conducted with 82 individuals from NMPs, research institutions, funding agency staff, and WHO. Forty-six global technical partners provided inputs through the online survey. A multitude of operational challenges and bottlenecks were identified across five core interventions areas: prevention; chemoprevention; case management; surveillance, monitoring, and evaluation (SME); and community engagement (CE)/social and behavior change (SBC). Most of the operational challenges identified were related to poor-quality delivery of the intervention, limited or lack of access to interventions, and broader health systems issues related to insufficient financing, limited numbers of trained health workers, poor data capture and use resulting in non-evidence-based programming, and lack of engagement and coordination with the private sector.

Key themes emerging from the synthesis of evidence gaps were around the lack of evidence on the effectiveness and cost-effectiveness of different interventions and intervention packages. Given the heterogeneity of country settings and transmission contexts, stakeholders noted the need for greater evidence generation around the impact of specific interventions and intervention packages across different contexts to more effectively guide NMP programming, as well as more information on cost-effectiveness of intervention packages given the resource constraints faced by NMPs. Another crosscutting theme was around the need for guidance on effective approaches to tackle persistent barriers that have impeded NMPs from achieving their intervention coverage targets. For vector control specifically, a key evidence gap noted was around effective delivery mechanisms and intervention packages for hard-to-reach populations. In case management, a need for more evidence on effective approaches or strategies to improve the quality of malaria case management was highlighted. For SME, a highlighted knowledge gap was on understanding the essential data elements and granularity needed to effectively guide program design and adaptation.

A total of 33 priority OR and PE topics were identified through the synthesis of the inputs from the stakeholder consultations and document review. By key intervention area, ten OR and PE topics were identified for prevention, seven for chemoprevention, seven for case management, five for SME, two for CE/SBC, and two in other crosscutting areas. Most research topics focused on generating evidence needed to close gaps in intervention coverage, as well as address persistent challenges faced by NMPs in the implementation of core interventions that have been included in national malaria strategic plans for many years. Several topics also spoke to broader health systems issues. These included: addressing challenges related to the delivery of interventions to the most vulnerable, and often the unreached; suboptimal quality of care; poor data quality and use of data to guide evidence-based programming; supply chain issues; and poor engagement of the private sector with the NMP in the delivery of quality care. The topics ranked in the top 10 by the evaluation committee are summarized in Table E1.

Table E1. Top ranked operational research and program evaluation topics.

Rank	Operational research/program evaluation topic
1	Test and evaluate different delivery mechanisms to reach and sustain high coverage of insecticide treated nets (ITNs) among hard-to-reach and highest risk populations.
2	Evaluate the effectiveness and cost-effectiveness of different strategies for deploying the RTS,S AS01 malaria vaccine with chemoprevention.
3*	Assess the effectiveness and cost-effectiveness of different intervention combinations (includes vector control and chemoprevention interventions) to better understand how interventions should be combined to maximize impact.
3*	Test and evaluate approaches or interventions to reduce the frequency of stockouts of key commodities for malaria case management, especially at the community level.
5	Evaluate and compare different insecticide management and/or rotation strategies on insecticide resistance prevalence and intensity (crosscuts use of ITNs and indoor residual spraying [IRS]).
6	Evaluate the impact and cost-effectiveness of expanding the age range, geographical coverage, and rounds of treatment of seasonal malaria chemoprevention.
7	Assess factors associated with volunteer community health worker (CHW) cadres' motivation and retention and evaluate different approaches or interventions to improve volunteer CHW motivation and retention.
8	Assess predictors of adherence to and determinants of uptake of seasonal malaria chemoprevention and evaluate different strategies to achieving high SMC coverage and adherence.
9	Test and evaluate the effectiveness of different deployment and targeting approaches for IRS to maximize impact.
10*	Assess different approaches or interventions to improve the analytic and data use capacity, and data use culture, at different levels of the health system.
10*	Assess the impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance.
10*	Given the challenges with ITN durability, test and evaluate the effectiveness of different approaches to improve routine/continuous distribution channels for ITNs to sustain coverage between mass campaigns.

Note: * indicates the research topics received the same overall ranking score.

Conclusion

The prioritization setting process engaged stakeholders to develop a prioritized list of malaria OR and PE topics grounded in endemic country perspectives and priorities. The resulting list identifies the critical evidence gaps that are perceived to be impeding achievement of high coverage of malaria interventions and the effective deployment of new tools. Addressing these evidence gaps will be important for overcoming the critical operational challenges that NMPs face in the implementation of their malaria control programs. The prioritized list of topics is a key resource for maximizing the relevance and impact of OR and PE investments by ensuring that research investments focus on the evidence needed to strengthen national strategies and program guidelines. The list should be used to inform the funding of country-driven research within the SSA region that will contribute to closing critical gaps in intervention coverage and ensuring continued progress toward improved malaria control and elimination.

I. Background and rationale

In a time of stalled progress and multiple threats to effective malaria control, national malaria programs (NMPs) and their partners need clear, evidence-based guidance for best practices for control and elimination, achieving and maintaining high levels of coverage, and deploying new tools and approaches. The current approach for identifying operational research (OR) and program evaluation (PE) priorities varies across malaria-endemic countries. Several countries have processes in place to define their own set of research priorities for malaria control and elimination; however, limited opportunities exist to coordinate and identify issues of broad relevance across malaria-endemic countries that, if addressed, have the potential for substantial impact across multiple country programs. In light of the limited available resources for OR and PE, a platform for bringing together malaria-endemic country stakeholders, donors, and other key implementation partners to discuss and prioritize research priorities can help improve collaboration, coordination, efficiency, and impact of research efforts. Ensuring more cohesive and inclusive approaches to prioritizing, generating, and sharing such research and evaluation data will be essential to enable the global malaria community to remain on track to meet goals and targets for malaria burden and mortality reduction as defined in the World Health Organization (WHO) Global Technical Strategy for Malaria 2016–2030 and Sustainable Development Goal 3. Policy, strategy, and operational decisions must be grounded in high-quality evidence to reignite gains and accelerate progress toward these goals.

Given this critical need, the US President's Malaria Initiative (PMI) funded the PMI Insights Project, a multidisciplinary partnership tasked with generating and catalyzing the use of OR and PE evidence to inform malaria program decision-making. The project works in partnership with PMI, The Global Fund to Fight AIDS, Tuberculosis and Malaria, the Bill & Melinda Gates Foundation, and in-country NMPs and research institutions to achieve this goal. In collaboration with the Université Cheikh Anta Diop (UCAD) in Dakar, Senegal, the PMI Insights Project facilitated a stakeholder consultative process to identify pressing gaps in malaria control and elimination policy, strategy, and guidelines, and to define a priority list of OR and PE topics to address and close the identified gaps for the sub-Saharan Africa (SSA) region. The resulting list of topics from this process aimed to build upon and align with other malaria research prioritization setting processes at the country, regional, and global level that were recently undertaken, and serve as a resource document for funding agencies and researchers to inform the selection of and investment in future OR and PE.

To guide the development of the prioritized list of OR and PE topics, the PMI Insights team developed an organizing framework and protocol.[1,2] In this report, we summarize the research prioritization methodology, present the key findings from the research prioritization setting process and the final prioritized list of OR and PE topics, and highlight key takeaways from the research prioritization process and recommendations for the use of the outputs.

II. Research prioritization objective and scope

The main objective of the research prioritization setting process was to develop a priority list of OR and PE topics that identifies and serves to address the most pressing operational challenges and evidence

[1] PMI Insights Project. 2021. Malaria Operational Research Prioritization Framework.
[2] PMI Insights Project. 2021. Malaria Operational Research Prioritization Protocol.

gaps in malaria control and elimination policy, strategy, and implementation guidance for countries in SSA. The overall aim of this effort is to foster greater alignment of priority research areas identified by NMPs and malaria-endemic country stakeholders with funding agency priorities, thereby facilitating a more coordinated and impactful approach to donor investments in the identified research priority areas.

The scope of the research priorities list is inclusive of OR and PE questions for malaria control and elimination interventions that have promising evidence demonstrating their safety and efficacy and for approaches and tools designed to improve the delivery and effectiveness of proven malaria control and elimination interventions. The scope of the research priorities list *is not inclusive* of "upstream" research related to the early development of new tools (e.g., product development or initial safety and efficacy trials of new products) for malaria control and elimination, nor routine entomological monitoring for evaluating insecticide resistance or therapeutic efficacy studies of antimalarials.

The aim of the prioritized list was to identify common research questions that have the potential to provide learning to inform strategies, policies, or implementation guidance for multiple NMPs, or for the global malaria community more broadly. The geographic scope for the stakeholder consultation process included malaria-endemic countries in SSA, with a focus on PMI's 24 focus countries in the region.

III. Key definitions

Operational research (OR), as defined by PMI, is the "application of social science research methods, statistical analysis, and other appropriate scientific methods to judge, compare, and improve policies and program outcomes from the earliest stages of defining and designing programs through their development and implementation with the objective of the rapid dissemination of conclusions and concrete impact on programming."[3]

Program evaluation (PE) is defined as the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgements about program design, improve program effectiveness, and/or inform decisions about future program development.[4] Findings are intended to inform decisions about program implementation. The research prioritization setting activity will address program evaluation questions that have broad applicability across multiple country malaria programs.

IV. Methodology for research prioritization setting

Overview

The OR and PE prioritization setting process used a mixed methods approach, consisting of a document review and a consultative process with individuals recruited from the following key stakeholder groups.

1. National malaria programs (NMPs) from PMI focal countries within SSA.
2. Malaria-endemic research institutions (RIs) within SSA.
3. Funding agencies, including PMI, the Gates Foundation, and the Global Fund.
4. WHO country representatives from the Global Malaria Programme (GMP) and Africa Regional Office (AFRO).

[3] President's Malaria Initiative authorizing legislation definition of operational research under the Lantos-Hyde Act, 2008.
[4] Patton MQ. Utilization-focused evaluation: the new century text. 3rd ed. Thousand Oaks, C: Sage, 1997.

5. Global technical partners (GTP) working in/providing support to malaria programming and research (e.g., non-profit organizations and academic institutions outside of SSA).

Stakeholders from each of the five groups were engaged to provide inputs into the research prioritization setting process through a mix of approaches, including key informant interviews (KIIs), small group discussions (SGDs), and an online survey.

Document review and synthesis

The document review included a review of relevant documents, meeting reports, and other literature encompassing the following key topic areas: (1) key malaria operational challenges/bottlenecks faced by NMPs in the implementation of their programs and evidence gaps in national or global malaria policy, strategy, and/or implementation guidance across the thematic areas outlined in the OR and PE Prioritization Framework (see Table 2); (2) outputs from recent national, regional, and/or global level research prioritization processes; and (3) recent and current funding efforts for malaria-related OR and PE. Table 1 summarizes the documents included in the review. To keep the review focused and relevant to the current situation of NMPs, the scope of the document review was limited to documents, reports, and literature from 2015 to the present and focused predominantly on PMI focus countries.

Table 1. Documents included in review.

Document review focus area	Type of documents reviewed
Malaria operational challenges/bottlenecks and evidence gaps in national and global malaria policy, strategy, and implementation guidance across thematic areas.	• Current or most recent National Malaria Strategic Plans from PMI focus countries • PMI Malaria Operational Plans from FY2019 and FY2020 • WHO Malaria Programme Review or Mid-term Review reports from PMI focus countries • WHO Evidence Review Group meeting reports or other similar technical consultations • WHO Global Malaria Programme guideline development group meeting reports • WHO Malaria Policy and Advisory Committee meeting reports • Roll Back Malaria (RBM) Working Group meeting reports • Cochrane reviews of specific interventions • Other recent country or regional malaria program evaluation reports or meeting reports documenting operational challenges/bottlenecks and/or evidence gaps in malaria control and elimination
Outputs from recent national, regional, and/or global level research prioritization processes.	• Country level malaria research prioritization agendas from PMI focus countries • Regional level malaria research prioritization agendas from SSA • Global/donor level malaria research prioritization research outputs (malERA Refresh 2017, PMI OR priorities, WHO Evidence Review Group meeting reports)
Recent and current funding efforts for malaria-related OR and PE.	• MESA track database • National Institute of Health WorldRePORT (https://worldreport.nih.gov/) • PMI Malaria Operational Plans from FY2019, FY2020, and FY2021*

Note: PMI Malaria Operational Plan for FY2021 was not available for inclusion at the time of the review; however, lists of current/ongoing PE and OR from the FY2021 Malaria Operational Plans were shared with the PMI Insights team for incorporation.

The PMI Insights team searched for relevant documents from key websites of malaria funding agencies and WHO, NMP websites for PMI focus countries, regional malaria initiative websites (e.g., Elimination 8), and the MESA Track website. A complementary search of PubMed and Google was also conducted to help identify additional outputs from previous research prioritization setting processes at country and regional levels. The search terms used for this include: malaria, malaria control, malaria elimination, operational research/operations research, prioritization/priority agenda, prioritization setting/priority setting, and program evaluation.

All documents were reviewed, coded, and analyzed using the online qualitative software program Dedoose.[5] Thematic codes for the analysis included the three key topic areas of the document review and the thematic areas outlined in the research prioritization framework document (Table 2). Key information on the specific type of document and the level of the document (national, regional, or global) was also captured. Further details on the methodology, the full list of documents reviewed, and the key findings can be found in a separate report.[6] In this report, the document review findings have been synthesized and triangulated with the findings from the stakeholder consultations.

Table 2. Thematic areas for the research prioritization.

Thematic Area	Description
1 Prevention *Core thematic area*	This area is inclusive of indoor residual spraying (IRS), insecticide-treated nets (ITNs), larval source management (LSM) and other prevention interventions such as the RTS,S AS01 malaria vaccine.
2 Chemoprevention *Core thematic area*	This area is inclusive of intermittent preventive treatment in pregnancy (IPTp), intermittent preventive treatment in infants (IPTi), seasonal malaria chemoprevention (SMC), and drug administration (e.g., mass drug administration, reactive or targeted drug administration).
3 Case management (CM) *Core thematic area*	This area is inclusive of care seeking; diagnosis, treatment, and referral systems for malaria; and implementation approaches to deliver malaria case management across the different networks of care (public, private, and community), such as approaches to improve coverage, access, and quality of case management and referral systems.
4 Surveillance, monitoring, and evaluation (SME) *Core thematic area*	This area is inclusive of malaria epidemiological and entomological surveillance systems, monitoring and evaluation systems, and country health management information systems (HMIS). It encompasses systems' capabilities to prepare and respond in a timely manner to disease outbreaks/cases and to detect and mitigate against threats such as drug and insecticide resistance.
5 Community engagement (CE) and social and behavior change (SBC) *Crosscutting thematic area*	This area includes community engagement or mobilization interventions, which are inclusive of social and behavior change interventions and approaches aimed at addressing coverage gaps or barriers in use of malaria prevention and control interventions.
6 Delivery and access (D&A) *Crosscutting thematic area*	This area deals with the management and delivery of safe and high-quality health interventions and services, and issues related to target populations' (e.g., high-risk, hard-to-reach, vulnerable, and mobile and migrant populations) access to interventions and services when they need them. It also encompasses aspects related to enhancing the delivery of interventions, such as aspects related to

[5] Dedoose qualitative software, https://www.dedoose.com/.
[6] PMI Insights Project. 2021. Malaria Operational Research Prioritization Document Review Report.

		integrated delivery of interventions and the use of digital approaches to increase quality and or efficiency of intervention delivery.
7	Supply chain (SC) *Crosscutting thematic area*	This area encompasses the systems and processes involved in the procurement and distribution of malaria medicines and other commodities.
8	Health systems strengthening (HSS) *Crosscutting thematic area*	This area comprises approaches and interventions that more broadly address challenges and barriers across the different health system building blocks (beyond the previously noted service delivery and supply chain aspects) and is inclusive of community health systems. It also encompasses specific challenges or issues related to scaling up proven interventions or approaches, sustainability, and local ownership.
9	Targeting and stratification of interventions and cost-effectiveness (TS/CE) *Crosscutting thematic area*	This area encompasses strategies and approaches specifically for the targeting, tailoring, and stratification of malaria control interventions or intervention packages to improve effectiveness and efficiency in delivery. This area is inclusive of assessments of cost-effectiveness of interventions and intervention packages.

Note: Thematic areas that represent core intervention areas are highlighted in color; crosscutting thematic areas are highlighted in gray.

Stakeholder mapping

A stakeholder mapping was conducted to identify key stakeholders in each of the five target stakeholder groups. PMI Insights project partners, UCAD, PMI, the Gates Foundation, the Global Fund, and WHO were consulted and asked to provide recommendations for individuals to be included in the consultations across the different stakeholder types. Additionally, individuals working in organizations and projects conducting malaria research and program implementation in SSA were identified through the RBM working group member lists and organization/project websites. For the NMPs, PMI Resident Advisors were asked to conduct the initial outreach to selected countries, and NMP Directors were asked to identify individuals from their institution to participate in the SGD. In addition, during stakeholder consultations, participants were asked to share information on other individuals to be included in the consultation process. The stakeholder consultation list was used to select individuals for interviews/SGDs and for the online survey.

Interviews and small group discussions

KIIs and SGDs were conducted with malaria stakeholders using a structured interview tool to gather information on their perceptions of key malaria operational challenges and bottlenecks faced by NMPs; knowledge gaps that NMPs face in being able to drive evidence-based decision-making; knowledge of recent or current malaria-related research agenda setting outputs or processes (e.g., national or institutional level); and what respondents perceived as key priority OR and PE questions for NMPs and the global malaria community. In addition to these questions, key background characteristics of the participants were captured (e.g., position, type of organization, and country).

Participant sampling and selection

KIIs and SGDs were conducted with representatives from NMPs, in-country research institutions, WHO, and funding agencies, including PMI, the Gates Foundation, and the Global Fund (Table 3). Participants were selected purposively based on their role/position and background experience working

in malaria control and elimination programming and/or research. Additionally, participants were sampled in a way that ensured a good mix of experience working in or knowledge of the different transmission settings (high/moderate transmission, low transmission, and very low settings) and representation across different geographical areas in SSA. Representatives from each of the NMPs and RIs selected participated in either KIIs or SGDs according to participant availability. For SGDs, participants represented only one institution; no mixing was done across different NMPs or research institutions. The number of participants in each SGD ranged from two to five, with an average of three participants. Several follow-up communications were made to each of the selected NMPs and RIs in the event of non-response. Altogether, four alternate NMPs and five RIs were selected as replacements from the initial sample. Four NMPs and 12 RIs did not respond to the invitation to participate in the KIIs/SGDs.

Table 3. Summary of key informant interviews and small group discussions conducted.

Stakeholder type	Proposed sample	Total number of interviews/small group discussions conducted
National Malaria Program (NMP) representatives	15 KIIs/SDGs with NMPs in Angola, Burkina Faso, Cameroon, DRC, Ghana, Kenya, Madagascar, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Uganda, Zambia, and Zimbabwe	14 KIIs/SGDs with NMPs from the following countries: Benin, Burkina Faso, DRC, Ghana, Kenya, Liberia, Madagascar, Mozambique, Nigeria, Rwanda, Senegal, Uganda, Zambia, and Zimbabwe.
Malaria-endemic research institutions (RIs)	18 research institutions (~3–5 per region: Central Africa, East Africa, Southern Africa, and West Africa)	11 KIIs/SGDs with institutions from the following countries: in Burkina Faso (Centre National de Recherche et de Formation sur le Paludisme and Institut de Recherche en Sciences de la Santé), Cameroon (University of Yaoundé), Ghana (University of Health and Allied Sciences and Kintampo Health Research Center), Madagascar (Institut Pasteur and CNARP), Senegal, (Unviersité de Thies, UCAD), Tanzania (Ifakara Health Research Institute), and Mozambique (INS).
Funding agency (FA) staff	PMI Technical Advisors (HQ level) across the different thematic areas (1–2 per thematic area [prevention, chemoprevention, case management, SME, SBC], 5–10 total) PMI Country Teams (1–2 per geographic area, 4–8 total) Global Fund Malaria Program Staff (4–6, across different thematic areas) Gates Foundation Malaria Program Staff (4–6, across different thematic areas [e.g., vector control, delivery, SME, CM, etc.])	18 KIIs/SGDs completed 5 SGDs with PMI Technical Advisors across the following thematic areas: vector control/prevention; malaria in pregnancy, case management, SME, SBC, and community health 3 SDGs with NIH and CDC Malaria Technical Advisors 4 PMI Country Teams: Ethiopia, Madagascar, Mozambique, and Tanzania (Mainland and Zanzibar) 1 SGD with Global Fund Malaria Program Staff 5 KIIs/SGDs with Gates Foundation Malaria Program Staff
World Health Organization (WHO) regional and	WHO representatives from the GMP (~2–4 at regional level (WHO AFRO) and 1–2 country regional representatives across the 4	4 KIIs/SGDs completed (1 with WHO/AFRO, 3 with country office representatives from Central, East, Southern, and West Africa)

country representatives	geographic areas (Central Africa, East Africa, Southern Africa, and West Africa)	
Total	**Proposed: ~51-60 interviews**	**47 KIIs/SGDs (82 individuals)**

Recruitment of participants

Selected participants from the funding agencies, WHO, and RIs were invited to participate in an interview via email. For the NMPs, PMI Resident Advisors in the selected countries contacted NMP Directors to discuss the stakeholder consultation process and invite them to participate in the interview. For NMP and malaria-endemic research institution participants, the initial individual(s) contacted were encouraged to invite other potential representatives from the program/institution to participate in the consultation.

Data collection method

Interviews were conducted virtually using Microsoft Teams or Zoom. A semi-structured interview guide was used for the interviews, which was tailored for each stakeholder group (see Annex 1 for interview guides). Interview guides were developed in English, French, and Portuguese. The interview guide for the NMPs and RIs was pilot tested with a few staff members from the PATH Senegal office, who had worked previously for and/or currently work directly with the Senegal NMP. The pilot testing was aimed at assessing participant understanding of interview questions and interview length. No changes were made to the interview guides based on the pilot-testing experience.

Prior to the start of every interview, participants were read a short consent script and asked for their verbal consent to participate in the interview and, if they agreed, whether they consented to be audio-recorded. Interviews were run by a moderator and a note-taker and were audio-recorded. Interviews were conducted in English, French, and Portuguese, and took approximately 1–1.5 hours to conduct.

Stakeholder online survey(s)

An online survey questionnaire was used to gather inputs from country and GTPs who support malaria programming and/or research in SSA. The online survey included questions on the participant's perception of key operational challenges faced by NMPs; pressing evidence/knowledge gaps in malaria policy, strategy, and implementation guidance; and priority OR and PE questions to address the challenges and gaps. Key background characteristics of the participants were also captured (e.g., position and type of organization, country, areas of malaria technical expertise). Survey questionnaires were sent out in English and French (see Annex 1 for the survey questionnaires).

Participant selection and recruitment

The survey was sent to a total of 151 individuals identified during the stakeholder mapping process that were not selected to participate in KIIs or SGDs (see Annex 2 for list of the institutions targeted through the outreach to the 151 individuals and the institutions that participated in the survey). An email was sent out to each of the targeted stakeholders with information on the research prioritization setting process and a link to the online survey. A short consent script was provided at the start of the survey questionnaire, which included information on the research prioritization setting process, the purpose of the survey, the type of information being gathered, why the participant was selected, the benefits and risks to participating, information on confidentiality of their survey answers, and how the information will be used.

Data collection method

The survey questionnaire was developed in SurveyMonkey. The link to the online survey questionnaire was shared via email. Several reminder emails were sent to participants to encourage their participation in the survey. The survey was kept open for six weeks, between August and September 2021. The survey questionnaire included a mix of short answer and open-ended questions.

The aggregate data from the online survey were exported for further review and analysis into an Excel-based spreadsheet.

Data synthesis and evaluation of research priorities

Analytic approach

The analysis of the data collected through the various methods was guided by the research prioritization framework. The data was synthesized and organized by the defined key thematic areas in the framework and, as relevant, also grouped by transmission setting. Commonly cited challenges and bottlenecks in the implementation of malaria control and elimination programs; pressing evidence gaps in malaria policy, strategy, and implementation guidance; and commonly identified OR and PE questions were synthesized and summarized across the key thematic areas.

OR and PE questions that were identified by multiple stakeholder groups and through the document review (at least three sources) or within at least three of the NMPs and/or RI consultations were put forward for the evaluation process.

Research priority evaluation process

To conduct the evaluation of the identified OR and PE topics, the PMI Insights team formed an evaluation committee made up of representatives of NMPs, RIs, and WHO AFRO. Potential candidates for the committee were identified through the stakeholder mapping and in consultation with UCAD, PMI Insights consortium partners, and the PMI OR management team. A solicitation of interest was sent out to 40 identified candidates. Of those that expressed interest, a shortlist of candidates was selected to ensure diverse representation across geographic areas in SSA, malaria area(s) of technical expertise, gender, and type of institution. In total, 17 individuals committed to participate on the committee. Terms of reference were developed to guide the work of the evaluation committee (see Annex 3 and 4 for the terms of reference and evaluation committee member list). Committee members received an honorarium for serving on the committee.

The PMI Insights team adapted the evaluation process and scoring methodology from the Child Health and Nutrition Research Initiative research priority setting methodology.[7] For the evaluation process, committee members were asked to individually evaluate the identified OR and PE questions across six evaluation criteria outlined in the research prioritization framework. For each evaluation criterion, the evaluator was asked one to two questions to assess whether the identified research question/topic satisfied the evaluation criteria (Table 4, refer also to Annex 5 for the full evaluation tool). Evaluators used a five-point Likert scale to score the OR and PE topics across the evaluation questions. Evaluators also were given the option to note "do not know" if they did not feel able to score the research topic against the criteria. For each OR and PE question, a research priority score (RPS) and average expert agreement (AEA) score was calculated. The RPS was calculated by taking the average score across all

[7] Rudan, I., Gibson, JL, Ameratunga, S., et al. 2008. Setting priorities in global child health research investments: Guidelines for implementation of the CHNRI method. Croat. Med Journal; 49(6): 720-733. doi: 10.3325/cmj.2008.49.720

criteria, for each OR and PE question. The AEA was calculated as the percent of evaluators who chose the mode (the most common score) for each OR and PE evaluation criteria question, averaged across the ten evaluation questions. Responses that received a "do not know" were not included in the overall calculation of the RPS and AEA.

Table 4. Evaluation criteria and questions.

Evaluation Criteria	Questions
Broad relevance	Q1. Is it likely the research findings could inform policy, strategy, or implementation guidance across several (3+) malaria-endemic countries?
High impact on malaria burden	Q2. Does the research question address a significant barrier to achieving coverage targets of a proven or new promising malaria control or elimination intervention? Q3. Is it likely the research would enable or lead to a substantial reduction in malaria burden or bring a setting(s) closer to elimination?
Improves efficiency	Q4. Is it likely the research could inform how to optimize the delivery of an intervention in terms of reducing unnecessary costs or resources? Q5. Is it likely the research would inform how to improve the quality or overall effectiveness of an intervention?
Addresses inequities	Q6. Would populations most-at-risk for and/or most vulnerable to malaria likely benefit from the research after the findings have been applied or implemented? Q7. Does answering the research question have the potential to lead to more equitable coverage of interventions or in the disease burden distribution in the mid- or long-term (5–10 years)?
Scalability and sustainability	Q8. Does the research address an intervention or approach that could be feasibly delivered at scale by national malaria programs?
Feasibility	Q9. Is the research question clear and well framed? Q10. Is it feasible to design and conduct a study in response to the research question (considerations: time and cost to undertake study, human resource needs, study design/methods, would receive ethical approval without major concerns)?

The OR and PE questions were ranked highest to lowest by their RPS, with higher scores indicating higher levels of agreement that the OR and PE questions met the evaluation criteria. The AEA scores represent the degree of alignment of the evaluators' scores across the evaluation criteria. After the evaluation scores were calculated, the evaluation committee convened two sessions by teleconference during January and February 2022 to review and discuss the scores. During the sessions, evaluation committee members were also asked to provide any recommendations for how the priority OR and PE topics could be reworded for improved clarity and understanding.

Ethical review

The protocol for the research prioritization setting process was reviewed by the PATH Research Determination Committee, Senegal's National Ethics Committee, and the Division of Parasitic Diseases and Malaria, U.S. Centers for Disease Control and Prevention. All institutions determined the protocol to be non-human subjects' research.

V. Findings

The main findings from the stakeholder consultations and document review are summarized in this section across the three central themes: (1) key operational challenges and bottlenecks faced by NMPs in the implementation of their malaria control and elimination programs; (2) pressing evidence gaps in malaria policy, strategy, and implementation guidance; and (3) prioritized OR and PE questions from the consultation process. Detailed findings from the document review and of the consultations with funding agency staff are available in separate reports.[8,9]

Key operational bottlenecks and challenges faced by national malaria programs

Tables 5–9 list commonly identified operational bottlenecks and challenges faced by NMPs across the core intervention areas of prevention, chemoprevention, case management, and surveillance, monitoring, and evaluation (SME), in addition to overarching CE/SBC related bottlenecks and challenges.[10] The majority of the operational challenges identified during the consultation process and document review were not specific to a particular transmission setting, and therefore are presented broadly for all transmission settings. The tables also note crosscutting themes and the source(s) of the identified bottlenecks and challenges.

Most challenges highlighted in prevention were related to ITNs and IRS (Table 5). Key challenges highlighted by stakeholders were related to sustaining and maintaining coverage of interventions and reaching the hardest-to-reach populations; suboptimal use; supply chain failures; limited data to guide implementation; inadequate numbers of trained human resources; and insufficient financial resources. All stakeholder groups highlighted insecticide resistance management for vector control as a key operational challenge.

Table 5. Key operational challenges and bottlenecks in prevention.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Insecticide-treated nets (ITN)		
Sustaining high coverage of ITNs in high burden areas and ensuring coverage among highest risk groups.	D&A, SC, HSS	NMP, RI, FA, WHO, GTP
Routine distribution and distribution to the last mile is challenging due to: stockouts, poor data availability and capacity for reporting, poor planning and quantification, transport challenges, and limited or inadequate storage facilities at district level and in health facilities.	SC	NMP, RI, FA, WHO, GTP, DR
Suboptimal ITN use due to various factors not related to access (e.g., discomfort with use; perception of low risk; perception that ITNs only provide limited value in preventing malaria; reasons specific to certain	CE/SBC	NMP, RI, FA, WHO, GTP, DR

[8] PMI Insights Project. 2021. Malaria Operational Research Prioritization Document Review Report.
[9] PMI Insights Project. 2021. Operational Research and Program Evaluation Prioritization: Funding Agencies.
[a] For inclusion in these summary findings tables, the most commonly reported operational bottlenecks or challenges were those cited across 5 or more countries, or within at least 3 documents one of which presented information on bottlenecks and challenges faced at a regional or global level.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
settings, such as lower use in urban areas; and diversion of nets for other uses).		
Shorter than expected durability of ITNs, resulting in reduced duration of ITN effectiveness.	D&A	NMP, RI, FA, GTP, DR
Insufficient funding and high cost of new PBO or dual active ingredient nets, leading to challenge of sustaining coverage.	HSS	NMP, RI, FA, GTP
Indoor residual spraying (IRS)		
Financial costs of IRS limits coverage and consistency of implementation.	HSS	NMP, RI, FA, WHO, GTP, DR
Challenge of determining what insecticide to spray, and when and where to deploy IRS.	D&A	NMP, RI, WHO, GTP
Challenge of resurgence of malaria cases following the withdrawal of IRS.	D&A	NMP, RI, FA, GTP
Supply chain challenges leading to delays in IRS implementation.	SC	NMP, RI
Larval source management (LSM)		
Challenge of engaging communities to lead, conduct, and maintain LSM.	CE/SBC	FA, GTP
Insufficient trained human resources (e.g., entomologists) and expertise for mapping of breeding sites.	HSS	NMP, RI, GTP
Lack of defined monitoring and evaluation frameworks and indicators for LSM and insufficient monitoring of programs.	HSS	FA, GTP, DR
Crosscutting		
Challenge in implementing insecticide resistance management.	D&A, HSS	NMP, RI, FA, WHO, GTP, DR

Notes: D&A=delivery and access; SC=supply chain; HSS=health systems strengthening; CE/SBC=community engagement/social and behavior change; NMP=national malaria program; RI=research institution; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

Most of the identified key challenges for chemoprevention were related to broader HSS and SC issues, including barriers to accessing services, poor health care provider adherence to national guidelines, supply chain weaknesses (Table 6).

Table 6. Key operational challenges and bottlenecks in chemoprevention.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Intermittent preventive treatment in pregnancy (IPTp)		
Women start antenatal care (ANC) later than recommended and/or do not attend all recommended ANC visits.	D&A	FA, WHO, GTP, DR
Women face several barriers (transport, fees) in accessing ANC/IPTp services.	HSS	GTP, DR
Health care providers low adherence to IPTp guidelines and/or lack of knowledge or training on IPTp guidelines.	D&A, HSS	FA, WHO, GTP, DR

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Stockouts of SP due to funding gaps, poor stock data, stock imbalances across facilities.	SC	FA, WHO, GTP, DR
Seasonal malaria chemoprevention		
High cost of implementation results in the intervention being donor dependent; delays in funding affect proper implementation.	HSS	NMP, RI, FA, GTP
Measurement of coverage (e.g., poor denominators to calculate coverage of the intervention).	HSS	FA, GTP
Delays in procurement, supply chain challenges.	SC, HSS	FA, GTP

Note: D&A=delivery and access; HSS=health systems strengthening; SC=supply chain; NMP=national malaria program; RI=research institution; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

Stakeholders noted many operational challenges for malaria case management (Table 7), including issues around care-seeking, diagnosis, treatment and referral, community case management, and private sector case management. The identified challenges all fell within the crosscutting themes of D&A, SC, and HSS.

Table 7. Key operational challenges and bottlenecks in case management.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Care-seeking		
Poor access to care for some populations due to long distance, lack of transport, and/or financial factors.	HSS	FA, GTP, DR
Caregivers' perception of poor-quality services, including lack of health facility functionality, insufficient providers, long wait times, and unavailability of medicines.	D&A, SC, HSS	GTP, DR
Diagnosis, treatment, and referral		
Health care providers' poor adherence to case management guidelines due to mistrust of diagnostic test results, belief that test results complement clinical diagnosis; gaps in recent training on guidelines (due to limited training and high turnover of human resources).	D&A	NMP, RI, FA, WHO, GTP, DR
Logistical challenges with commodity supply due to distance, high transport costs, and/or inadequate storage facilities.	SC, HSS	NMP, RI, FA, GTP, DR
Challenge with quantification of commodities due to poor quality data, lack of stock cards for reporting, limited availability of stock data, poor data use, and use of parallel sources/mechanisms for quantification and distribution of commodities.	SC, HSS	FA, GTP, DR
Limited capacity of health facility staff in supply chain management and reporting and use of stock data.	SC, HSS	FA, GTP, DR
Community case management		
Accessing and maintaining sufficient supply of malaria commodities among community health workers (CHWs) due to insufficient financial resources; CHW stock data rarely used for commodity quantification; and/or poor-quality or missing stock data from CHWs.	SC, HSS	NMP, RI, FA, GTP, DR

Operational challenge or bottleneck	Crosscutting themes	Source(s)
High turnover of CHWs linked to lack of incentives, motivation, and task overload.	HSS	NMP, RI, GTP, DR
Poor adherence to national treatment guidelines by CHWs.	D&A	FA, GTP
Poor linkage between communities and CHWs and weak supervision of CHWs by health facilities.	D&A, HSS	FA, GTP
Poor data quality and/or missing data from community level; poor integration of community data into national HMIS.	HSS	GTP, DR
Limited human and financial resources for integrated community case management limiting coverage of CHWs.	HSS	GTP, DR
Private sector case management		
Lack of engagement, coordination, and integration of private sector with the public sector for malaria case management and reporting.	HSS	NMP, RI, GTP, DR
Poor quality of care/non-adherence to national treatment guidelines among providers in the private sector.	D&A	NMP, RI, GTP

Note: D&A=delivery and access; SC=supply chain; HSS=health systems strengthening; NMP=national malaria program; RI=research institution; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

Several operational challenges in SME were highlighted by stakeholders; the majority of which fell within the crosscutting theme of HSS (Table 8). Key operational challenges noted related to limited human resource capacity, issues with data quality, weak information systems, and inadequate entomology capacity. All stakeholders highlighted the lack of guidance on stratification to inform subnational targeting of interventions as a key challenge.

Table 8. Key operational challenges and bottlenecks in surveillance, monitoring, and evaluation.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Surveillance, monitoring, and evaluation/national health management information system (HMIS)		
Poor quality HMIS data in terms of timeliness, accuracy, and consistency leading to inaccurate information for management and decision-making.	D&A	NMP, RI, FA, WHO, GTP, DR
Insufficient human resources for surveillance, monitoring, and evaluation, and operational research (SME/OR) at national and subnational levels.	HSS	GTP, DR
Limited SME/OR capacity at national and subnational levels; particularly in analysis, interpretation, and use of data for programmatic decision-making.	HSS	NMP, RI, FA, GTP, DR
Poor culture of data use at all levels, particularly subnational levels. Lack of data-to-action frameworks to support decision-making.	D&A, HSS	NMP, RI, FA, GTP, DR
Inadequate supportive supervision provided for data reporting, limited or inconsistent data quality audits, and lack of feedback loops.	HSS	FA, GTP, DR
Fragmented or poorly integrated data systems (e.g., HMIS and LMIS; private sector and community level data not integrated into HMIS; mHealth initiatives not integrated into HMIS).	HSS	FA, WHO, GTP, DR

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Limited visibility of stock status, particularly at community level to facilitate real-time data to address stock challenges.	D&A, HSS	FA, GTP
Challenge of defining populations at risk or accurate denominators for measuring coverage of interventions.	HSS	FA, DR
Challenge or lack of understanding around how best to stratify to inform subnational targeting of interventions.	HSS	NMP, RI, FA, WHO, GTP
Entomological monitoring and surveillance		
Poor coverage of entomological surveillance data, leading to limited understanding of malaria vector behavior.	HSS	NMP, RI, FA, GTP
Insufficient capacity for conducting entomological surveillance, and capacity for analysis, interpretation, and use of vector data for decision-making.	HSS	GTP, DR
Fragmented system for entomological data capture, due to challenges with data sharing and lack of data management system.	HSS	FA, GTP

Notes: D&A=delivery and access; HSS=health systems strengthening; NMP=national malaria program; RI=research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

For CE/SBC, key challenges were in the lack of evidence to guide programming and insufficient funding and human resources to implement CE/SBC at a wide scale (Table 9).

Table 9. Key operational challenges and bottlenecks in community engagement/social and behavior change.

Operational challenge or bottleneck	Crosscutting themes	Source(s)
Insufficient monitoring and evaluation of CE/SBC activities, resulting in non-evidence-based CE/SBC interventions and lack of understanding around community beliefs and acceptability of interventions.	HSS	NMP, RI, DR
Limited funding for CE/SBC interventions at national and subnational levels, leading to disparities in coverage across regions within a country.	HSS	FA, GTP, DR
Inadequate technical capacity in CE/SBC and insufficient human resources to provide wide-scale coverage of CE/SBC.	HSS	NMP, RI, DR

Notes: HSS=health systems strengthening; NMP=national malaria programs; RI=research institutions; FA-funding agencies; GTP=global technical partners; DR=document review.

Key evidence gaps in malaria policy, strategy, and implementation guidance

Critical evidence gaps identified through the document review and stakeholder consultations are summarized in Tables 10-14 by core intervention areas. Not surprisingly, many evidence gaps were closely aligned with the previously noted operational challenges (Tables 5-9).

For prevention, a crosscutting theme across the different interventions (e.g., ITNs, IRS, LSM and combination vector control approaches) was a lack of evidence on the effectiveness or impact of the approach or intervention. For IRS and LSM specifically, the lack of evidence on the effectiveness of these interventions across different settings and transmission contexts as well as for different use cases was

noted. Better understanding around effective delivery mechanisms, and specifically for hard-to-reach populations was also a key evidence gap identified.

Table 10. Evidence gaps in prevention.

Evidence gap	Crosscutting themes	Source(s)
Insecticide-treated nets (ITNs)		
Lack of evidence on effectiveness of CE/SBC approaches to improve ITN use.	D&A, CE/SBC	FA, GTP, DR
Understanding barriers and facilitators to ITN use (includes social factors at community level, in the context of provider-patient interactions, and specifically in low transmission settings).	CE/SBC	NMP, RI, GTP, DR
Better understanding of ITN durability under routine conditions.	D&A	NMP, RI
Indoor residual spraying (IRS)		
Lack of guidance on IRS exit or transition strategies.	D&A, TS/CE	NMP, RI, FA, GTP, DR
Understanding impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance	D&A	FA, GTP, DR
Understanding of cost-effective or cost-saving approaches for IRS (e.g., targeted IRS, partial spraying, decentralized approaches for implementation).	TS/CE	NMP, RI, FA, GTP, DR
Larval source management (LSM)		
Lack of evidence on the impact of LSM on malaria burden and transmission in different contexts and transmission settings (including low transmission settings and its ability to address residual transmission).	D&A	FA, GTP, DR
Crosscutting prevention areas		
Understanding what effective delivery mechanisms are for hard-to-reach populations.	D&A	NMP, RI
Understanding of effective and innovative approaches to ensure coverage of prevention interventions in hard-to-reach populations.	D&A	NMP, RI
Lack of evidence on the effectiveness and cost-effectiveness of intervention combinations (e.g., ITNs + IRS, ITNs or IRS with other prevention interventions like LSM).	TS/CE	NMP, RI, FA, WHO, GTP
Lack of understanding on what data are needed to inform and improve targeting and stratification of interventions (e.g., what are the minimal essential data needs and geographic granularity?).	TS/CE	NMP, RI, FA, WHO, GTP

Notes: D&A=delivery and access; CE/SBC=community engagement/social and behavior change; TS/CE=targeting and stratification/cost-effectiveness; NMP=national malaria programs; RI=research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

For intermittent preventive treatment and seasonal malaria chemoprevention (SMC), evidence gaps highlighted the need for greater understanding of effective strategies or approaches to achieve higher coverage and more effective delivery of the intervention (Table 11). For SMC and mass drug administration (MDA), a need for more guidance was noted to understand how to effectively target the

intervention. Other evidence gaps identified by NMPs and research institutions were around how best to address barriers to scale-up of IPTi, and better understanding when to withdraw IPTp as transmission declines.

Table 11. Evidence gaps in chemoprevention.

Evidence gap	Crosscutting themes	Source(s)
Intermittent preventive treatment		
Understanding of effective strategies to achieve higher coverage and more efficient delivery of IPTp.	D&A	NMP, RI, WHO, GTP, DR
Assessment of factors that have impeded scale-up of IPTi implementation and how to address the barriers. Limited understanding of the operational feasibility and how best to deliver the intervention.	D&A	NMP, RI, DR
In settings where malaria transmission has declined substantially from moderate-high, better understanding at what transmission threshold to transition away from IPTp delivery.	D&A	NMP, RI
Seasonal malaria chemoprevention		
Evidence on effectiveness and cost-effectiveness of SMC, particularly with regards to expansion of SMC to school age children and geographical coverage outside the Sahel.	D&A, TS/CE	FA, GTP, DR
Understanding of strategies of how best to achieve high coverage of SMC in target areas.	D&A	NMP, RI
Better guidance on when and where should SMC be used to reduce burden (in areas of higher and less seasonal transmission), and when and how to determine when to scale-up or scale-down the intervention.	TS/CE	FA, GTP
Mass drug administration		
More evidence needed on optimum methods for implementing MDA programs in different settings, including how to promote community engagement and compliance with treatment, and specification on the level of intervention coverage needed (frequency, number of rounds, optimal timing, and duration).	D&A, TS/CE	NMP, RI, DR

Notes: D&A=delivery and access; TS/CE=targeting and stratification/cost-effectiveness; NMP=national malaria programs; RI=research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

The key evidence gaps highlighted by stakeholders in case management were around the lack of evidence on effective approaches for addressing poor-quality of malaria case management, frequent stockouts, and strengthening collaboration with the private sector (Table 12).

Table 12. Evidence gaps in case management.

Evidence gap	Crosscutting themes	Source(s)
Diagnosis, treatment, and referral		
Guidance on effective strategies/approaches beyond supervision and training to improve adherence to national treatment guidelines at all levels of the health system.	D&A	NMP, RI, GTP
Guidance on effective strategies/approaches to address the issue of stockouts of malaria commodities, especially at community level.	SC	NMP, RI
Community case management		
Lack of evidence on the quality of integrated community case management care provided by CHWs.	D&A	GTP, DR
Private sector case management		
Effective strategies and policies to strengthen collaboration with the private sector for malaria case management and reporting of data through the national HMIS.	HSS	NMP, RI, GTP, DR

Notes: D&A=delivery and access; SC=supply chain; HSS=health systems strengthening; NMP=national malaria programs; RI=research institutions; GTP=global technical partners; DR=document review.

For SME, key evidence gaps highlighted were around understanding minimum data needed for guiding malaria programming, optimal surveillance system approaches and the performance of current surveillance systems (Table 13).

Table 13. Evidence gaps in surveillance, monitoring, and evaluation.

Evidence gap	Crosscutting themes	Source(s)
Surveillance, monitoring, and evaluation/national health management information system		
Understanding of minimum data needs to inform real-time programmatic decision-making, particularly for malaria or integrated surveillance systems in low transmission settings.	HSS	FA, WHO, GTP
Understanding of minimum data needs for informing subnational targeting of interventions, including how best to stratify based on geography, transmission, epidemiological, and other contextual factors.	TS/CE, HSS	NMP, RI, FA, WHO, GTP
Identification and characterization of "key populations" for malaria, including accurate denominators for populations at risk in order to more accurately measure intervention coverage.	D&A	FA, DR
Limited information available on the performance of surveillance systems, particularly in lower transmission settings.	D&A	NMP, RI, GTP
Understanding around optimal surveillance systems for malaria elimination and whether the 1-3-7 approach is a one-size fits all approach or are there other effective approaches to use in elimination settings.	D&A, HSS	NMP, RI, GTP
Entomological monitoring and surveillance		

Evidence gap	Crosscutting themes	Source(s)
Limited understanding of An. Stephensi spread into new geographical areas, including information on breeding, resting, biting behavior, and susceptibility to insecticides.	NA	FA, DR

Notes: HSS=health systems strengthening; TS/CE=targeting and stratification/cost-effectiveness; D&A=delivery and access; NMP=national malaria programs; RI=research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

For CE/SBC, the lack of evidence around the effectiveness and cost-effectiveness of different interventions or approaches was highlighted as a key evidence gap, with many stakeholders noting that this gap leads to the implementation of non-evidence-based approaches and complicates the planning and targeting of CE/SBC programming (Table 14).

WHO and other global technical partners identified the lack of evidence around multi-sectoral strategies/approaches as a key gap; noting this evidence is needed for advocacy efforts to engage other sector actors in malaria prevention efforts.

Table 14. Evidence gaps in community engagement/social and behavior change and other crosscutting areas.

Evidence gap	Crosscutting themes	Source(s)
Community engagement/social and behavior change		
Lack of evidence on the effectiveness and cost-effectiveness of CE/SBC interventions/approaches on malaria intervention uptake, across different transmission settings and contexts.	HSS	NMP, RI, FA
Lack of evidence on the duration of effectiveness of malaria CE/SBC interventions to inform CE/SBC programming (e.g., appropriate level of investment, how and where to target CE/SBC programming).	HSS	FA, GTP, DR
Crosscutting		
Lack of evidence on effective interagency/multi-sectoral strategies for malaria prevention.	D&A, HSS	WHO, GTP
Lack of evidence around the effectiveness and cost-effectiveness of different malaria intervention packages to guide programs in programmatic decision-making.	D&A	FA, GTP

Notes: HSS=health systems strengthening; D&A=delivery and access; NMP=national malaria programs; RI=research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR=document review.

Operational research and program evaluation priorities

Altogether, 33 OR and PE priority topics emerged from the consultation process. Topics identified by at least three NMPs/RIs stakeholders and/or across three different stakeholder groups were put forward to the evaluation committee for the evaluation process. The identified topics were evaluated by evaluation committee members across ten questions covering the six evaluation criteria (see previous Table 4). Evaluation scores for each of the OR and PE topic areas are summarized in Table 15 (see Annex 6 for detailed scores across all evaluation questions and Appendix 1 for the full list of priorities by rank and by thematic area). The research priority scores (RPS), which represent an average of the

evaluator's scores across all evaluation questions for each OR/PE topic, ranged from 71.5–87.9. These scores suggest generally high level of agreement in the importance of the proposed topics among the evaluators. The average expert agreement (AEA) scores, which represent the level of agreement of scores across the evaluators were more varied, ranging from 40.3–67.6. AEA scores below 50 show a higher level of disagreement across evaluators. The wider range of AEA scores likely reflects the diverse range of experience and expertise across the evaluation committee members.

The OR and PE topics identified were largely focused on generating evidence to guide or support closing gaps in intervention coverage to achieve national strategic plan targets, and specifically on addressing persistent challenges faced by NMPs in the implementation of core malaria control approaches that have been a part of national strategies for many years. Topics also reflect the need to gather further evidence around how best to deploy different interventions and intervention packages; including the integration of newer tools (RTS,S/AS01 malaria vaccine) to guide more effective targeting of interventions. Several topics prioritized by stakeholders spoke to broader health systems issues that require broader intersectoral collaboration to address. These included addressing challenges related to delivery of interventions to the most vulnerable, and often the unreached; health provider capacity to deliver quality care per national guidelines; poor data quality and use for informing evidence-based decision-making; supply chain system issues and addressing frequent stockouts; and poor private sector integration and quality of care.

The breakdown of the OR/PE topics by key intervention areas were prevention (10), chemoprevention (7), case management (7), SME (5), CE/SBC (2), and other crosscutting areas (2). During the evaluation committee meetings to review and discuss the evaluation scores, some minor changes were put forward by the committee for rephrasing of the topics to improve clarity and specificity. The inputs have been incorporated into the final list of research priorities in Table 16 (Note: research topics which include committee requested changes have an asterisk at the end of the question).

Table 15. Evaluation scores of prioritized OR and PE topic areas.

Overall Rank	Operational Research/Program Evaluation Topic	Intervention Area	RPS	AEA
1	Test and evaluate different delivery mechanisms to reach and sustain high coverage of ITNs among hard-to-reach and highest risk populations	Prevention	87.9	59.4
2	Evaluate the effectiveness and cost-effectiveness of different strategies for deploying the RTS, S AS01 malaria vaccine with chemoprevention (e.g., campaign vs. expanded program on immunization (EPI)-linked vs combination campaign/EPI strategies).	Prevention and Chemoprevention	86.6	53.0
3	Assess the effectiveness and cost-effectiveness of different intervention combinations (e.g., ITNs + IRS, ITNs or IRS + LSM, vector control + chemoprevention) to better understand how interventions should be combined to maximize impact.	Crosscutting	85.3	53.5
3	Test and evaluate approaches or interventions to reduce the frequency of stockouts of key commodities for malaria case management, especially at the community level (specifically addressing challenges related to commodity quantification, stock management capacity, reporting and use of stock data).	Case Management	85.3	47.9
5	Evaluate and compare different insecticide management and/or rotation strategies on insecticide resistance prevalence and intensity (crosscuts use of ITNs and IRS).	Prevention	85.1	54.1
6	Evaluate the impact and cost-effectiveness of expanding the age range, geographical coverage, and rounds of treatment of seasonal malaria chemoprevention.	Chemoprevention	84.5	55.3
7	Assess factors associated with volunteer CHW cadres' motivation and retention and evaluate different approaches or interventions to improve volunteer CHW motivation and retention. *	Case Management	83.3	47.6
8	Assess predictors of adherence to and determinants of uptake of SMC and evaluate different strategies to achieving high SMC coverage and adherence.	Chemoprevention	82.3	52.5
9	Test and evaluate the effectiveness of different deployment and targeting approaches for IRS to maximize impact (e.g., testing different insecticides, duration and frequency of spraying, geographic/structural targeting strategies).	Prevention	82.0	50.6
10	Assess different approaches or interventions to improve the analytic and data use capacity, and data use culture at different levels of the health system.	SME	81.3	45.3
10	Assess the impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance.	Prevention	81.3	52.4
10	Given the challenges with ITN durability, test and evaluate the effectiveness of different approaches to improve routine/continuous distribution channels for ITNs to sustain coverage between mass campaigns.	Prevention	81.3	60.4

Overall Rank	Operational Research/Program Evaluation Topic	Intervention Area	RPS	AEA
13	Compare different SBC/CE strategies in terms of effectiveness and cost-effectiveness on healthcare seeking, adherence to treatment, and uptake of key prevention interventions.	CE/SBC	80.9	55.1
14	Assess the effectiveness and cost-effectiveness of innovative approaches to reduce the cost and/or improve the efficiency of IRS implementation (e.g., partial spraying of structures, use of a decentralized approach, targeted spraying).	Prevention	80.8	55.9
15	Assess structural and behavioral factors associated with delayed care-seeking across different population groups (e.g., age, gender, hard-to-reach/vulnerable populations) and compare different strategies to decrease delays in care-seeking.	Case Management	80.0	54.7
16	Assess predictors of adherence and non-adherence to case management treatment guidelines among health care providers and test/evaluate different strategies to improve adherence to guidelines.	Case Management	79.5	46.1
17	Evaluate how current surveillance systems are functioning, and whether they are producing reliable and accurate information to guide countries toward elimination.	SME	79.4	48.2
18	Assess the operational feasibility and most effective delivery platform for IPTi administration (e.g., EPI, mass campaign, community health workers).	Chemoprevention	78.9	42.8
19	Assess the feasibility and benefit of different digital tools/systems for use at the community level for data capture, reporting, and transmission to HMIS/DHIS2.	SME	78.7	45.3
20	Evaluate different strategies for achieving high MDA coverage and adherence in different transmission contexts.	Chemoprevention	78.6	47.1
20	Test and evaluate interventions to improve adherence to malaria treatment guidelines and reporting in the private sector (Note: Private sector is inclusive of private sector clinics, hospitals, pharmacies, drug shops, and other private sector providers). *	Case Management	78.6	55.3
22	Assess the long-term effectiveness and sustainability of different social and behavior change approaches on key malaria treatment and prevention behaviors and the duration of their impact on intervention uptake.	CE/SBC	78.1	60.9
23	Compare different strategies for surveillance and response in elimination settings, assessing completeness, timeliness, delivery of response, and cost-effectiveness.	SME	78.0	55.6
23	Test the effectiveness of different strategies to improve IPTp coverage. *	Chemoprevention	78.0	58.2
25	Test and evaluate strategies to improve the efficiency of the delivery of IPTp (e.g., community-based delivery through community health workers).	Chemoprevention	77.9	46.8

Overall Rank	Operational Research/Program Evaluation Topic	Intervention Area	RPS	AEA
26	Test and evaluate different approaches or interventions for improving HMIS data quality (e.g., assess minimum periodicity of supervision, strategies for easing reporting burden on staff/simplification of reporting system, strategies to incentivize reporting accuracy).	SME	77.6	57.1
27	Evaluate different strategies to improve health care worker adherence to integrated management of childhood illness guidelines.	Case Management	77.4	58.1
28	Evaluate the effectiveness and cost-effectiveness of LSM on epidemiological and entomological outcomes in different transmission contexts and the duration of impact.	Prevention	76.6	52.4
28	Test approaches or strategies to improve cost and resource efficiency (e.g., integration of seasonal malaria chemoprevention with other delivery platforms) and to maintain effectiveness in the delivery of SMC when scaling up the intervention.	Chemoprevention	76.6	67.6
28	Compare or evaluate different strategies/packages of interventions to prevent resurgence of malaria cases following the withdrawal of IRS. *	Prevention	76.6	47.1
31	Assess barriers and facilitators to ITN use in different settings where access to ITNs is high and evaluate the effectiveness of different SCB approaches/interventions to improve ITN use within different settings/contexts based on the identified barriers (e.g., community level strategies, provider/patient communication/SBC approaches, SBC approaches for low transmission settings).	Prevention and CE/SBC	76.3	40.3
32	Test different approaches for working with/incentivizing participation and collaboration of the private sector in the referral, diagnosis, treatment, and reporting of malaria cases.	Case Management	75.5	53.5
33	Assess the impact of cross border movement of people on malaria incidence/prevalence and evaluate the effectiveness of different strategies to reduce malaria transmission across international borders. *	Crosscutting	71.5	45.0

Notes: RPS=research priority score; AEA=average expert agreement; * Indicates the evaluation committee recommended minor rephrasing of the topic for improved clarity and specificity.

Emerging research topics

Through the stakeholder consultation process, several additional emerging research and evaluation questions and evidence gaps were identified by stakeholders (Table 16). Upon review of these emerging topics, the UCAD and the PMI Insights team did not feel that the topics fit well within the defined scope for the research prioritization process (see Section II, pages 1-2) and therefore, did not put forward the topics for the formal evaluation and prioritization process. However, as these research topics were highlighted by 3 or more NMPs and/or RIs and across multiple stakeholder groups, the team wanted to share the emerging topics to bring attention to them, as they also were viewed by stakeholders as important and warranting attention.

In the emerging topics, NMPs highlighted the need for better understanding around the overall performance of their programs and whether current intervention packages were sufficient to achieve their set national malaria strategic plan goals and targets. Greater understanding around how best to move NMPs from control to elimination, as well as more effective integration of malaria and other disease program activities to improve efficiency were also noted by NMPs and RIs as key evidence gaps. All stakeholder groups during the consultations noted the importance of gaining a better understanding around the essential data needed for informing and improving the targeting/stratification of malaria vector control interventions.

Other research/evaluation topics and evidence gaps highlighted through the stakeholder consultations, within the document review, and during the evaluation committee meetings, were related to emerging threats to malaria progress. These topics and gaps included: (1) drug resistance to artemisinin-based combination therapy (ACTs) and sulfadoxine/pyrimethamine (SP), (2) challenge of HRP2/3 deletions for diagnostics, and (3) spread of *An. stephensi* in the horn of Africa, specifically assessing the linkage between *An. stephensi* and urban malaria in affected countries.

Table 16. Emerging research topics identified outside of the scope of the OR/PE prioritization process.

Thematic Area	Research Topic	Source of priority
Prevention	Evaluate how to best optimize the RTS, S AS01 dosing regimen to improve uptake.	NMP, RI
Chemoprevention	Assess whether IPTp-SP continues to be effective for prevention of malaria in pregnancy and adverse birth outcomes. Evaluate effective alternatives to SP for IPTp.	NMP, RI
	Evaluate the benefit/impact of IPTp in low transmission settings.	NMP, RI
Case Management	Testing use of new point of care diagnostic tools to improve treatment practices for malaria and other febrile illnesses.	NMP, RI
	Assess the distribution of HRP2/3 deletion and how it affects malaria diagnostic and treatment practices.	NMP, RI, Evaluation Committee
	Test and evaluate effective strategies that can be deployed to mitigate drug resistance to ACTs.	NMP, RI
	Assess the spread of *Anopheles stephensi* and the linkage between its spread and urban malaria in affected countries.	DR, FA, Evaluation Committee

Thematic Area	Research Topic	Source of priority
Surveillance, Monitoring and Evaluation	Assess what data elements are most critical/essential (e.g., geographic granularity, transmission, epidemiological, and other contextual factors) to inform and improve targeting/stratification of malaria vector control interventions.	NMP, RI, FA, WHO, GTP
Crosscutting	Test and evaluate what combinations of interventions are best targeted for hard-to-reach populations.	NMP, RI
	Evaluate the impact of multi-sectoral strategies to combat malaria burden.	NMP, RI
	Assess whether the current package of interventions is enough to achieve national malaria control program targets and goals, or whether additional interventions are needed.	NMP, RI
	Evaluate whether national malaria programs are achieving what they are expected to achieve, and if not, why. Assess how national malaria programs are performing in the implementation of different interventions and the impact of NMP interventions on malaria burden.	NMP, RI
	Test and assess strategies for how national malaria programs move from control to elimination.	NMP, RI
	Test and assess strategies for how to integrate malaria prevention with other disease interventions for more efficient/effective delivery.	NMP, RI

Note: NMP=national malaria programs; RI=malaria-endemic research institutions; FA=funding agencies; WHO=World Health Organization; GTP=global technical partners; DR = document review.

VI. Key takeaways and conclusion

The research prioritization setting process engaged stakeholders to develop a prioritized list of malaria OR and PE topics grounded in endemic country perspectives and priorities. The prioritization setting process identified a multitude of operational challenges and pressing evidence gaps that are impeding malaria control in countries across SSA. Identified priorities reflect persistent challenges that NMPs have faced for many years in designing the most effective and efficient strategies and program guidelines to control malaria. The challenges highlight three primary themes relevant for OR and PE prioritization and funding:

1. NMPs have insufficient evidence on the effectiveness and cost-effectiveness of specific interventions and intervention packages across different settings and transmission contexts. This includes how best to tailor intervention packages for maximum impact and resource efficiency. This evidence is critically needed to guide program strategies in the context of limited resources for malaria control.
2. NMPs are grappling with how to achieve national strategic plan goals and targets. NMP priority areas for OR and PE are those that can guide how to reach high coverage of core malaria interventions, how to better understand impact, and how to improve their overall intervention effectiveness.
3. Broader health system issues need to be addressed in order to improve effective coverage of malaria interventions. Fundamental health systems challenges that contribute to gaps in malaria intervention coverage include: insufficient financial resources; procurement and supply chain failures; inadequate human resource capacity contributing to poor quality delivery of interventions; and weak and poorly integrated health information systems to guide evidence-based decision making.

The prioritized list of OR and PE topics also highlights the need for evidence to guide how best to implement tools that are less widely implemented and have a more limited evidence base, including LSM and IPTi. There is also a need for evidence to guide implementation of new tools, including the RTS,S/AS01 malaria vaccine. Furthermore, the SME priorities specifically highlight the need for improved surveillance systems and capacity to generate high quality data to inform targeting of interventions and support countries or settings moving toward elimination.

The OR and PE prioritization setting process had several strengths. These strengths include: (1) a prioritization framework developed to organize information in a manner similar to how programs organize strategies and approaches to malaria control, (2) engagement of five stakeholder groups towards identifying country perspectives and priorities for OR and PE, (3) a mixed methods approach to data collection and data triangulation towards developing a comprehensive initial list of OR and PE priorities, 4) an expert evaluation committee comprised and chaired by endemic country research, policy, and program leaders, and 5) evaluation of research priorities using an established method, clear criteria, objective rating, and ratings review and discussion to finalize the ranked set of topics. Although the process had a rigorous and inclusive design process, strong participation, and collaborative execution, there are limitations to the process and outputs. These limitations include: (1) a predominant focus on stakeholders and priorities in moderate- and high-malaria burden settings in SSA with less inputs from stakeholders from low-burden settings in SSA, (2) relatively rapid implementation and moderate reach across NMPs and RIs in SSA endemic countries, and (3) limited length of individual

consultations (approximately one hour each) in relation to a wide range of issues for discussion. This initial process and resulting prioritized list of OR and PE topics will benefit from continued and expanded consultation both in breadth and depth, as well as an implementation of an expanded set of engagement and information gathering modalities. Finally, the consultations identified several additional research and evaluation areas of importance that were outside of the pre-defined scope of the prioritization process. While these topics are not reflected in the resulting list of research topics, they merit attention. Of note, NMPs specifically highlighted the need for greater investments to assess the overall performance of their programs to better understand what is working, areas that need improvement, and whether they are on track to meeting their targets.

Aligning research investment and implementation around country-driven priorities for OR and PE will ensure that the limited resources available for OR and PE are dedicated to answering the questions that can address pressing gaps in national strategies and program guidelines. Evidence-based strategies and guidelines are essential to ensuring high coverage with the most effective intervention mix for reducing malaria burden and continuing progress towards elimination. The prioritized list of OR and PE topics is an important resource for strengthening coordination and investment in research that is grounded in country perspectives and priorities for maximum relevance and impact.

Annex 1: Stakeholder consultation tools

Stakeholder Consultation Interview Guide:

National Malaria Programs

- Hello, my name is ___ and my colleagues ___ are on the line also from the PMI Insights project.
- As you may know, PMI Insights Project is designed to identify and answer critical malaria OR and PE questions in collaboration with NMCPs and local research institutions.
- The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority OR and PE questions that can address the identified bottlenecks and challenges.
- Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda.
- There are no foreseen risks to your participation in this interview.
- The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly.
- Your participation in this interview/group discussion is voluntary. At any time, you may withdraw your participation without consequence. We anticipate this interview/group discussion will last approximately one hour.

At this time, do you have any questions for me

Please say so now if you DO NOT consent to participate in the interview/group discussion.

Please say so now if you DO NOT consent to have this interview/group discussion audio-recorded.

Interview questions

Participant(s) Characteristics

1. Organization/Country:
2. Role/Position*:
3. Area(s) of malaria expertise*:

*Note: complete this section for each participant.

Malaria programming, and operational challenges and bottlenecks

4. What do you think are the **main operational challenges** or bottlenecks that the national malaria program and/or its implementing partners face with regards to:
    a. Prevention interventions (e.g., LLINs, IRS, LSM, entomological surveillance/monitoring or other vector control interventions)?

b. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?

c. Case management (at facility level, at community level)?

d. Surveillance, monitoring, and evaluation systems/approaches?

e. Social and behavior change interventions/approaches?

5. Have you observed any knowledge gaps or shortcomings in national malaria strategic guidance or program guidelines that would **benefit from further research**? If yes, can you describe the gaps? *OR ask – What evidence or information do you think is needed to improve and provide more detailed national malaria strategies and implementation guidelines in (country)?*
    a. If yes, can you describe the gaps in consideration of the technical areas:
        i. Prevention interventions (e.g., LLINs, IRS, LSM, entomological surveillance/monitoring or other vector control interventions)
        ii. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?
        iii. Case management (at facility level, at community level)?
        iv. Surveillance, monitoring and evaluation systems/approaches?
        v. Social and behavior change interventions/approaches?
    b. What evidence/information would address the identified gaps?
6. What **knowledge/evidence gaps** do you think would be beneficial to address to improve malaria intervention access in (country) – specifically access among hard-to-reach and most vulnerable populations?
    a. What about knowledge/evidence gaps that would be beneficial to address to improve intervention uptake?
    b. What about to improve the efficiency/cost-effectiveness of the delivery of interventions?
7. Does the NMP stratify/target different intervention(s)/intervention packages based on local/subnational transmission risk/setting?
    a. Has the program encountered any challenges in the implementation of the targeting/stratification of intervention(s)? If yes, please describe what the challenges have been.
    b. How do you think the targeting/stratification could be improved? What information is needed to improve or better inform targeting/stratification?
8. What do you see as the most critical program evaluation questions for the (country) national malaria program?

OR and PE priorities and country prioritization process

Priority OR/PE questions

9. In reflecting on your responses to what are the main operational challenges/bottlenecks that the country faces and the key knowledge gaps, what operational research questions/areas do you think would be the most beneficial/useful for informing how to best address the challenges/bottlenecks (or close the knowledge gaps)?

10. If you had to rank the most important/top 3 operational research questions for (country) national malaria program, what would they be?

Research prioritization process at country level

11. Is there an existing process in (country) that defines malaria research priority areas?
    a. If yes, can you describe the process?
    b. Who is involved?
    c. How often are research priorities set?
    d. How are the research priorities moved forward/funded?
    e. Is there a set of research priorities that have been recently set? If yes, can you share what they are?
12. Is/Are there any technical working group(s) that address(es) issues related to malaria control/elimination research/operational research?
    a. What is the main role of the TWG?
    b. Are they involved in defining research priorities for (country)?
    c. What organization(s)/institutions are involved in the TWG?

Recent or current OR/PE studies undertaken

13. What operational research studies have been recently undertaken in (country)? Is there any documentation/report of the study(ies) that you can share?
14. Has (country) national malaria program undergone any recent program evaluations - of the whole program or of specific intervention(s)?
    a. If yes, can you provide more information on the objectives/scope of the program evaluation?
    b. Is there any documentation/report from the evaluation that you can share?

Closing

15. Do you have any recommendations for others to consult with about the topics we have covered in our discussion today?

Thank you for your time and participation in this interview today. We appreciate your valuable inputs into this process. We will share the report on our findings from the stakeholder consultations with you when it is available.

Stakeholder Consultation Interview Guide:

Malaria-Endemic Research Institutions/Partners

- Hello, my name is ___ and my colleagues ___ are on the line also from the PMI Insights project.
- As you may know, PMI Insights project is designed to identify and answer critical malaria OR and PE questions in collaboration with NMCPs and local research institutions.
- The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority OR and PE questions that can address the identified bottlenecks and challenges.
- Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda.
- There are no foreseen risks to your participation in this interview.
- The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly.
- Your participation in this interview/group discussion is voluntary. At any time, you may withdraw your participation without consequence. We anticipate this interview/group discussion will last approximately one hour.

At this time, do you have any questions for me?

Please say so now if you DO NOT consent to participate in the interview/group discussion.

Please say so now if you DO NOT consent to have this interview/group discussion audio-recorded.

Interview questions

Participant(s) characteristics

1. Organization/Country:
2. Role/Position*:
3. Area(s) of malaria expertise*:

*Note: Complete for each participant.

Malaria programming, and operational challenges and bottlenecks

4. What do you think are the main operational challenges or bottlenecks that the national malaria program and/or its implementing partners face with regards to:
    a. Prevention interventions (e.g., LLINs, IRS, LSM, entomological surveillance/monitoring or other vector control interventions)
    b. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?

c. Case management (at facility level, at community level)?

d. Surveillance, monitoring, and evaluation systems/approaches?

e. Social and behavior change interventions/approaches?

5. Have you observed any knowledge gaps or shortcomings in national malaria strategic guidance or program guidelines in (country) **that would benefit from further research**? If yes, can you describe the gaps? *OR ask – What evidence or information do you think is needed to improve and provide more detailed national malaria strategies and implementation guidelines in (country)?*

    a. If yes, can you describe the gaps in consideration of the technical areas:

        i. Prevention interventions (e.g., LLINs, IRS, LSM, entomological surveillance/monitoring or other vector control interventions)

        ii. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?

        iii. Case management (at facility level, at community level)?

        iv. Surveillance, monitoring, and evaluation systems/approaches?

        v. Social and behavior change interventions/approaches?

    b. What evidence/information would address the identified gaps?

6. What knowledge/evidence gaps do you think would be beneficial to address to improve malaria intervention access in (country) – specifically access among hard-to-reach and most vulnerable populations?

    a. What about knowledge/evidence gaps that would be beneficial to address to improve intervention uptake?

    b. What about to improve the efficiency/cost-effectiveness of the delivery of interventions?

7. To your knowledge, are different intervention(s)/intervention packages targeted/stratified based on local/subnational transmission risk/setting?

    a. Are you aware of any challenges that the NMP faces in the implementation of the targeting/stratification of intervention(s)? If yes, please describe what the challenges have been.

    b. How do you think the targeting/stratification could be improved? What information is needed to improve or better inform targeting/stratification?

8. What do you see as the most critical program evaluation questions for the (country) national malaria program?

Country OR and PE

Priority OR/PE questions

9. In reflecting on your responses to what are the main operational challenges/bottlenecks that the country faces and the key knowledge gaps, what operational research questions/areas do you think would be the most beneficial/useful for informing how to best address the challenges/bottlenecks (or close the knowledge gaps)?

10. If you had to rank the most important/top 3 operational research questions for (country) national malaria program, what would they be?

Research prioritization process at country level

11. To your knowledge, how are malaria research priority areas set in (country)?
    a. Is there an existing process in (country) to define the research priority areas? If yes, can you describe the process?
    b. Who is involved?
    c. How often are research priorities set?
    d. How are the research priorities moved forward/funded?
    e. Is there a set of research priorities that have been recently set? If yes, can you share what they are?
12. How does your institution/organization determine what areas of malaria research to pursue?
    a. Is this done in partnership with the NMP? If yes, can you describe your process for collaboration? If no, can you describe why there is not a close partnership with the NMP?
13. Is/Are there any technical working group(s) that addresses issues related to malaria control/elimination research in (country)?
    a. What is the main role of the TWG(s)?
    b. Are they involved in defining research priorities for (country)?
    c. What organization(s)/institutions are involved in the TWG?
14. Has your institution/organization undertaken any recent or is currently undertaking any malaria operational research?
    a. If yes, is there any documentation/report of the study(ies) that you can share?

Closing

15. Do you have any recommendations for others to consult with about the topics we have covered in our discussion today?

Thank you for your time and participation in this interview today. We appreciate your valuable inputs into this process. We will share the report on our findings from the stakeholder consultations with you when it is available.

Stakeholder Consultation Interview Guide:

Funding Agency Staff

- Hello, my name is ___ and my colleagues ___ are on the line also from the PMI Insights project.
- As you may know, PMI Insights project is designed to identify and answer critical malaria OR and PE questions in collaboration with NMCPs and local research institutions.
- The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority OR and PE questions that can address the identified bottlenecks and challenges.
- Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda.
- There are no foreseen risks to your participation in this interview.
- The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly.
- Your participation in this interview/group discussion is voluntary. At any time, you may withdraw your participation without consequence. We anticipate this interview/group discussion will last approximately one hour.

At this time, do you have any questions for me?

Please say so now if you DO NOT consent to participate in the interview/group discussion.

Please say so now if you DO NOT consent to have this interview/group discussion audio-recorded.

Interview questions

Participant(s) characteristics

1. Organization/Country:
2. Role/Position*:
3. Area(s) of malaria expertise*:

*Note: Complete for each participant.

Malaria programming, and operational challenges and bottlenecks

*Note to be flexible in the areas being probed on, based on the participant's background/area of expertise.

Participant script: For this next set of questions, I will be asking you about operational challenges and bottlenecks in malaria programming across a number of different thematic areas. If there are some areas that are not in your area of expertise/day-to-day work, you can let me know and we can skip those areas.

4. Operational challenges and bottlenecks:
    a. **Prevention interventions** (e.g., LLINs, IRS, LSM, or other vector control interventions)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

b. **Chemoprevention interventions** (IPTp, IPTi, SMC)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

c. **Case management** (at facility level, at community level)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

d. **Surveillance, monitoring, and evaluation systems/approaches**

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

e. **Community engagement/social and behavior change interventions/approaches**

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

5. What knowledge/evidence gaps do you think would be beneficial to address to improve malaria intervention access – specifically access among hard-to-reach and most vulnerable populations?

6. Based on your knowledge and experience, what do you think are the main challenges/knowledge or data gaps that NMPs face around targeting, tailoring, and/or stratifying different intervention(s)/intervention packages?

7. I am going to ask you about your top priority questions for OR and PE. By PE we mean, the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgements about program design, improve program effectiveness, and/or inform decisions about future program development.
    a. In reflecting on your responses to what are the main operational challenges/bottlenecks that NMPs face, what are the top 3 operational research questions to answer what would they be and why?
    b. What do you see as the most critical program evaluation questions facing national malaria programs?

Institutional research priority setting

8. How does your institution make decisions about what malaria operational research or program evaluation studies will get funded?
    a. How are ideas generated for the malaria OR and PE that you fund?
    b. What factors or criteria does your institution take into consideration/use when deciding whether to fund a malaria OR PE study?
    c. Who influences the decision(s)
9. What is the key research priority OR PE areas for your institution? How were the priority areas identified/determined?

Deprioritized questions if more time

10. Based on our discussion today, do you have any recommendations for others within your organization that would be beneficial to consult with?
11. What about knowledge/evidence gaps that would be beneficial to address to improve intervention uptake?
12. What about knowledge/evidence gaps that would be beneficial to address to improve the efficiency/cost-effectiveness of the delivery of interventions?
13. From a macro level, what do you see as the key knowledge gaps or shortcomings in malaria strategic guidance, policies, or program guidelines that would benefit from further research?

Thank you for your time and participation in this interview today. We appreciate your valuable inputs into this process. We will share the report on our findings from the stakeholder consultations with you when it is available.

Stakeholder Consultation Interview Guide:

WHO AFRO representatives

- Hello, my name is ___ and my colleagues ___ are on the line also from the PMI Insights project.
- As you may know, PMI Insights project is designed to identify and answer critical malaria OR and PE questions in collaboration with NMCPs and local research institutions.
- The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority OR and PE questions that can address the identified bottlenecks and challenges.
- Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda.
- There are no foreseen risks to your participation in this interview.
- The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly.
- Your participation in this interview/group discussion is voluntary. At any time, you may withdraw your participation without consequence. We anticipate this interview/group discussion will last approximately one hour.

At this time, do you have any questions for me?

Please say so now if you DO NOT consent to participate in the interview/group discussion.

Please say so now if you DO NOT consent to have this interview/group discussion audio-recorded.

Interview questions

Participant(s) characteristics

1. Organization/Country:
2. Role/Position*:
3. Area(s) of malaria expertise*:

*Note: Complete for each participant.

Malaria programming, and operational challenges and bottlenecks

Participant script: For this next set of questions, I will be asking you about operational challenges and bottlenecks in malaria programming across a number of different thematic areas. If there are some areas that are not in your area of expertise/day-to-day work, you can let me know and we can skip those areas.

4. Operational challenges and bottlenecks:
    a. **Prevention interventions** (e.g., LLINs, IRS, LSM, or other vector control interventions)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

b. **Chemoprevention interventions** (IPTp, IPTi, SMC)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

c. **Case management** (at facility level, at community level)

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

d. **Surveillance, monitoring, and evaluation systems/approaches**

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

e. Community engagement/social and behavior change interventions/approaches

i. For countries or settings with high/moderate transmission, what do you think are the main operational challenges or bottlenecks that national malaria programs (NMPs) face with regards to implementation of _____

ii. For countries or settings with low/very low transmission, what do you think are the main operational challenges or bottlenecks that NMPs face with regards to implementation of_____

5. What knowledge/evidence gaps do you think would be beneficial to address to improve malaria intervention access – specifically access among hard-to-reach and most vulnerable populations?

a. What about knowledge/evidence gaps that would be beneficial to address to improve intervention uptake?

b. To improve the efficiency/cost-effectiveness of the delivery of interventions?

6. Based on your knowledge and experience, what do you think are the main challenges/knowledge or data gaps that NMPs face around targeting, tailoring, and/or stratifying different intervention(s)/intervention packages?
7. From a macro level, what do you see as the key knowledge gaps or shortcomings in malaria strategic guidance, policies, or program guidelines that would benefit from further research? *OR ask – What evidence or information do you think is needed to improve and provide more detailed malaria strategic guidance, policies, or program guidelines?*
    a. Probe on specific intervention areas (e.g., prevention, chemoprevention, case management, SME, SBC, targeting/stratification)
    b. What evidence/information would address the identified gaps?
8. What do you see as the most critical program evaluation questions for the (country) national malaria program?

Priority OR and PE

9. In reflecting on your responses to what are the main operational challenges/bottlenecks that NMPs face, if you had to rank the most important/top 3 operational research questions to answer what would they be and why?

Thank you for your time and participation in this interview today. We appreciate your valuable inputs into this process. We will share the report on our findings from the stakeholder consultations with you when it is available.

Stakeholder Consultation Interview Guide:

WHO Country Representatives

- Hello, my name is ___ and my colleagues ___ are on the line also from the PMI Insights project.
- As you may know, PMI Insights project is designed to identify and answer critical malaria OR and PE questions in collaboration with NMCPs and local research institutions.
- The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority OR and PE questions that can address the identified bottlenecks and challenges.
- Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda.
- There are no foreseen risks to your participation in this interview.
- The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly.
- Your participation in this interview/group discussion is voluntary. At any time, you may withdraw your participation without consequence. We anticipate this interview/group discussion will last approximately one hour.

At this time, do you have any questions for me?

Please say so now if you DO NOT consent to participate in the interview/group discussion.

Please say so now if you DO NOT consent to have this interview/group discussion audio-recorded.

Interview questions

Participant(s) characteristics

1. Organization/Country:
2. Role/Position*:
3. Area(s) of malaria expertise*:

*Note: Complete for each participant.

Malaria programming, and operational challenges and bottlenecks

Participant script: For this next set of questions, I will be asking you about operational challenges and bottlenecks in malaria programming across a number of different thematic areas. If there are some areas that are not in your area of expertise/day-to-day work, you can let me know and we can skip those areas.

4. What do you think are the main operational challenges or bottlenecks that the national malaria program faces with regards to prevention interventions (e.g., ITNs, IRS, LSM, or other vector control interventions)?
    a. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?

b. Case management (at facility level, at community level)?

c. Surveillance, monitoring, and evaluation systems/approaches?

d. Social and behavior change interventions/approaches?

5. Are you aware of any challenges that NMP(s) face in the implementation of the targeting/stratification of intervention(s)? What information would be useful to improve or better inform targeting/stratification?

6. Have you observed any knowledge gaps or shortcomings in national malaria strategic guidance or program guidelines for chemoprevention **that would benefit from further research**? If yes, can you describe the gaps? *OR ask – What evidence or information do you think is needed to improve and provide more detailed guidance for chemoprevention?*

    a. If yes, can you describe the gaps in consideration of the technical areas:

        i. Prevention interventions (e.g., LLINs, IRS, LSM, entomological surveillance/monitoring or other vector control interventions)

        ii. Chemoprevention interventions (IPTp, IPTi, SMC, MDA/FDA, etc.)?

        iii. Case management (at facility level, at community level)?

        iv. Surveillance, monitoring and evaluation systems/approaches?

        v. Social and behavior change interventions/approaches?

    b. What evidence/information would address the identified gaps?

7. Are there any knowledge/evidence gaps that you think would be beneficial to address to improve:

    a. Malaria intervention access, particularly among hard-to-reach and most vulnerable populations?

    b. Malaria intervention uptake?

    c. The efficiency/cost-effectiveness of the delivery of interventions?

8. What do you see as the most critical program evaluation questions for the (country) national malaria program?

Country OR and PE prioritization setting

9. In reflecting on your responses to what are the main operational challenges/bottlenecks that the country faces and the key knowledge gaps, if you had to rank the most important/top 3 operational research questions for (country) national malaria program, what would they be?

10. To your knowledge, how are malaria research priority areas set in (country)?

    f. Is there an existing process in (country) to define the research priority areas? If yes, can you describe the process?

    g. Who is involved?

    h. How often are research priorities set?

    i. How are the research priorities moved forward/funded?

j. Is there a set of research priorities that have been recently set? If yes, can you share them?

11. Are you aware of any recent or currently ongoing malaria operational research or program evaluations being undertaken in (country)?
    a. If yes, what are the topics/research questions being addressed?
    b. Is there any documentation/report of the study(ies) available that could be shared?

Thank you for your time and participation in this interview today. We appreciate your valuable inputs into this process. We will share the report on our findings from the stakeholder consultations with you when it is available.

Malaria Operational Research Prioritization Setting Inputs Survey: Global Technical Stakeholders

Background and Consent:

The PMI Insights project is a USAID partnership designed to identify and answer critical malaria operational research and program evaluation questions in collaboration with national malaria programs and research institutions in malaria endemic countries. The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority operational research and program evaluation questions that can address the identified bottlenecks and challenges.

You have been selected to participate in this stakeholder consultation based on your professional experience and expertise in malaria control and/or elimination. Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community. The research agenda will be used to align research priorities of NMPs with funding partners and to advocate for investment in the research agenda. There are no foreseen risks to your participation in this survey. If you choose to participate, the survey questionnaire will take you about 30-45 minutes to complete.

The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly. At the end of the survey, we will ask you if you are willing to be contacted by a member of the research team for follow-up questions or clarifications on your provided responses to the survey.

Your participation in this survey is voluntary, we greatly appreciate your time and inputs into this process. For any questions related to this survey or the project, please contact Samantha Herrera at sherrera@path.org.

Do you give your consent to participate in the survey (Yes/No)?

Survey questionnaire

Section 1: Background characteristics of participants

No.	Question	Responses Comments/Notes
Background characteristics of survey participant		
1	Name of organization you work for:	Short answer
2	Country where you work:	Multiple choice or short answer
3	Role or position within your organization:	Short answer
4	Number of years working in malaria programming/research	Multiple choice (select one) 1. 0-1 years 2. 2-5 years

		3. 6-10 years 4. 10+ years 5. Other technical area of expertise (e.g., child health, maternal health, infectious diseases, HSS)
5	Area(s) of malaria expertise	Check all that apply: 1. Malaria parasitology/basic science 2. Malaria prevention/vector control 3. Chemoprevention 4. Clinical case management 5. Surveillance, monitoring and evaluation 6. Malaria policymaking or program management 7. Community engagement/social and behavior change 8. Health systems 9. Expertise in other-related area (e.g., child health, maternal health, infectious diseases) 10. Other (specify):

Section 2: Perspectives on operational challenges/barriers and priority operational research

In these next sections of the survey, we would like to gather your perspective on what are the most pressing operational challenges or bottlenecks faced by national malaria programs in the implementation of the core intervention areas for malaria control and elimination, as well as your perspectives on key evidence gaps in malaria control and elimination policy, strategy, and implementation guidance. The core intervention areas we are gathering inputs on include: 1) prevention, 2) chemoprevention, 3) case management, and 4) surveillance, monitoring, and evaluation. Within each of the core intervention areas, we encourage you to think about operational challenges and evidence gaps as they relate to the following crosscutting areas:

1. Quality delivery of and improving access to the intervention among populations at risk
2. Health system strengthening issues (e.g., supply chain management, health workforce, governance, scale-up of the intervention, sustainability, local ownership)
3. Community engagement and mobilization
4. Social and behavior change interventions
5. Targeting, tailoring, and stratification of interventions or intervention packages
6. Cost-effectiveness/improving efficiency of the delivery of the intervention

Based on your responses, we then ask you to provide what your top 3 operational research or program evaluation questions would be to address the identified challenges or gaps.

We have listed out common intervention sub-themes for each core intervention area and provided additional opportunities for you to address other intervention areas or sub-themes not listed. **Please note that if there are some areas that are not in your area of expertise/day-to-day work, you can skip those areas.**

1. Core intervention area: prevention

For this core intervention area, the different interventions include Insecticide-treated nets (ITNs)/long-lasting insecticide-treated nets (LLINs), indoor residual spraying (IRS), larval source management (LSM), and other prevention intervention areas.

Intervention area	Key operational challenges or bottlenecks faced by national malaria programs	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
Insecticide-treated nets (ITNs)/Long-lasting insecticide-treated nets (LLINs)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Indoor residual spraying (IRS)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Larval source management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other prevention area (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

2. Core intervention area: chemoprevention

For this core intervention area, the different interventions include intermittent preventive therapy in pregnancy (IPTp), seasonal malaria chemoprevention, mass drug administration, and other chemoprevention areas.

Intervention Area	Key operational challenges or bottlenecks faced by national malaria programs	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
Intermittent preventive therapy in pregnancy	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

Seasonal malaria chemoprevention	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Mass drug administration (MDA)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

3. Core intervention area: case management

For this core intervention area, the different sub-themes covered include care-seeking; diagnostics, treatment, and referral systems; community case management; and private sector management.

Sub-theme	**Key operational challenges or bottlenecks faced by national malaria programs**	**Evidence gaps in malaria policy, strategy, and/or implementation guidance**	**Top 3 priority OR and/or PE questions to address the challenges or evidence gaps**
Care-seeking	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Diagnostics, treatment, and referral systems	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Community case management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Private sector case management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

4. Core intervention area: surveillance, monitoring, and evaluation

For this core intervention area, the different sub-themes include health management information systems (HMIS)/logistics management information systems (LMIS), monitoring and evaluation systems, malaria surveillance systems/response, and entomological monitoring and surveillance.

Sub-theme	Key operational challenges or bottlenecks faced by national malaria programs	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
HMIS/LMIS	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Monitoring & evaluation systems	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Malaria surveillance system(s) and response	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Entomological monitoring & surveillance	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

For this final section of the survey, we provide an opportunity for you to share other key operational challenges and bottlenecks, evidence gaps, and priority OR and PE questions on topic areas that were not covered in the previous survey sections. If you have no additional inputs to provide, check 'no' for question 18 and you will be taken to the end of the survey.

Question	Responses
Are there any other operational challenges or evidence gaps that you think are important to address that were not addressed in the core intervention areas listed previously?	Multiple choice 1. Yes 2. No
List out additional operational challenges or bottlenecks that national malaria programs face:	Open-ended response

List out additional key evidence gaps in malaria policy, strategy, and/or implementation guidance:	Open-ended response
List out additional priority OR and PE questions to address the challenges and/or evidence gaps you noted:	Open-ended response
If you agree to have the PMI Insights team contact you for any follow-up questions or clarifications on the responses you've provided to the survey, please provide your name and email address below:	Name: Email:

Survey Closing: Thank you for your time and valuable input in this malaria operational research prioritization setting process. We will share the key findings and identified research priority areas from this stakeholder consultations with you when they are available. We will be disseminating the results in a virtual stakeholder workshop and webinar, which we will share more information about in the coming months.

Stakeholder Consultation Survey Questionnaire:

Country Level Stakeholders

Background and Consent:

The PMI Insights project is a USAID partnership designed to identify and answer critical malaria operational research and program evaluation questions in collaboration with national malaria programs and in-country research institutions. The project is facilitating a stakeholder consultation process to identify key bottlenecks and operational challenges in malaria control and elimination programming and to define priority operational research and program evaluation questions that can address the identified bottlenecks and challenges.

You have been selected to participate in this stakeholder consultation based on your professional experience and expertise in malaria control and/or elimination. Your opinions and inputs will help shape a priority research agenda for malaria programming that will be shared broadly with the global malaria community and used to align research priorities of NMPs with funding partners, and advocate for investment in the research agenda. There are no foreseen risks to your participation in this survey.

If you choose to participate, the survey questionnaire will take you about 30-45 minutes to complete.

The information that you provide during this process will be kept confidential. All the information gathered during this consultation process will be synthesized and shared in an aggregate form and will not be able to be linked back to you directly. At the end of the survey, we will ask you if you are willing to be contacted by a member of the research team for follow-up questions or clarifications on your provided responses to the survey.

Your participation in this survey is voluntary, we greatly appreciate your time and inputs into this process. For any questions related to this survey or the project, please contact Samantha Herrera at sherrera@path.org.

Do you give your consent to participate in the survey (Yes/No)?

Survey questionnaire

Section 1: Background characteristics of participants

No.	Question	Responses Comments/notes
Background characteristics of survey participant		
1	Name of organization you work for:	Short answer
2	Country where you work:	Multiple choice or short answer
3	Role or position within your organization:	Short answer
4	Number of years working in malaria programming/research	Multiple choice (select one) 6. 0-1 years 7. 2-5 years 8. 6-10 years

		9. 10+ years 10. Other technical area of expertise (e.g., child health, maternal health, infectious diseases, HSS)
5	Area(s) of malaria expertise	Check all that apply: 11. Malaria parasitology/basic science 12. Malaria prevention/vector control 13. Chemoprevention 14. Clinical case management 15. Surveillance, monitoring and evaluation 16. Malaria policymaking or program management 17. Community engagement/social and behavior change 18. Health systems 19. Expertise in other-related area (e.g., child health, maternal health, infectious diseases) 20. Other (specify):

Section 2: Perspectives on operational challenges/barriers and priority operational research

In these next sections of the survey, we would like to gather your perspective on what are the most pressing operational challenges or bottlenecks faced by your country's national malaria programs in the implementation of the core intervention areas for malaria control and elimination, as well as your perspectives on key evidence gaps in malaria control and elimination policy, strategy, and implementation guidance. The core intervention areas we are gathering inputs on include: 1) prevention, 2) chemoprevention, 3) case management, and 4) surveillance, monitoring, and evaluation. Within each of the core intervention areas, we encourage you to think about operational challenges and evidence gaps as they relate to the following crosscutting areas:

5. Quality delivery of and improving access to the intervention among populations at risk
6. Health system strengthening issues (e.g., supply chain management, health workforce, governance, scale-up of the intervention, sustainability, local ownership)
7. Community engagement and mobilization
8. Social and behavior change interventions
9. Targeting, tailoring, and stratification of interventions or intervention packages
10. Cost-effectiveness/improving efficiency of the delivery of the intervention

Based on your responses, we then ask you to provide what your top 3 operational research or program evaluation questions would be to address the identified challenges or gaps.

We have listed out common intervention sub-themes for each core intervention area and provided additional opportunities for you to address other intervention areas or sub-themes not listed. **Please note that if there are some areas that are not in your area of expertise/day-to-day work, you can skip those areas.**

1. Core intervention area: prevention

For this core intervention area, the different interventions include Insecticide-treated nets (ITNs)/long-lasting insecticide-treated nets (LLINs), indoor residual spraying (IRS), larval source management (LSM), and other prevention intervention areas.

Intervention area	Key operational challenges and/or bottlenecks faced by your country's national malaria program	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
Insecticide-treated nets (ITNs)/Long-lasting insecticide-treated nets (LLINs)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Indoor residual spraying (IRS)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Larval source management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other prevention area (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

2. Core intervention area: chemoprevention

For this core intervention area, the different interventions include intermittent preventive therapy in pregnancy (IPTp), seasonal malaria chemoprevention, mass drug administration, and other chemoprevention areas.

Intervention area	Key operational challenges and/or bottlenecks faced by your country's national malaria program	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
Intermittent preventive therapy in pregnancy	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

Seasonal malaria chemoprevention	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Mass drug administration (MDA)	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

3. Core intervention area: case management

For this core intervention area, the different sub-themes covered include care-seeking; diagnostics, treatment, and referral systems; community case management; and private sector management.

Sub-theme	**Key operational challenges and/or bottlenecks faced by your country's national malaria program**	**Evidence gaps in malaria policy, strategy, and/or implementation guidance**	**Top 3 priority OR and/or PE questions to address the challenges or evidence gaps**
Care-seeking	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Diagnostics, treatment, and referral system	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Community case management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Private sector case management	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

4. Core intervention area: surveillance, monitoring, and evaluation

For this core intervention area, the different sub-themes include health management information systems (HMIS)/logistics management information systems (LMIS), monitoring and evaluation systems, malaria surveillance systems/response, and entomological monitoring and surveillance.

Sub-theme	Key operational challenges and/or bottlenecks faced by your country's national malaria program	Evidence gaps in malaria policy, strategy, and/or implementation guidance	Top 3 priority OR and/or PE questions to address the challenges or evidence gaps
HMIS/LMIS	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Monitoring & evaluation systems	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Malaria surveillance system(s) and response	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Entomological monitoring & surveillance	Open-ended response:	Open-ended response:	**1.** **2.** **3.**
Other (specify):	Open-ended response:	Open-ended response:	**1.** **2.** **3.**

For this final section of the survey, we provide an opportunity for you to share other key operational challenges and bottlenecks, evidence gaps, and priority OR and PE questions on topic areas that were not covered in the previous survey sections. If you have no additional inputs to provide, check 'no' for question 23 and you will be taken to the end of the survey.

Question	Responses
Are there any other operational challenges or evidence gaps that you think are important to address that were not addressed in the core intervention areas listed previously?	Multiple choice 3. Yes 4. No

List out additional operational challenges or bottlenecks that your national malaria program faces:	Open-ended response
List out additional key evidence gaps in malaria policy, strategy, and/or implementation guidance:	Open-ended response
List out additional priority OR and PE questions to address the challenges and/or evidence gaps you noted:	Open-ended response
If you agree to have the PMI Insights team contact you for any follow-up questions or clarifications on the responses you've provided to the survey, please provide your name and email address below:	Name: Email:

Survey Closing: Thank you for your time and valuable input in this malaria operational research prioritization setting process. We will share the key findings and identified research priority areas from this stakeholder consultations with you when they are available. We will be disseminating the results in a virtual stakeholder workshop and webinar, which we will share more information about in the coming months.

Annex 2. List of institutions targeted for online survey

No.	Institution	Completed survey
1	Abt Associates (headquarters and field-based staff)	Yes
2	Abdou Maumouni University/Niger	No
3	Addis Continental	No
4	African Leaders Malaria Alliance (ALMA 2030)	No
5	Applied Molecular Biology Laboratory (LBMA)/Mali	Yes
6	Armauer Hansen Research Institute	No
7	Bayer	Yes
8	Catholic Relief Services	No
9	Centre Suisee de Recherches Scientifiques (CSRS)/Cote d'Ivoire	Yes
10	Center for Applied Malaria Research and Evaluation (CAMRE) at Tulane University	Yes
11	Chemonics/Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) and HR2030 Program	Yes
12	Clinton Health Access Initiative	Yes
13	Elimination 8	Yes
14	Felix Houphouet Boigny University/Cote d'Ivoire	No
15	FHI 360	No
16	Harvard Broad Institute	Yes
17	ICF/MEASURE Malaria (headquarters and field-based staff)	Yes
18	Innovative Vector Control Consortium	No
19	Barcelona Institute for Global Health (ISGlobal)	No
20	Jimma University	Yes
21	JHPIEGO	Yes
22	Johns Hopkins School of Public Health	No
23	Johns Hopkins University Center for Communication Programs	Yes
24	John Snow Inc.	No
25	London School of Hygiene and Tropical Medicine	Yes
26	Macha Research Trust	Yes
27	Malaria Atlas Project (MAP) of Telethon Kids Institute at Curtin University	Yes
28	Malaria Consortium (headquarters and field-based staff)	Yes
29	Management Sciences for Health (MSH)/Integrated Health Services Activity	Yes
30	Medical Care Development International (MCDI)	Yes
31	Medicines for Malaria Venture	No

32	MRC Centre for Global Infectious Disease Analysis at Imperial College London	Yes
33	Noguchi Memorial Institute for Medical Research (NMIMR)/Ghana	No
34	The Palladium Group	No
35	PATH	Yes
36	Pilgrim Africa	Yes
37	Plan International	No
38	Population Services International/Impact Malaria Project (headquarters and field-based staff)	Yes
39	RTI (headquarters and field-based staff)	Yes
40	SANRU/Democratic Republic of Congo	No
41	Save the Children (headquarters and field-based staff)	Yes
42	Society for Family Health (Nigeria)	No
43	Swiss Tropical and Public Health Institute	Yes
44	HRH2030 Program/Swiss Tropical and Public Health Institute	No
45	University of Rwanda	Yes
46	University of San Francisco Malaria Elimination Institute	Yes
47	University of Sciences, Techniques and Technologies of Bamako/Mali	No
48	United Nations-Habitat	No
49	Zoom Lion (Ghana)	No
Total Number of Institutions that Completed Survey		**28**

Annex 3. Evaluation committee terms of reference

Terms of Reference

Evaluation Committee for PMI Insights Research Prioritization Process

1. Background

In a time of stalled progress and multiple threats to effective malaria control, national malaria programs and their partners need clear guidance on best practices for control and elimination, achieving and maintaining high levels of coverage, and deploying new tools and approaches. The current approach for identifying operational research (OR) and program evaluation (PE) priorities varies across malaria endemic countries. Many countries have processes in place to define their own set of research priorities for malaria control and elimination; however, there are limited opportunities to coordinate and identify pressing issues that have broad relevance, which, if addressed, would have the potential for substantial impact across several country programs. Given the limited resources for OR and PE, providing a platform for bringing together malaria endemic country stakeholders, donors, and other key implementation partners to openly discuss and prioritize research priorities has the potential to improve collaboration, coordination, and efficiency of research efforts. Ensuring more cohesive and inclusive approaches to prioritizing, generating, and sharing such research and evaluation data will be essential to enable the global malaria community to keep on track to meet goals and targets for malaria burden and mortality reduction as defined in the WHO Global Technical Strategy for Malaria 2016-2030 and the Sustainable Development Goal 3. Policy, strategy, and operational decisions must be grounded in evidence to reignite gains and accelerate progress toward these goals.

Given this critical need, the US President's Malaria Initiative (PMI) has funded the PMI Insights Project, which is a multidisciplinary partnership with the goal to improve delivery and coverage with the most appropriate mix of new and existing tools and approaches to contribute to reducing malaria burden and accelerating progress toward elimination. In support of this goal, Insights consortium partners will collaborate with PMI, other funding agencies including The Global Fund and the Bill & Melinda Gates Foundation, and work closely with and be guided by in-country national malaria programs (NMPs) and research institutions to design, implement and disseminate research that identifies best practices for control and elimination, informs new strategies to achieve and maintain high levels of intervention coverage, and guides deployment of new tools and approaches.

One of the PMI Insights' key mandates is to design and implement a collaborative and systematic process to achieve stakeholder alignment around the most pressing gaps in malaria control and elimination policy, strategy, and implementation guidance, and define a priority OR and PE agenda to address and close the gaps. The overarching goal of this consultation process will be to foster greater alignment of OR and PE priorities of national malaria programs with funding agencies, informing a more coordinated and complementary approach to donor investments in country-identified priority areas. To achieve this aim, PMI Insights has conducted a desk review and stakeholder consultations with representatives from national malaria programs, malaria-endemic research institutions, WHO, funding agency staff, and other global technical partners to gather inputs on pressing evidence gaps and priority OR and PE questions.

The PMI Insights project is now seeking the technical assistance of a committee to conduct an objective evaluation of the identified OR and PE priority questions identified in the stakeholder consultation process. The evaluation will consist of reviewing and scoring the OR and PE questions across a set of defined evaluation criteria, and to refine priority OR and PE topic areas. The committee will specifically be tasked with contributing to the finalization of the evaluation tool, using this tool to prioritize the OR/PE questions, and supporting the dissemination of the prioritized OR/PE agenda with the broader malaria community.

2. Scope and Tasks of the Committee

A. Support the finalization of the research prioritization evaluation tool. Evaluation Committee members will review and provide inputs on a tool to guide the evaluation process of the identified OR and PE questions. Specific tasks and estimated level of effort (LOE) will include:

- Individually review the tool and share feedback with the PMI Insights project team and Evaluation Committee Co-Chairs. (LOE ~1-2 hours)
- Participate in a meeting with the Evaluation Committee to discuss and finalize input on the evaluation tool for the research prioritization process. (LOE ~2 hours)

B. Conduct the evaluation of the research priorities. Evaluation Committee members will carry out the evaluation of the identified OR and PE priority questions from the PMI Insights stakeholder consultation process. Specific tasks and estimated LOE will include:

- Individually carry out the evaluation of identified research priorities using the evaluation tool and share evaluation scores with the PMI Insights project team for compilation and analysis. (LOE ~4-6 hours)
- Participate in a meeting with Evaluation Committee members to review the scores from the evaluation process, discuss areas of disagreement/misalignment in the scores, and come up with a consensus on the scores for the OR/PE questions across the defined research prioritization evaluation criteria. (LOE ~2-4 hours)

C. Support the dissemination of the research agenda and research prioritization process. Evaluation Committee members will participate in the dissemination of the evaluation process and the final list of OR/PE priority questions/agenda to the broader malaria community. Specific tasks and estimated LOE will include:

- Participate in a workshop convened by the PMI Insights project with stakeholders engaged in the research prioritization consultation process and the broader malaria community to share the findings from the research prioritization process, the scores from the evaluation process, and the final list of OR and PE priorities. The workshop is estimated to take place over 2 days, approximately 3-4 hours per day. The Evaluation Committee Co-Chairs will be asked to support the facilitation of the workshop and present on the evaluation process and the finalized research agenda. (LOE ~6-8 hours for committee members)
- Participate in a webinar convened by the PMI Insights project to share the final research agenda. The Evaluation Committee Co-Chairs will be asked to co-facilitate and or present during the webinar. (LOE ~1-2 hours for committee members)

Based on the scope and tasks outlined for the Evaluation Committee members, we expect that their service will be from November 2021 through January 2022. Based on the proposed scope and tasks outlined, it is expected that committee members will commit approximately 2-3 days of their time during the outlined timeframe. Evaluation Committee Co-Chairs will require additional LOE (~2-3 days) to support the coordination of the committee and preparation for the workshop and webinar.

3. Responsibilities of the Committee Chairs

The PMI Insights project will select two individuals to serve as Evaluation Committee Co-Chairs. The Co-Chairs are responsible for facilitating the efficient conduct of business of the Evaluation Committee. PATH, the lead on the PMI Insights project, will serve as the secretariat to support the work of the committee.

The Co-Chairs shall in particular:

A. Organize the work of the Evaluation Committee in co-operation with the committee members and the PMI Insights project to secure the timely completion of tasks, in particular setting the agenda of meetings.

B. Ensure that these terms of reference guide the work of the committee and propose measures in case of variance.

C. Ensure that prior to the first meeting of the committee, potential evaluation committee member conflicts of interest are declared.

D. Facilitate thorough discussion to establish consensus, as needed, based on all available information.

E. Present the findings from the evaluation process at the workshop and webinar convened by the PMI Insights project.

4. Evaluation Committee Composition and Membership

The PMI Insights project envisions the Evaluation Committee to be comprised of between 10-15 members, two of which will serve in the role of the Committee Co-Chairs.

A. The Evaluation Committee will be comprised of researchers and program leaders that have served in leadership roles within national malaria programs, universities, research institutions, implementing organizations, and WHO country/AFRO regional offices in sub-Saharan Africa. Desired qualifications include:

- Substantial experience working in malaria programming or research.
- Programmatic and/or research expertise in at least one of the following technical areas: 1) malaria parasitology, 2) vector control/entomology; 3) malaria chemoprevention; 4) case management of malaria at facility and/or community levels; 5) malaria surveillance, monitoring, and evaluation; or 6) malaria program management/policymaking. Evaluation Committee members will be selected to ensure a range of malaria expertise across the listed technical areas.

B. The Evaluation Committee composition will strive for gender balance as well as diversity in participant background and demographics, including geography, years of experience, and technical expertise.

C. Members of the Evaluation Committee will be provided with an honorarium for their service. Members agree to participate through the conclusion of the final webinar to disseminate the final research agenda, which is expected to be held at the end of December 2021 or early January 2022. Based on the scope and tasks outlined for the Evaluation Committee members, we expect that their service will be from October 2021 through late December or early January 2022.

5. Independence, Confidentiality, and Transparency

A. Members of the Evaluation Committee should be independent of any external influence and act solely on the basis of scientific considerations.

B. All Evaluation Committee participants will make a formal declaration of conflicts of interest that may be prejudicial to an independent review at their first Evaluation Committee meeting. This declaration shall be updated in a timely manner by Evaluation Committee participants, as appropriate.

C. Any Evaluation Committee participant declaring a conflict of interest may be asked not to participate in parts of the meeting pertaining to their declared conflicting interests.

6. Meeting procedures

A. Meeting Materials

Meeting materials shall be provided to Evaluation Committee members as early as possible to enable preparation for the proposed meetings.

B. Agenda

Meeting agendas will be developed between the PMI Insights project and the Evaluation Committee Chairs. The final agenda will be circulated in advance of meetings by the Committee Chairs.

C. Format of the Minutes

The minutes shall include: (1) the list of attendees; (2) the final agenda; (3) a summary record of the proceedings; and (4) action points.

D. Confidentiality

The proceedings of each Evaluation Committee meeting shall be treated as confidential. In addition, all documentation provided for a meeting as well as the meeting minutes shall be treated as Confidential Information of PATH.

Annex 4. Evaluation committee member list

No.	Member name	Institution	Institution type	Country
1	Elizabeth Juma	World Health Organization (WHO)/Ghana	WHO	Ghana
2	Jaishree Raman	Malaria Research Unit at South African Medical Research Council	RI	South Africa
3	Fitsum Tadesse	Armauer Hansen Research Institute/Radboud University Nijmegen Medical Centre	RI	Ethiopia
4	Catherine Maiteki-Sebuguzi	National Malaria Control Program	NMP	Uganda
5	Alassane Dicko	Malaria Research and Training Center/University of Bamako	RI	Mali
6	Prof. Evelyn Ansah (Committee co-chair)	University of Health Allied Sciences	RI	Ghana
7	Dorothy Achu	National Malaria Control Program	NMP	Cameroon
8	Corine Karema	Independent, Quality and Equity Healthcare, Kigali-Rwanda (previously NMP Director)	NMP	Rwanda
9	Rose Leke	University of Yaoundé	RI	Cameroon
10	Perpetua Uhomoibhi	National Malaria Elimination Program	NMP	Nigeria
11	Khoti Gausi	WHO/Country Office	WHO	South Sudan
12	Busiku Hamainza	National Malaria Elimination Centre	NMP	Zambia
13	Baltazar Candrinho	National Malaria Control Programme	NMP	Mozambique
14	Corine Ngufor	Center for Entomological Research in Cotonou/London School of Hygiene and Tropical Health Collaborative Research Program	RI	UK/Benin
15	Don Mathanga	University of Malawi, Faculty of Public Health and Director of the Malaria Alert Centre, a research unit within the College of Medicine	RI	Malawi
16	Charles Mbogo	Kenya Medical Research Institute and Pan African Mosquito Control Association	RI	Kenya
17	Roger Tine (Committee co-chair)	Université Cheikh Anta Diop of Dakar	RI	Senegal

Notes: NMP = national malaria program; RI = research institution

Annex 5. Research prioritization evaluation tool

Malaria research prioritization evaluation tool

Guidance for evaluation committee members

The operational research (OR) and program evaluation (PE) priority areas identified through the PMI Insights stakeholder consultation process and desk review will be evaluated by committee members across six defined evaluation criteria. Evaluation criteria are described in detail in Table 1. Each criterion highlights key aspects and considerations for the identified research priority areas. Although each criterion is to be considered separately, it is important to note that there are some linkages across the outlined evaluation criteria.

For the evaluation process, committee members will be asked to independently evaluate the set of identified OR and PE priority areas that emerged from the stakeholder consultations against the six evaluation criteria. Each evaluation criterion has 1-2 questions per criteria that can be used to guide the assessment and ranking of the identified OR/PE research priority areas. (Table 2). Eligible responses to the evaluation questions in Table 2 are: 'Yes, strongly agree' (5 points), 'Yes, agree' (4 points), 'Neither agree or disagree' (3 points), 'No, disagree' (2 points), 'No, strongly disagree' (1 point), or 'Do not know" (not included in ranking score). Committee members who do not feel able to respond to a specific evaluation question, should mark 'Do not know.' Committee members will complete the evaluation of the identified OR and PE questions through an online survey form through SurveyMonkey or using an Excel-based evaluation form.

The PMI Insights team will be responsible for the analysis of the committee scores and will present the aggregate scores back to the committee. Individual scores will not be shared. The committee will have an opportunity to review and discuss the aggregate scores upon completion of the process.

Table A1. Evaluation criteria.

No.	Criteria	Definition
1	Broad relevance	This criterion assesses the relevance of the research priority across a relatively large number of malaria-endemic settings. This criterion will take into consideration the potential relevance of the priority across multiple settings and countries, thus demonstrating that addressing the priority would inform the work of multiple country programs.
2	High impact on malaria burden	This criterion assesses the extent to which the research priority would address significant coverage gaps, challenges, or barriers in the uptake of or access to malaria interventions among populations at risk, and therefore lead to a substantial impact on malaria burden relative to the specific country or subnational context. Another aspect of consideration for this criterion will be whether the research priority addresses an intervention area where there is substantial financial investment by country malaria programs and funding agencies; thereby enabling greater opportunity for impact. For high and moderate transmission settings, a research priority would be considered to have high impact if it would lead to optimization of a proven intervention and thus likely contribute to a substantial reduction in malaria mortality, incidence, and/or malaria prevalence. In low and very low transmission settings, leading to high impact is likely to be more nuanced and difficult to measure, and will largely be based on the context. In these settings it would be expected that addressing the research gap/priority would contribute to reducing threats to intervention effectiveness (e.g., mitigating threats to drug and insecticide resistance), strengthening the robustness of a country's surveillance system, or bringing a setting(s) closer to and achieving elimination.
3	Improves efficiency	Assesses the extent to which then research priority will help improve efficiency in the delivery of an intervention or approach. In this context, improved efficiency could refer for example to the optimization of how an intervention is delivered in terms of reducing unnecessary resources or costs, changing how an intervention is delivered to improve the quality and/or its effectiveness, or improvements in data quality, accuracy, or timeliness, from data or digital innovations. Efficiency could also be conceptualized in terms of potentially withdrawing or replacing an intervention with another proven intervention to improve efficiency or cost-effectiveness.
4	Addresses inequities	Evaluates the extent to which the research priority will help address inequities in access to interventions and coverage gaps with an emphasis on gender, geographical (specifically, hard-to-reach populations), demographic (with a focus on high-risk and more vulnerable populations, such as children under five years of age and pregnant women), and socio-economic factors.
5	Scalability and sustainability	Assesses the extent to which the research priority addresses an approach or intervention that can be feasibly and effectively delivered at scale within countries' existing systems to reach the eligible population(s) in need. Several aspects will be taken into consideration to assess scalability of an approach or intervention, such as the cost required, available resources and supporting systems within the country, ability of the approach/intervention to remain effective as it is scaled up, local ownership, political will, and sustainability.
6	Feasibility	Assesses whether the research priority is answerable using available research methods and in alignment with ethical principles (e.g., research does not raise any major ethical concerns). The criteria also assesses whether the research can be answered in an efficient manner, both in terms of the cost/affordability and timeliness for carrying out the research (such that the research findings when available will still be relevant).

Table A2. Evaluation questions.

Evaluation Criteria	Evaluation questions
Broad relevance (BR)	1. Is it likely the research findings could inform policy, strategy, or implementation guidance across several (3+) malaria-endemic countries?
High impact on malaria burden (HI)	2. Does the research question address a significant barrier to achieving coverage targets of a proven or new promising malaria control or elimination intervention? 3. Is it likely the research would enable or lead to a substantial reduction in malaria burden or bring a setting(s) closer to elimination?
Improves efficiency (IE)	4. Is it likely the research could inform how to optimize the delivery of an intervention in terms of reducing unnecessary costs or resources? 5. Is it likely the research would inform how to improve the quality or overall effectiveness of an intervention?
Addresses inequities (AI)	6. Would populations most-at-risk for and/or most vulnerable to malaria likely benefit from the research after the findings have been applied or implemented? 7. Does answering the research question have the potential to lead to more equitable coverage of interventions or in the disease burden distribution in the mid- or long-term (5-10 years)?
Scalability and Sustainability (SS)	8. Does the research address an intervention or approach that could be feasibly delivered at scale by national malaria programs?
Feasibility (F)	9. Is the research question clear and well framed? 10. Is it feasible to design and conduct a study in response to the research question (considerations: time and cost to undertake study, human resource needs, study design/methods, would receive ethical approval without major concerns)?

Annex 6. Detailed evaluation scores of OR and PE topics

Table A3. Evaluation criteria scores for OR and PE topics by evaluation criteria question and overall research priority score.

OR/PE Topic	Evaluation Criteria										RPS Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Test and evaluate different delivery mechanisms to reach and sustain high coverage of ITNs among hard-to-reach and highest risk populations	88.2	88.2	85.9	88.2	85.9	94.1	90.6	85.9	87.1	84.7	87.9
Evaluate the effectiveness and cost-effectiveness of different strategies for deploying the RTS, S AS01 malaria vaccine with chemoprevention (e.g., campaign vs. EPI-linked vs combination campaign/EPI strategies).	91.8	90.0	86.3	90.6	88.2	88.2	84.7	83.5	83.5	78.8	86.6
Assess the effectiveness and cost-effectiveness of different intervention combinations (e.g., ITNs + IRS, ITNs or IRS + LSM, vector control + chemoprevention) to better understand how interventions should be combined to maximize impact.	94.1	84.7	85.9	90.6	87.5	77.5	76.5	88.2	84.7	83.5	85.3
Test and evaluate approaches or interventions to reduce the frequency of stockouts of key commodities for malaria case management, especially at the community level.	85.9	85.9	83.8	84.7	88.2	85.9	87.1	83.5	82.4	85.9	85.3
Evaluate and compare different insecticide management and/or rotation strategies on insecticide resistance prevalence and intensity.	94.1	77.6	82.4	85.9	91.8	81.2	78.8	87.1	85.9	85.9	85.1
Evaluate the impact and cost-effectiveness of expanding the age range, geographical coverage, and rounds of treatment of seasonal malaria chemoprevention.	89.4	84.7	90.6	77.6	80.0	87.1	82.4	84.7	85.9	82.4	84.5
Assess factors associated with CHW motivation and retention and evaluate different approaches or interventions to improve CHW motivation and retention.	85.9	84.7	75.3	75.3	81.2	88.2	85.9	81.2	88.2	87.1	83.3
Assess predictors of adherence to and determinants of uptake of SMC and evaluate different strategies to achieving high SMC coverage and adherence.	80.0	80.0	78.8	82.4	84.7	88.2	82.4	81.3	82.5	82.7	82.3

OR/PE Topic	Evaluation Criteria										RPS Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Test and evaluate the effectiveness of different deployment and targeting approaches for IRS to maximize impact (e.g., testing different insecticides, duration and frequency of spraying, geographic/structural targeting strategies).	85.9	80.0	82.4	87.1	87.1	75.3	77.6	81.2	81.2	82.4	82.0
Assess different approaches or interventions to improve the analytic and data use capacity, and data use culture at different levels of the health system.	81.2	75.3	72.9	83.5	83.5	76.5	82.4	82.4	88.2	87.1	81.3
Assess the impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance.	83.5	77.6	82.4	84.7	87.1	76.5	75.3	81.2	83.5	81.2	81.3
Given the challenges with ITN durability, test and evaluate the effectiveness of different approaches to improve routine/continuous distribution channels for ITNs to sustain coverage between mass campaigns.	84.7	85.9	74.1	84.7	82.4	78.8	77.5	82.4	81.2	81.2	81.3
Compare different SBC/community engagement strategies in terms of effectiveness and cost-effectiveness on healthcare seeking, adherence to treatment, and uptake of key prevention interventions.	82.4	82.4	80.0	84.7	83.5	81.2	80.0	80.0	78.8	76.3	80.9
Assess the effectiveness and cost-effectiveness of innovative approaches to reduce the cost and/or improve the efficiency of IRS implementation (e.g., partial spraying of structures, use of a decentralized approach, targeted spraying).	85.9	81.2	77.6	88.2	80.0	75.3	78.8	77.6	83.5	80.0	80.8
Assess structural and behavioral factors associated with delayed care-seeking across different population groups (e.g., age, gender, hard-to-reach/vulnerable populations) and compare different strategies to decrease delays in care-seeking.	81.2	84.7	78.8	76.5	75.3	84.7	83.5	76.5	80.0	78.8	80.0
Assess predictors of adherence and non-adherence to case management treatment guidelines among health care providers and test/evaluate different strategies to improve adherence to guidelines.	83.5	82.4	77.5	78.8	84.7	75.3	70.6	77.6	82.4	82.4	79.5

OR/PE Topic	Evaluation Criteria										RPS Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Evaluate how current surveillance systems are functioning, and whether they are producing reliable and accurate information to guide countries toward elimination.	88.2	80.0	74.1	78.8	72.9	76.5	77.6	78.8	82.4	84.7	79.4
Assess the operational feasibility and most effective delivery platform for IPTi administration (e.g., EPI, mass campaign, community health workers).	81.2	75.0	69.4	87.1	76.5	81.2	77.5	80.0	82.4	78.8	78.9
Assess the feasibility and benefit of different digital tools/systems for use at the community level for data capture, reporting, and transmission to HMIS/DHIS2.	87.1	72.9	68.2	77.6	80.0	74.1	75.3	78.8	85.9	87.1	78.7
Evaluate different strategies for achieving high MDA coverage and adherence in different transmission contexts.	85.0	81.3	76.3	81.3	78.8	72.5	73.8	81.3	80.0	76.0	78.6
Test and evaluate interventions to improve adherence to malaria treatment guidelines and reporting in private sector health facilities.	82.4	77.6	78.8	77.6	82.4	70.6	75.3	75.3	81.2	84.7	78.6
Assess the long-term effectiveness and sustainability of different social and behavior change approaches on key malaria treatment and prevention behaviors and the duration of their impact on intervention uptake.	83.5	82.4	75.0	77.6	81.2	74.1	76.5	74.1	75.3	81.2	78.1
Compare different strategies for surveillance and response in elimination settings, assessing completeness, timeliness, delivery of response, and cost-effectiveness.	80.0	74.1	77.6	81.2	84.7	71.8	71.8	76.5	78.8	83.8	78.0
Test the effectiveness of different strategies to improve early ANC attendance and IPTp coverage.	78.8	81.2	78.8	78.8	80.0	80.0	78.8	76.5	77.6	77.6	78.0
Test and evaluate strategies to improve the efficiency of the delivery of IPTp (e.g., community-based delivery through community health workers)?	80.0	81.2	68.2	80.0	78.8	80.0	80.0	69.4	80.0	81.2	77.9
Test and evaluate different approaches or interventions for improving HMIS data quality.	84.7	75.3	69.4	76.5	76.5	72.9	75.3	81.2	83.5	81.2	77.6
Evaluate different strategies to improve health care worker adherence to IMCI guidelines.	78.8	76.3	73.8	81.3	76.3	80.0	75.0	76.3	75.0	81.3	77.4

OR/PE Topic	Evaluation Criteria										RPS Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Evaluate the effectiveness and cost-effectiveness of larval source management on epidemiological and entomological outcomes in different transmission contexts and the duration of impact.	88.2	75.3	74.1	75.3	82.4	71.8	68.2	70.6	81.2	78.8	76.6
Test approaches or strategies to improve cost and resource efficiency (e.g., integration of seasonal malaria chemoprevention with other delivery platforms) and to maintain effectiveness in the delivery of seasonal malaria chemoprevention when scaling up the intervention.	77.6	77.6	76.5	81.2	77.6	77.6	74.1	74.1	72.9	76.5	76.6
Compare or evaluate different strategies/packages of interventions to maintain low/current malaria case incidence following the withdrawal of IRS.	88.2	68.2	75.3	78.8	76.5	72.9	72.9	80.0	77.6	75.3	76.6
Assess barriers and facilitators to ITN use in different settings where access to ITNs is high and evaluate the effectiveness of different social and behavior change (SBC) approaches/interventions to improve ITN use within different settings/contexts based on the identified barriers.	80.0	76.5	73.8	76.5	78.8	77.6	76.5	75.3	70.6	77.6	76.3
Test different approaches for working with/incentivizing participation and collaboration of the private sector in the referral, diagnosis, treatment, and reporting of malaria cases.	85.9	78.8	72.9	75.3	81.2	69.4	67.1	70.6	76.5	77.6	75.5
Assess the magnitude of cross border movement of people on malaria incidence/prevalence and evaluate the effectiveness of different strategies to reduce malaria transmission along international borders.	82.4	72.9	68.2	65.0	68.2	72.9	72.9	64.7	75.0	72.5	71.5

Notes: BR=broad relevance criteria; HI1=high impact criteria question 1; H12=high impact criteria question 2; IE1=improves efficiency criteria question 1; IE2=improves efficiency criteria question 2; AI1=addresses inequities criteria question 1; AI2=addresses inequities criteria question 2; SS=sustainability and scalability criteria; F1=feasibility criteria question 1; F2=feasibility criteria question 2.

Table A4. Average expert agreement scores for OR and PE topics by criteria question and overall

OR/PE Topic	Evaluation Criteria										AEA Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Test approaches or strategies to improve cost and resource efficiency (e.g., integration of SMC with other delivery platforms) and to maintain effectiveness in the delivery of seasonal malaria chemoprevention when scaling up the intervention.	70.6	76.5	58.8	58.8	58.8	52.9	70.6	70.6	76.5	82.4	67.6
Assess the long-term effectiveness and sustainability of different social and behavior change approaches on key malaria treatment and prevention behaviors and the duration of their impact on intervention uptake.	52.9	58.8	50.0	58.8	58.8	58.8	70.6	58.8	70.6	70.6	60.9
Given the challenges with ITN durability, test and evaluate the effectiveness of different approaches to improve routine/continuous distribution channels for ITNs to sustain coverage between mass campaigns.	52.9	58.8	35.3	64.7	64.7	64.7	68.8	64.7	64.7	64.7	60.4
Test and evaluate different delivery mechanisms to reach and sustain high coverage of ITNs among hard-to-reach and highest risk populations.	47.1	58.8	58.8	58.8	58.8	70.6	52.9	58.8	64.7	64.7	59.4
Test the effectiveness of different strategies to improve early ANC attendance and IPTp coverage.	47.1	64.7	64.7	64.7	76.5	58.8	70.6	52.9	52.9	58.8	58.2
Evaluate different strategies to improve health care worker adherence to IMCI guidelines.	68.8	43.8	37.5	68.8	75.0	50.0	43.8	50.0	62.5	81.3	58.1
Test and evaluate different approaches or interventions for improving HMIS data quality.	52.9	52.9	47.1	47.1	58.8	41.2	47.1	70.6	82.4	70.6	57.1
Assess the effectiveness and cost-effectiveness of innovative approaches to reduce the cost and/or improve the efficiency of IRS implementation (e.g., partial spraying of structures, use of a decentralized approach, targeted spraying).	47.1	41.2	52.9	47.1	52.9	58.8	64.7	58.8	64.7	70.6	55.9
Compare different strategies for surveillance and response in elimination settings, assessing completeness, timeliness, delivery of response, and cost-effectiveness.	52.9	41.2	58.8	58.8	64.7	41.2	35.3	58.8	75.0	68.8	55.6

OR/PE Topic	Evaluation Criteria										AEA Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Test and evaluate interventions to improve adherence to malaria treatment guidelines and reporting in private sector health facilities.	64.7	41.2	47.1	70.6	64.7	41.2	47.1	64.7	58.8	52.9	55.3
Evaluate the impact and cost-effectiveness of expanding the age range, geographical coverage, and rounds of treatment of seasonal malaria chemoprevention.	58.8	47.1	58.8	70.6	52.9	52.9	64.7	52.9	47.1	47.1	55.3
Compare different SBC/community engagement strategies in terms of effectiveness and cost-effectiveness on healthcare seeking, adherence to treatment, and uptake of key prevention interventions.	52.9	64.7	35.3	41.2	58.8	47.1	41.2	76.5	58.8	75.0	55.1
Assess structural and behavioral factors associated with delayed care-seeking across different population groups (e.g., age, gender, hard-to-reach/vulnerable populations) and compare different strategies to decrease delays in care-seeking.	58.8	47.1	64.7	41.2	41.2	41.2	58.8	58.8	70.6	64.7	54.7
Evaluate and compare different insecticide management and/or rotation strategies on insecticide resistance prevalence and intensity (crosscuts use of ITNs and IRS).	70.6	47.1	41.2	47.1	58.8	58.8	47.1	64.7	52.9	52.9	54.1
Test different approaches for working with/incentivizing participation and collaboration of the private sector in the referral, diagnosis, treatment, and reporting of malaria cases.	47.1	58.8	47.1	47.1	47.1	47.1	35.3	52.9	82.4	70.6	53.5
Assess the effectiveness and cost-effectiveness of different intervention combinations (e.g., ITNs + IRS, ITNs or IRS + LSM, vector control + chemoprevention) to better understand how interventions should be combined to maximize impact.	76.5	64.7	52.9	58.8	50.0	50.0	41.2	47.1	47.1	47.1	53.5
Evaluate the effectiveness and cost-effectiveness of different strategies for deploying the RTS, S AS01 malaria vaccine with chemoprevention (e.g., campaign vs. EPI-linked vs combination campaign/EPI strategies).	64.7	56.3	50.0	58.8	52.9	52.9	47.1	47.1	58.8	41.2	53.0

OR/PE Topic	Evaluation Criteria										AEA Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Assess predictors of adherence to and determinants of uptake of SMC and evaluate different strategies to achieving high SMC coverage and adherence.	58.8	41.2	47.1	41.2	52.9	47.1	64.7	62.5	50.0	60.0	52.5
Assess the impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance.	47.1	52.9	52.9	47.1	64.7	35.3	41.2	47.1	70.6	64.7	52.4
Evaluate the effectiveness and cost-effectiveness of larval source management on epidemiological and entomological outcomes in different transmission contexts and the duration of impact.	52.9	47.1	35.3	41.2	64.7	52.9	58.8	41.2	58.8	70.6	52.4
Test and evaluate the effectiveness of different deployment and targeting approaches for IRS to maximize impact (e.g., testing different insecticides, duration and frequency of spraying, geographic/structural targeting strategies).	52.9	47.1	41.2	47.1	64.7	47.1	35.3	47.1	64.7	58.8	50.6
Evaluate how current surveillance systems are functioning, and whether they are producing reliable and accurate information to guide countries toward elimination.	47.1	47.1	35.3	52.9	52.9	41.2	35.3	47.1	64.7	58.8	48.2
Test and evaluate approaches or interventions to reduce the frequency of stockouts of key commodities for malaria case management, especially at te community level.	47.1	47.1	50.0	41.2	52.9	47.1	47.1	52.9	47.1	47.1	47.9
Assess factors associated with CHW motivation and retention and evaluate different approaches or interventions to improve CHW motivation and retention.	52.9	47.1	35.3	29.4	70.6	58.8	47.1	41.2	47.1	47.1	47.6
Evaluate different strategies for achieving high MDA coverage and adherence in different transmission contexts.	43.8	43.8	50.0	37.5	43.8	37.5	37.5	68.8	68.8	40.0	47.1
Compare or evaluate different strategies/packages of interventions to maintain low/current malaria case incidence following the withdrawal of IRS.	52.9	35.3	47.1	41.2	35.3	35.3	41.2	70.6	58.8	52.9	47.1

OR/PE Topic	Evaluation Criteria										AEA Overall
	BR	HI1	HI2	IE1	IE2	AI1	AI2	SS	F1	F2	
Test and evaluate strategies to improve the efficiency of the delivery of IPTp (e.g., community-based delivery through community health workers)?	41.2	41.2	35.3	58.8	52.9	47.1	47.1	35.3	56.3	52.9	46.8
Assess predictors of adherence and non-adherence to case management treatment guidelines among health care providers and test/evaluate different strategies to improve adherence to guidelines.	41.2	41.2	31.3	52.9	41.2	58.8	47.1	41.2	52.9	52.9	46.1
Assess different approaches or interventions to improve the analytic and data use capacity, and data use culture at different levels of the health system.	52.9	35.3	29.4	41.2	47.1	47.1	41.2	47.1	58.8	52.9	45.3
Assess the feasibility and benefit of different digital tools/systems for use at the community level for data capture, reporting, and transmission to HMIS/DHIS2.	47.1	41.2	29.4	47.1	52.9	29.4	29.4	41.2	70.6	64.7	45.3
Assess the magnitude of cross border movement of people on malaria incidence/prevalence and evaluate the effectiveness of different strategies to reduce malaria transmission along international borders.	41.2	41.2	29.4	37.5	47.1	47.1	52.9	35.3	56.3	62.5	45.0
Assess the operational feasibility and most effective delivery platform for IPTi administration (e.g., EPI, mass campaign, community health workers).	52.9	37.5	35.3	52.9	35.3	41.2	31.3	35.3	52.9	52.9	42.8
Assess barriers and facilitators to ITN use in different settings where access to ITNs is high and evaluate the effectiveness of different social and behavior change (SBC) approaches/interventions to improve ITN use within different settings/contexts based on the identified barriers.	47.1	35.3	43.8	41.2	35.3	41.2	35.3	52.9	29.4	41.2	40.3

Notes: BR=broad relevance criteria; HI1=high impact criteria question 1; HI2=high impact criteria question 2; IE1=improves efficiency criteria question 1; IE2=improves efficiency criteria question 2; AI1=addresses inequities criteria question 1; AI2=addresses inequities criteria question 2; SS=sustainability and scalability criteria; F1=feasibility criteria question 1; F2=feasibility criteria question 2.