Global **Malaria** Programme

WHO Malaria Policy Advisory Committee (MPAC) meeting

OCTOBER 2017   MEETING REPORT

SUMMARY

On 17–19 October 2017, the WHO Malaria Policy Advisory Committee (MPAC) convened to review updates and progress, and provide guidance with respect to specific thematic areas of work carried out by the Global Malaria Programme (GMP).

The meeting included 10 sessions focused on 18 topics: (1) the outcomes from an evidence review group (ERG) on low density infections; (2) the outcomes from an ERG on the deployment of piperonyl butoxide plus pyrethroids nets; (3) an update on malaria elimination in the Greater Mekong Subregion; (4) the outcomes from the drug efficacy and response technical expert group (TEG); (5) a response plan on *pfhrp2* gene deletions; (6) an update on RTS,S pilot implementation; (7) an update on the malaria vaccine advisory committee; (8) an update on the vector control advisory group; (9) the outcomes of the ERG on comparative effectiveness of vector control tools; (10) a proposed ERG on border malaria; (11) an introduction to the WHO Research & Development Observatory; (12) a presentation on universal access to malaria core interventions ; (13) the results from the rapid access expansion programme on integrated community case management of malaria; (14) a demonstration of the online mapping tool for insecticide resistance, antimalarial resistance and *hrp2/3* deletion data; (15) the outcomes of the ERG on malaria in pregnancy outside of Africa; (16) an update on the establishment of the malaria elimination oversight committee (MEOC) and malaria elimination certification panel (MECP); (17) a proposed ERG on malaria mortality estimates; and (18) a review of the revised recommendations for achieving and maintaining universal coverage with long-lasting insecticidal nets in malaria control.

At the closing session, the key outcomes/recommendations of MPAC to GMP included:

- **Low density infections:** MPAC agreed with the standardization of the terminology suggested by the ERG, reviewed the suggestions for updating the WHO recommendations on the diagnosis of *P. falciparum*

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and *P. vivax* malaria in low transmission settings and endorsed the proposed updates with some modifications.

- **Deployment of PBO plus pyrethroids nets:** MPAC endorsed the recommendations of the ERG with the note that specifying "metabolic pyrethroid resistance" should be updated throughout the document. MPAC also noted that the largest benefit of the pyrethroid–PBO nets was in areas of moderate metabolic pyrethroid resistance, but that available data indicate that this class of nets performs at least as well as or better than pyrethroid-only LLINs across all settings where any level of pyrethroid resistance due to a metabolic resistance mechanism is present. The online version of the recommendations will be updated accordingly.

- **Elimination in the Greater Mekong Subregion:** MPAC welcomed reported progress in the GMS as evidenced by declines in national incidence across the subregion. MPAC requested that future reports be based on a more detailed analysis that includes subnational data on incidence reductions and progress in those areas in the GMS with documented transmission of multidrug resistant (MDR) *P. falciparum.*

- **Drug efficacy & response:** MPAC supported the initiative to develop updated guidance for prevention and treatment of MDR *P. falciparum* as an extension of the current *Global plan for artemisinin resistance and containment* (GPARC). MPAC also supported continued research into treatment options for MDR including triple therapy and/or sequential approaches. MPAC urged GMP to work with donors and partners to ensure that an adequate stockpile of artemisinin combination therapies (ACTs) are available for programme use.

- **Response plan on *pfhrp2* gene deletions:** MPAC noted the progress that has been made since the last update and supported the global response plan with suggestions for the outcome-based actions, coordination and prioritization.

- **RTS,S pilot implementation:** MPAC noted the progress made to date and was in favour of the development of the proposed framework for policy decision making.

- **Malaria vaccine advisory committee (MALVAC):** MPAC supports the reconvening of MALVAC with the suggestion that the purpose of the committee must be made clear.

- **Vector control advisory group (VCAG):** MPAC requested that VCAG, and WHO more generally, explore ways to further simplify its processes and definitions in the assessment of the public health value of new vector control tools. A review of current documentation should specifically clarify the algorithms for how decisions are made, with the goal of increasing understanding of the process among development partners. A specific area requiring further clarity is how insecticide-treated nets are being evaluated when compared to other vector control interventions, given that the current definition of "class" and "entomological effect" do not support current classification of different new generation nets. MPAC also recommended that the WHO guidance for insecticide resistance management be updated including the use of non-pyrethroid/multiple active ingredient long-lasting insecticidal nets as insecticide resistance management tools analogous to the rotation of insecticides for indoor residual spraying covered in the *Global plan for insecticide resistance management* (GPIRM). Finally, MPAC noted that the cost implications of evidence-generation are beyond the scope of VCAG and highlighted the need to work with partners to identify incentives including accelerated funding for key evidence generating trials.

- **Comparative effectiveness of vector control tools:** MPAC agreed that SumiShield® 50WG meets the current WHO efficacy criteria for indoor residual spraying and has a similar entomological effect to other products that are currently covered by a WHO policy recommendation. Based on this assessment, MPAC recommended that the existing WHO policy for IRS be extended to include SumiShield® 50WG. Specific ERG recommendations on the evaluation of other new tools were accepted as presented in the draft recommendations shared with MPAC.

- **Border malaria:** MPAC supported the convening of the ERG on border malaria and noted that border issues are long-standing and are often a political issue as much as a technical issue for malaria control and elimination programmes. MPAC urged the Secretariat to reach out to national malaria control programmes to help frame the questions to be considered by the ERG and to include an analysis of successes and challenges already learned.

- **Global Observatory on Health R&D:** MPAC appreciated the opportunity to contribute to the thinking on how to prioritize investments in malaria R&D and suggested that if malaria is being used as a pathfinder, perhaps WHO should look at the cross-disease relevance of investments.

- **Universal access to malaria core interventions:** MPAC noted that overall, countries are not on target to meet the GTS milestones for 2020 on burden reduction and agree that action is needed urgently to reduce malaria morbidity and mortality by targeting coverage of core interventions of vector control, diagnosis and treatment, chemoprevention and surveillance.

- **Rapid access expansion programme results:** MPAC noted the positive results of the RAcE programme and highlighted that there is a wealth of historical evidence that demonstrates the impact of introducing well-trained, supervised and supplied community health workers (CHWs). MPAC further noted that the challenge to maintaining the impact of CHWs is to include them as health system personnel delivering a countrywide intervention.

- **Malaria Threats Map:** MPAC noted the progress of the Malaria Threats Map tool and felt that it is a useful platform for making global threats data available.

- **Malaria in pregnancy outside of Africa:** MPAC noted the conclusions of the ERG and agreed that no new recommendations are needed based on the data reviewed.

- **Malaria elimination oversight committee and malaria elimination certification panel:** MPAC agreed that it was important to separate the functions of the groups and clarified the expected role of MPAC in reviewing the panel reports and endorsing recommendations for malaria-free certification to the Director-General.

- **Malaria mortality estimates:** MPAC supported the convening of an ERG for malaria mortality estimates and noted three key issues to consider: 1) the need to develop methods to estimate the burden of indirect deaths from malaria; 2) the need to ensure the engagement of country programmes especially those with highest burden and weak surveillance systems, so as for them to understand the estimation approaches and provide input; and 3) expansion of the ERG to include the methods for estimating malaria morbidity as these require further discussion and have implications for mortality estimation.

- **Achieving universal coverage with long-lasting insecticidal nets:** MPAC endorsed the revised recommendations with some minor adjustments to the text.

BACKGROUND

The WHO Global Malaria Programme (GMP) convened the Malaria Policy Advisory Committee (MPAC) for its twelfth meeting in Geneva, Switzerland on 17–19 October 2017. MPAC convenes twice annually in Geneva to provide independent strategic advice to WHO on policy recommendations for malaria control and elimination. The Committee is supported by technical expert groups (TEGs) and ad hoc evidence review groups (ERG), whose work focuses on thematic areas and specific research questions to generate sufficient evidence to provide guidance. Over the course of the three-day meeting's open sessions, 14 MPAC members, six national malaria control programme managers, the WHO Secretariat and 40 observers discussed the updates and progress in the work areas presented. Recommendations were discussed in the final closed session of the committee.

UPDATES FROM THE GLOBAL MALARIA PROGRAMME

The GMP Director opened the meeting by providing a concise general update on the work of the WHO-GMP units organized according to the five roles articulated in the Strategy: 1) Address key malaria control and elimination strategic questions; 2) set, communicate & disseminate evidence-based normative guidance, policy advice and implementation guidance to support country action; 3) coordinate WHO capacity building & technical support to Member States, jointly with regions and countries; 4) help countries develop and implement robust surveillance systems to generate quality data and use those data to achieve greater impact; 5) keep an independent score of global progress in malaria control and elimination, including drug & insecticide resistance. Key strategic concerns include an analysis of malaria mortality and coverage gaps, prioritizing the R&D pipeline for malaria, and a reassessment of the current contribution of malaria to the burden of anaemia. The Director highlighted new normative guidance that has been launched since the last meeting, the work to strengthen policy dissemination, technical support to Member States and capacity building activities that have been undertaken, work on surveillance to improve routine data and analysis, and updates on the *World Malaria Report* and the Malaria Threats Map. Visits to the GMP website have increased steadily since 2014 and communications around World Malaria Day and other high level events have increased web traffic. The Director closed with a reminder of the 2020 GTS milestones and the number of countries that are not on track.

SUMMARY OF THE MPAC SESSIONS

Outcomes from evidence review group on low density malaria infections

Background: In March 2014, WHO published recommendations on the use of malaria diagnostics in low transmission settings.[1] The application of nucleic acid amplification (NAA) based diagnostic tools in epidemiological investigations and targeted elimination efforts has expanded, and highly sensitive, non-NAA-based point-of-care-methods have been developed and commercialized. Therefore, WHO convened an ERG to review the previous recommendations based on new evidence and the natural history, prevalence, contribution to transmission, and public health importance of detecting and treating low-density *P. falciparum* and *P. vivax* infections. The ERG determined that the

terminology moving forward should be low density infections, rather than asymptomatic or submicroscopic infections.

MPAC conclusions: MPAC agreed with the standardization of the terminology and reviewed the suggestions for updating the previous WHO recommendation on the diagnosis of *P. falciparum* and *P. vivax* malaria in low transmission settings. MPAC endorsed the update with some modifications:

- A number of highly sensitive techniques are available that detect low-density infections (below 100 parasites/μl). There is currently insufficient evidence to assess whether detection of low-density infections using these tools will have a significant impact on transmission. Until such evidence is generated these tools should be further evaluated through research activities and are not recommended for deployment in routine malaria control or elimination programmes.

- Quality-assured conventional RDT and microscopy are the recommended diagnostic tools for the confirmation and management of malaria cases and malaria surveillance, including routine health information systems and household surveys, in all epidemiological settings. Malaria cases should be reported by type of diagnostic test used.

- The majority of infections with asexual parasites (including those infections with low-density parasitaemia) have gametocytes and therefore all malaria infections must be considered as potentially infectious. There is no demonstrated benefit of routine detection of low-density gametocytemia by molecular methods.

- Presentation of NAA results should include details of the methods used for sample collection and extraction, and the quantity of blood added for the PCR reaction, as well as details of outputs in DNA copies or parasite density.

- The role of serological assays in malaria elimination programmes is not known. In addition, reagents (antigens and controls), assay methodologies and analytical approaches used in these assays need to be standardized and validated.

Other issues that were raised during the discussion were the possible use of highly sensitive malaria tests in research; to collect information on the cost-effectiveness of detecting and treating low density infections; to develop a methodology framework for research on low density infections in all epidemiological settings, including elimination as well as in moderate to high transmission settings; to explore the importance of detecting low density infections in passive and active case detection strategies; to evaluate the impact of reactive case detection or focal or mass test and treatment approaches with these tests; and to investigate whether these tests are of value in managing malaria in pregnancy.

Outcomes from evidence review group on deployment of piperonyl butoxide plus pyrethroids nets

Background: An ERG was convened to consider new data on the potential public health value of a pyrethroid net containing the synergist piperonyl butoxide (PBO). On the basis of the available evidence, the ERG concluded that one epidemiological study in an area with resistance has demonstrated that pyrethroid-PBO nets have additional public health value over standard LLINs, and recommended that pyrethroid-PBO nets receive an interim endorsement as a new WHO class of vector-control products. The ERG

further recommended that national malaria control programmes and their partners consider deployment of pyrethroid–PBO nets in areas where pyrethroid resistance has been confirmed in the main malaria vectors, but only if universal coverage with effective vector control can be maintained. The ERG also called for the generation of further evidence on pyrethroid–PBO nets to support refinement of WHO guidance regarding the conditions for the deployment of this class of product:

MPAC conclusions: MPAC endorsed recommendations of the ERG with the note that specifying "metabolic pyrethroid resistance" should be updated throughout the document. MPAC noted that the largest benefit of the pyrethroids–PBO nets is likely to occur in areas of moderate pyrethroid resistance, but that available data indicate that this class of nets performs at least as well as or better than pyrethroid–only LLINs across other settings where pyrethroid resistance due to a metabolic resistance mechanism is present. It was requested that this should be clarified in the recommendations available online.

Update on malaria elimination in the Greater Mekong Subregion (GMS)

Background: An update was provided on the trends, strategy, Malaria Mekong Elimination Team and support, therapeutic efficacy study sites, pharmacology support, regional coordination, country progress and challenges in the subregion.

MPAC conclusions: MPAC welcomed reported progress in the GMS as evidenced by declines in national incidence across the subregion. MPAC noted that it is critically important to keep on target for reduction/ elimination goals, particularly given the ongoing challenge of multidrug resistant (MDR) *P. falciparum* in the subregion. MPAC requested that future reports be based on a more detailed analysis that includes data on incidence reductions and progress in those areas in the GMS with documented transmission of MDR *P. falciparum*. MPAC noted the importance of and need for country specific operational plans detailing specific elimination activities. MPAC further noted progress achieved in data sharing and harmonization of partner activities and the key role of WHO in this effort. The ongoing challenge of the continued availability of oral artemisinin monotherapy as documented by recent market survey data was noted with concern, and MPAC urged the rapid formulation of a specific response plan. MPAC noted that future progress will be dependent on a strong commitment to elimination from national programmes. Any challenges or barriers to such commitment will need to be explored and addressed proactively.

Outcomes from the Drug Efficacy & Response Technical Expert Group

Background: GMP convened the technical expert group on Drug Efficacy and Response which developed draft recommendations on three sessions: 1) molecular markers – genotyping and monitoring drug resistance; 2) monitoring the prophylactic effect of preventive treatment; and 3) prevention and treatment of multidrug resistant malaria.

- **Piperaquine resistance –** There is sufficient evidence to confirm *Pfplasmepsin 2-3* increased copy number as a marker of piperaquine resistance in Asia. *Pfplasmepsin 2-3* increased copy number should be incorporated into surveillance and monitoring activities globally where piperaquine is being used or considered for use. *Pfkelch 13* prevalence and a growing prevalence

of *Pfplasmepsin 2–3* increased copy number should be considered in situations where a therapeutic efficacy study might not be feasible.

- **Markers of reinfection and recrudescence for *P. falciparum* –** Regarding the current guidance on *P. falciparum* genotyping in clinical trials, the use of capillary electrophoresis for *msp1*, *msp2*, and *glurp* assessment should be promoted; both molecular markers *msp1* and *msp2* should be genotyped for all samples; and PCR of different allelic families of *msp1* and *msp2* should be performed in different tubes to avoid template competition. The TEG recommends that the guidance on *P. falciparum* genotyping should be reviewed when new analyses have been completed.

- ***P. vivax* molecular markers –** There are no markers that can be used to differentiate between recrudescence, relapse, and reinfection, which makes it difficult to interpret primaquine efficacy and blood stage resistance studies. There are no molecular markers of *P. vivax* resistance to chloroquine, mefloquine, or primaquine. CYP2D6 genotyping should be included in primaquine clinical trials.

- **Monitoring the efficacy of seasonal malaria chemoprevention (SMC) –** The TEG updated its previous recommendations and noted that only limited data are available on the effect of SMC on molecular markers of resistance.

- **Strategy for antimalarial drug resistance management –** The TEG agreed that it would be valuable to have a new strategy for antimalarial drug resistance management, and that it should be developed based on the *Global plan for artemisinin resistance and containment* (GPARC) and made available as soon as possible.

- **Update on antimalarial drug efficacy and drug resistance –** The TEG recommends that all putative *Pfkelch13* mutants conferring artemisinin resistance be independently verified as being associated with resistance both in genetic studies and in the ring stage survival assay (RSA), ideally before publication claiming such an association.

- **Triple therapies –** Although data are preliminary, the data support the testing of triple therapies as a potential strategy against multidrug–resistant *P. falciparum*. Given the concern over QTc interval prolongation interval and the issues regarding the measurement of changes in QTc as malaria symptoms resolve, further analysis of QTc using alternative methods was requested by the ERG. An alternative treatment option for multidrug–resistant *P. falciparum* is to use two sequential artemisinin–based combination therapies. This approach should be tested in clinical trials.

- **Atovaquone–proguanil (AP) –** In the GMS, there may be a role for AP in combination with an ACT; artesunate–mefloquine+AP and artesunate–pyronaridine+AP are two options for testing.

MPAC conclusions: MPAC noted the evidence and progress on identifying plasmepsin 2–3 increased copy number as a useful marker for piperaquine resistance in the GMS; its relevance in sub–Saharan Africa remains to be determined. In the GMS, piperaquine resistance threatens the utility of dihydroartemisinin–piperaquine (DHA–PPQ) as a first line antimalarial treatment and thus should be closely monitored to guide ACT selection. MPAC further noted that in all malarious areas, surveillance for molecular markers of resistance to artemisinin and other ACT partner drugs is essential to guide treatment options and to monitor for emergence of resistance. MPAC supported the re–evaluation of the molecular methods and algorithm for classifying recurrent *P. falciparum* infections as reinfection or recrudescence. For *P. vivax*, further research is needed to

develop molecular methods to distinguish relapses from reinfections as current tools are not consistently reliable for this purpose. MPAC supported ongoing efforts to monitor molecular markers of resistance for amodiaquine (AQ) and sulfadoxine–pyrimethamine (SP) in the context of SMC, and looks forward to additional information as it becomes available.

MPAC supported the initiative to develop updated guidance for prevention and treatment of multidrug resistant (MDR) *P. falciparum* as an extension of the current GPARC, and looks forward to reviewing the initial draft. MPAC also supported continued research into options to address treatment for MDR including triple therapy and/or sequential approaches which may raise an issue with compliance. MPAC noted the continued monitoring and geographic extension in the GMS of the *P. falciparum* strain containing the C580Y Kelch mutation associated with artemisinin resistance. To date, there is no evidence of spread of this strain to sub Saharan Africa. MPAC further noted that the C580Y mutation has been documented in falciparum parasites in Guyana in South America, but these do not appear to be related to the GMS strain. Careful monitoring for this mutation in Guyana and surrounding countries is needed. MPAC noted that the number of ACTs failing in the GMS countries varies by area but several ACTs including artesunate–mefloquine (ASMQ) and artesunate–pyronaridine are effective antimalarial treatment for MDR *P. falciparum*. However, access to ASMQ has been problematic due to procurement challenges with the supplier. WHO should work with donors and partners to ensure an adequate stockpile of ACTs for programme use as required. MPAC reiterated that failing ACTs should not be used for treatment or for research purposes in the context of MDR resistance, as such use exerts additional selective on resistant parasites, facilitating their spread.

Global response plan to *pfhrp2* gene deletions

Background: The global response plan for *pfhrp2/3* deletions comprises a global framework to support national malaria control programmes and their implementing partners to address the problem of *pfhrp2/3* deletions that limit the programmatic effectiveness of HRP2–based rapid diagnostic tests (RDT) and put malaria patient lives at risk. The document also summarizes current knowledge and critical gaps in knowledge to guide future research and product development. The four objectives of an implemented global action plan are to:

1. define the frequency and distribution of these diagnostically relevant mutations in circulating *P. falciparum* strains;

2. provide concrete guidance to countries on malaria diagnosis and treatment in settings where such mutations are found to be frequent;

3. identify gaps in knowledge about the genesis and spread of strains with *pfhrp2* and/or *pfhrp3* deletions and the actions required to develop new, accurate tests for malaria based on alternative target antigens; and

4. coordinate advocacy and communication with donors, policy–makers, test developers, research agencies, technical partners and disease control programmes to assist in planning.

Three areas for discussion on the draft plan were posed: 1) the proposed actions based on the three potential outcomes of the standardized protocol for assessing national prevalence of *pfhrp2/3* deletion mutants among patients with falciparum malaria; 2) the coordination of the response including discovery, development, quality control, selection, procurement, distribution, storage and use of RDTs; and 3) prioritizing the areas of work identified.

MPAC conclusions: MPAC noted the progress that has been made since the last update and supported the global response plan. MPAC noted that there is currently no evidence on the speed of progression of prevalence of the mutations, but that it would be important to continue to monitor areas with low levels of deletions to determine any increasing trend. The suitability of 5%[2] false negative RDT as a threshold that would indicate the need for a change in diagnostic test will depend on the local epidemiology, sampling frame and sampling size. If the survey results do not allow a clear conclusion as to whether the prevalence of deletions is above or below the defined threshold for change, periodic monitoring will be needed.

MPAC identified three areas of the response that will need coordination: product development; implementation; and developing a research agenda. MPAC felt that WHO should play an important role in overall coordination, particularly in guiding the implementation of the plan. Regarding the prioritization of activities, MPAC felt that the development of validated new diagnostics targeting parasites with *pfhrp2* gene deletions is clearly the highest priority, followed by the prioritized list: 2) the need to assess secular trends in the prevalence of *pfhrp2* gene deletions; 3) the establishment of a network of laboratories to perform molecular confirmation; 4) working with donors and research institutes for a funding plan; 5) mapping distribution of *pfhrp2* gene deletions; 6) strengthening coordination by WHO amongst stakeholders including private sector, governments, manufacturers, providers, donors and research institutions; and 7) supporting countries in the selection of new RDTs.

Update on RTS,S pilot implementation

Background: A team at WHO, led jointly by the Directors of the Immunization, Vaccines and Biologicals (IVB) Department and GMP, has taken the lead in developing the Malaria Vaccine Implementation Programme (MVIP), to operationalize the recommendation for pilot implementation of RTS,S and its rigorous evaluation. MVIP will support the subnational introduction of the malaria vaccine in selected areas of three pilot countries (Ghana, Kenya and Malawi) and the evaluation of the programmatic feasibility of administering the required four doses in children; the vaccine's potential role in reducing childhood deaths; and its safety in the context of routine use.

All pilot countries have initiated the development of vaccine introduction plans, activities to strengthen pharmacovigilance, and planning for communications activities. First vaccine introduction is currently anticipated for mid-2018. WHO developed a master protocol for the pilot evaluations which was reviewed by the WHO Research Ethics Review Committee and submitted to the European Medicines Agency. WHO released a Request for Proposals to identify research partners to conduct the pilot evaluations. Selection in principle of research partners will enable discussion of their proposals, and contracts will be awarded by the end of 2017. Updates on the MVIP were provided to the AFRO Regional Immunization Technical Advisory Group (RITAG), the Global Advisory on Vaccine Safety (GACVS) and the Strategic Advisory Group of Experts (SAGE) on immunization. GACVS recommended a set of pharmacovigilance readiness criteria and will continue to provide support to the pilot countries and to the planned Data Safety and Monitoring Board. A joint regulatory review of RTS,S by national regulatory authorities from the three countries will be convened by WHO under the auspices of the African Vaccine Regulatory Forum. This review will provide the basis for the conditional authorization of the vaccine for use in the three countries. A Programme Advisory Group composed of independent external experts was convened to provide technical advice and recommendations to the MVIP Leadership and to the Programme Coordination Group.

In response to the previous MPAC recommendation, the MVIP team proposed the development of a framework for policy decision on RTS,S that describes how

data collected through the implementation pilots will be used to inform policy. The framework would establish criteria that would likely lead to a recommendation for vaccine use at the end of the pilot implementation programme.

MPAC conclusions: MPAC noted the progress made to date and was in favour of the development of the proposed framework. There was some discussion on whether an assessment of impact on mortality was required for a policy recommendation and it was agreed that impact on disease and severe malaria should be sufficient. MPAC looks forward to reviewing the draft framework in 2018.

Malaria Vaccine Advisory Committee (MALVAC) update

Background: The latest version of the WHO Malaria Vaccine R&D Technical Roadmap was produced in 2013. Since then, the malaria vaccine landscape has evolved in several major ways. In this evolving context, it is important to reconsider the role of malaria vaccines in the future technical framework for malaria control and elimination. The Malaria Vaccine Advisory Committee (MALVAC) was established to provide expert input to help WHO articulate its vision and recommendations on malaria vaccine development. MALVAC has been inactive for several years. It is timely for MALVAC to be reconstituted with new membership and updated terms of reference to assist WHO in the prioritization of specific malaria vaccine research and development avenues and support robust future policy decisions. The state-of-the-art in malaria vaccine development should be reviewed, and priority targets and preferred clinical development pathways should be redefined based on the review of new evidence, consideration of recent activities and changed public health priorities. An updated vision for the role of vaccines in future malaria control and elimination efforts needs to be articulated.

MPAC conclusions: MPAC supports the convening of MALVAC. It will be useful to develop new terms of reference that provide clear expectations on the role of MALVAC.

Update on the Vector Control Advisory Group

Background: The Vector Control Advisory Group (VCAG) was jointly established in 2012 by GMP and the Department of Control of Neglected Tropical Diseases (NTD) as an independent advisory body to WHO on the public health value of new tools, technologies and approaches for vector control. The VCAG guides innovators on data requirements to allow the assessment of public health value of new vector control tools, as well as on trial designs to generate these data. A product has public health value if it has proven protective efficacy to reduce or prevent infection and/or disease in humans. Currently available product have been categorized into eight intervention types: insecticide-treated nets, indoor residual spray products, mosquito larvicides, products providing personal protection, space spray products, aircraft disinsection products, molluscicides and rodenticides. Each intervention type has one or more product classes. With the arrival of new interventions the list of intervention types is likely to be further expanded, as is the number of classes. An update was provided on the products reviewed during the sixth meeting and the products to be reviewed at the seventh meeting immediately following MPAC. The draft recommendations of an Expert Advisory Group on the design of epidemiological trials for vector control products were presented, including an overview of the hierarchy of trial designs and end-points for studies to demonstrate public health value.

MPAC conclusions: MPAC recognized the progress that VCAG has made in appropriately diversifying membership and better defining terminology and process

around the evaluation of new vector control tools. There were five major topics of discussion during the session:

1. Definition of product class – The current VCAG definition of product class in vector control is a group of products that share a common entomological effect by which it reduces pathogen transmission and thus reduces infection and/or disease in humans.[3] MPAC noted that review of this definition is required, with the aim of clarifying the evaluation process. It was suggested that within the definition, evaluation of impact on vectors should be separated from evaluation of epidemiological impact, as the latter is only required for the "first-in-class" products.

2. Insecticide resistance management – the *Global insecticide resistance management plan* (GPIRM) provides guidance for rotating insecticide class products in IRS, but the evidence required to support a product claim for effectiveness against resistant insects is limited. MPAC recommended that the same assessment process and type of evidence (i.e. entomological or epidemiological endpoints) should be used to assess the public health value of LLINs and IRS with new active ingredients and/or combinations of active ingredients as insecticide resistance management.

3. Cost – MPAC noted that cost implications of evidence-generation are beyond the scope of VCAG, but recognizes that there is a disincentive to manufacturers to be the first in class, as they would bear the cost of the required trials. MPAC highlighted the general need for partners to work together to identify incentives to simulate and reward innovation, as well as resources to fund the two epidemiological trials required to assess public health value of a new class.

4. Entomological correlates of epidemiological endpoints – Some stakeholders felt that Phase 1 and 2 (laboratory and semi-field) studies should be considered sufficient to predict the epidemiological impact of products, and that Phase 3 and 4 studies are not required. This position is not shared by VCAG members, as there is no clear demonstration of a correlation of entomological endpoints with epidemiological ones. However VCAG is willing to discuss this topic further when additional evidence in this area is available. In this context it was highlighted that it is not clear that Phase 3 entomological field trials are faster or less expensive than epidemiological field trials.

5. Urgency for new tools – some partners alerted MPAC to anecdotal and unpublished evidence indicating that countries have lost confidence in LLINs and that upsurges have been reported in areas where coverage is reportedly high. However, current evidence from a five-country study coordinated by WHO suggests that the present tools remain effective despite physiological and behavioural resistance. A detailed analyses is, however, needed to determine if anecdotal reports of loss of confidence in LLINs in some areas is justified (e.g., do malaria indices support this perception or is the loss of programmatic effectiveness a function of insecticide resistance, low access and use of LLINs, poor quality LLINs or other factors).

MPAC requested that VCAG, and WHO more generally, explore ways to further simplify its processes and definitions in the assessment of the public health value of new vector control tools. A review of current documentation should specifically clarify the algorithms for how decisions are made, with the goal of increasing understanding of the process among development partners. A specific area requiring further clarity is how insecticide-treated nets are being evaluated when compared to other vector control interventions, given that the current definition of "class" and "entomological effect" do not support current classification of different new generation nets. MPAC also recommended that the WHO guidance for insecticide resistance management be

updated including the use of non-pyrethroid/multiple active ingredient long-lasting insecticidal nets as insecticide resistance management tools analogous to the rotation of insecticides for indoor residual spraying covered in the *Global plan for insecticide resistance management* (GPIRM). Finally, MPAC noted that the cost implications of evidence-generation are beyond the scope of VCAG and highlighted the need to work with partners to identify incentives including accelerated funding for key evidence generating trials.

Outcomes of the evidence review group on comparative effectiveness of vector control tools

Background: WHO recommends tools, technologies and approaches for public health use based on evidence of their impact on infection and/or disease in humans, as well as their safety and quality. The process for evaluating vector control products was revised in early 2017 to better meet the needs of countries endemic for vector-borne diseases. Under the revised process, the evaluation pathway to be followed is determined by whether or not a product is part of a product class with an existing WHO policy recommendation. Products covered by an existing WHO policy recommendation will follow the prequalification pathway, while all new tools, technologies and approaches will follow the new intervention pathway. For products not covered by an existing WHO policy recommendation, VCAG will validate whether the intervention under assessment has public health value. Once public health value has been demonstrated, WHO will issue a policy recommendation.

On the basis of a request from MPAC in March 2017, WHO reviewed the data requirements associated with the evaluation of new vector control interventions to ensure that new interventions can be deployed as soon as possible, while ensuring that the policy recommendations guiding deployment remain evidence-based. With the move to a revised evaluation system and the arrival of new products, WHO must also guide the assessment of products that clearly fall under an existing product class, but that differ in their product specification and/or differ from the first-in-class product for which epidemiological data are available. For such products, WHO requires reassurance of similar performance in order to provide normative guidance to vector control programmes faced with the challenge of selecting reliable products. An ERG was convened to review summarized laboratory and field trial data for selected new vector control products and using these as case studies, to develop both product-specific policy recommendations and general recommendations on the evaluation of new vector control tools, technologies and approaches.

MPAC conclusions: MPAC commended the work of the ERG and recognizes the work of VCAG in managing a complex issue. MPAC agrees that SumiShield® 50WG meets the current WHO efficacy criteria for IRS and has a similar entomological effect to other IRS products that are currently covered by a WHO policy recommendation. Based on this assessment it was recommended that existing WHO policy for IRS be extended to include SumiShield® 50WG. MPAC suggested that the fifth draft recommendation[5] be removed so as to avoid ambiguity. While SumiShield® 50WG was not assessed against a resistance management claim, it is to be expected that countries will deploy it in a rotation strategy to manage insecticide resistance, which would be consistent with existing GPIRM recommendations on insecticide class rotation to manage resistance. It was noted that WHO should update its guidance on insecticide resistance management to reflect new tools available for rotation or mosaic strategies. Specific ERG recommendation on the evaluation of other new tools were accepted as presented in the draft recommendations shared with MPAC.

Proposed ERG on border malaria

Background: In order to define and characterize the problem of border malaria and assess its implications for malaria control, elimination and prevention of re-establishment, a working group meeting was held on 9–10 August 2017. Building on a literature review and a plenary discussion, a definition of border malaria was proposed as "malaria transmission or potential for transmission that takes place across adjacent administrative areas that share an international border (or lie at a specified distance from an international border)". Border malaria occurs because the contiguous areas share a common ecology, related human populations, and related malaria parasites and vectors; accordingly, there is frequent mixing of people, parasites and vectors. The relevance of border malaria increases when there is a transmission differential across the border due to a gradient in receptivity or intervention coverage. Although both imported malaria, border malaria differs from transnational malaria, which is defined as cases of malaria that cross a border or enter a country, but do not affect transmission within a defined distance from border.

GMP proposes to convene an ERG with the following five objectives:

1. To conduct a literature review on border malaria, including a brief analysis of border malaria occurring in about 30 countries, and to summarize the characteristics of border malaria and its different categories;

2. To review and comment on case studies and to make specific recommendations for tackling the different categories of border malaria;

3. To evaluate the effectiveness of the current tools and interventions targeting border malaria;

4. To draw evidence from other global/eradication initiatives where cross-border risks have played an important role in disease transmission (polio; measles; guinea worm; lymphatic filariasis/ onchocerciasis);

5. To define a research agenda for border malaria and a future action plan for the next 2–3 years.

MPAC conclusions: MPAC supported the convening of the ERG on border malaria and noted that border issues are long-standing and are often a political and broader development issue as much as a technical issue for malaria control and elimination programmes. MPAC urged the Secretariat to reach out to national malaria control programmes to help frame the questions to be considered by the ERG and to include an analysis of successes, challenges and lessons already learned. MPAC suggested that there will be a need for advocacy to increase effective action against border malaria and a sixth objective, to review recommendations of earlier meetings and problems related to their implementation. The Secretariat clarified that this ERG will not look specifically at large scale migrant workers, but the marginalized and vulnerable populations living on the border would be included.

WHO Research & Development Observatory

Background: In May 2013, the Sixty-sixth World Health Assembly mandated the establishment of the WHO Global Observatory on Health Research and Development, a centralized and comprehensive source of information and analyses on global health R&D activities for human diseases. It builds on existing data and reports from a wide range of data sources, and gathers new information with the aim of enabling decisions on R&D priorities. Investments in health R&D are still insufficiently aligned with global public health demands and needs. Governments, policy-makers, funders and

researchers, therefore, need an accurate picture of the current situation, so as to spot R&D gaps and ensure that funds and resources are used in the best possible way. The Observatory is a global-level initiative that aims to identify health R&D priorities based on public health needs by:

- consolidating, monitoring and analysing relevant information on the health R&D needs of developing countries;

- building on existing data collection mechanisms; and

- supporting coordinated actions on health R&D.

Malaria R&D was selected as the first case study for the observatory and MPAC was requested to comment on the methodology developed to prioritize R&D for malaria, and to volunteer experts to review the detailed draft report that will be refined and presented to the Expert Committee for consideration during its first meeting in 2018. The work is at an early stage and inputs were actively sought from the MPAC. Six challenges to malaria control and elimination were identified: 1) optimization and management of tools and strategies; 2) regions with high transmission intensity; 3) residual transmission; 4) achieving universal access; 5) addressing *P. vivax* and non-falciparum species; and 6) achieving, documenting and maintaining elimination. Next, technical obstacles to malaria control and elimination (e.g. vector resistance to insecticides, parasite resistance to drugs, and selection of gene-deleted parasites) are being mapped to these 6 challenges. Third, potential product types will be mapped to the challenges and fourth, the pipeline of tools in development will be mapped onto potential product solutions using heat maps to establish whether there is an existing target indication, a possible target indication, or not indicated/impossible. Finally, potential product solutions based on the existing pipeline will be classified as to the R&D stage accelerate, innovate, investigate depending on if a potential tool is already being tested, at the proof of concept stage or in early development. MPAC was asked to comment on whether basic and implementation science should also be included.

MPAC conclusions: MPAC appreciated the opportunity to contribute to the thinking on how to prioritize investments in malaria R&D and suggested that if malaria is being used as a pathfinder, perhaps WHO should look at the cross-disease relevance of malaria investments. The approach currently seems to be siloed and product focused, and based on previous work in malaria R&D, whereas a systems-based approach might be more appropriate and could include areas like information systems and engineering. MPAC asked how success will be defined for this exercise. Since the mandate for this work is from Member States, it may be useful for WHO to be aware of funders' strategies, but they should not direct the prioritization exercise.

Update on WHO technical consultation on universal access to malaria core interventions

Background: Since the last meeting, GMP has continued data analysis and is preparing for a technical consultation with five objectives: 1) to identify particular population sub-groups associated with high all-cause mortality and the impact of risk factors, including coverage gaps of core malaria interventions delivered through different platforms; 2) to characterize coverage for current core malaria interventions and identify bottlenecks in service provision; 3) to review existing data sources and methods for surveillance that enable disease estimates as well as core intervention coverage in high burden countries; 4) to identify the most effective strategies and enabling interventions to accelerate progress in reducing malaria mortality; and 5) to agree on the focus of a global call to action and the core elements of a global response plan to be launched in April 2018.

The mortality analysis includes sub-national level analysis to identify characteristics of populations with high under-five mortality, cluster level analysis to examine the links between malaria intervention coverage and under-five mortality rates, and mathematical modelling to identify potential cost-effective strategies to reduce morbidity and mortality. Several background papers are in development to provide the evidence foundation for the consultation including: child mortality in Africa; coverage gaps of vector control, IPTp, SMC and malaria diagnosis and treatment; and a review of financial determinants of access to core malaria interventions.

MPAC conclusions: MPAC noted that overall, countries are not on target to meet the GTS milestones for 2020 on burden reduction and agree that action is urgently needed including the increased coverage of core interventions of vector control, diagnosis and treatment, chemoprevention, and surveillance. Regarding the proposed analysis, MPAC suggested that it should be built on a historical view of what is known already, that broader child health and development interventions that improve malaria outcomes should be incorporated, and that comparisons should be made between countries with good coverage and poor coverage to identify lessons learned. MPAC agreed that it will be important to identify the determinants of child mortality in high malaria burden countries and supported a consultation to engage partners and countries.

Integrated Community Case Management (iCCM) of malaria: results from the Rapid Access Expansion Programme

Background: The Rapid Access Expansion (RAcE) Programme was funded by Global Affairs Canada from April 2012 to June 2018 to contribute to the reduction of child mortality by increasing access to treatment for common childhood illnesses in five African countries, and to stimulate policy updates and catalyse scale-up of integrated community case management. Countries were selected based on having high disease burden, an enabling policy environment and the potential for scale-up were: Democratic Republic of the Congo (DRC), Malawi, Mozambique, Niger and Nigeria.

As a result of the programme, 1.5 million under-five children have access to diagnosis and treatment services for malaria, pneumonia and diarrhoea and over 8400 trained community health workers have treated more than seven million cases since 2013. End line household surveys assessed caregiver knowledge, attitudes, and practices related to pneumonia, diarrhoea and malaria in the intervention areas. In all countries, there were significant increases in treatment seeking, receiving appropriate treatment, and care delivered by a community health worker (CHW). An evaluation of the plausible contribution of RAcE on child mortality was conducted using the Lives Saved Tool (LiST) and found the under-five morality reduction attributable to iCCM between 6-14% from 2013 to 2016 in DRC, Niger and the states of Abia and Niger in Nigeria. The programme has contributed evidence that iCCM is an effective strategy to save lives and that effective iCCM is an integral part of the primary health system relying on the treatment services of trained community health workers at the village level.

MPAC conclusions: MPAC noted the positive results of the RAcE programme and highlighted that there is a wealth of historical evidence that demonstrates the impact of introducing well-trained, supervised and supplied CHWs. MPAC further noted that the incorporation of CHWs into the primary health care system of a country is an essential requirement for maintaining and extending the impact of CHWs.

Malaria Threats Map

Background: GMP has developed a consolidated Malaria Threats Map online application to map available data on the biological challenges to malaria control and elimination including: vector insecticide resistance, *P. falciparum hrp2/3* gene deletions, and *P. falciparum* and *P. vivax* antimalarial drug efficacy and drug resistance. The application is in the final stages of development and the URL to the beta application will be circulated widely upon launch. Scheduled technical meetings at global, regional and country level will demonstrate the tool to national malaria control programmes and partners and to collect feedback to guide Phase II development, such as optimized mobile compatibility and print functionality.

MPAC conclusions: MPAC noted the progress of the Malaria Threats Map tool and commended it as an important initiative to further promote data sharing. There was a discussion about potential other data that would be useful to map, but it was clarified that this particular tool is limited to biological threats but mapping other data could be pursued in the future.

Outcomes of the ERG on malaria in pregnancy outside of Africa

Background: WHO convened an ERG to develop draft recommendations based on the review of recent evidence derived from malaria in pregnancy studies conducted in Africa, the Americas and Asia. Other studies reviewed included evaluations on antimalarial drug pharmacokinetics (PK) in pregnant women, impact of maternal use of azithromycin added to IPTp–sulfadoxine–pyrimethamine on birth outcomes and sexually transmitted infections and reproductive tract infections, and the interactions between HIV infection and malaria in pregnancy. Proposed conclusions and recommendations included:

1. Recent information indicates that although the overall incidence of *Plasmodium vivax* infection in pregnancy is low, it is associated with maternal anaemia, fetal loss, and small for gestational age, and preterm births, particularly in symptomatic pregnant women. However, the evidence reviewed does not support a change in the current recommendations on prevention, early diagnosis and treatment of clinical malaria followed by chloroquine prophylaxis to prevent parasitaemia following relapses.

2. Further research is needed on the effects of *P. falciparum* and *P. vivax* coinfection in pregnancy.

3. Evidence of PK and pharmacodynamics evaluations indicate that PK effects on pregnancy vary substantially among the different studies and antimalarial medicines. Given the inconsistency of the findings it is not clear whether dosage adjustment is required during pregnancy.

4. A cluster-randomized controlled trial compared monthly intermittent preventive treatment in pregnancy (IPTp) with dihydroartemisinin–piperaquine (DHA–PPQ) with intermittent screening and treatment (IST) and single screening and treatment (SST) conducted in two sites in Indonesia. Preliminary results indicate that IPTp halved the risk of malaria during pregnancy and at delivery compared with SST, but only on the higher transmission. Study findings were not consistent across sites and study outcomes, and there was no consistent positive impact on birth outcomes. IST did not result in the detection of significantly more malaria infections than the existing SST strategy. Based on the current level of evidence, IPTp-DHA-PPQ is not currently recommended for malaria prevention in pregnant women.

5. The provision of SP through IPTp does not cure sexually transmitted infections (STIs) and reproductive tract infections (RTIs). Also, the impact of adding azithromycin to IPTp with SP on STIs or RTIs and adverse birth outcomes requires further research, since current evidence of improved outcomes is limited. Additionally, the risk of increases in antimicrobial resistance associated with azithromycin use also requires further assessment.

6. Low birth weight and preterm birth rates were reduced in two studies but not in one of the largest studies. Since study designs differed across sites, further research is needed to evaluate the impact of adding azithromycin to IPTp–SP on adverse birth outcomes.

7. Co-trimoxazole (CTX) prophylaxis provides only partial protection against malaria during pregnancy. Research is needed to evaluate new strategies, including alternative medicines for IPTp to be safely administered concomitantly with CTX prophylaxis.

MPAC conclusions: MPAC noted the conclusions of the ERG and agreed that no new recommendations are proposed based on the data reviewed and that there is insufficient evidence to recommend any changes in dosage for pregnant women. The Committee indicated that an important research question will be to determine if low density infections have health impact on pregnancy outcomes and determining the potential role and impact of highly sensitive rapid diagnostic tests in that context.

Update on the establishment of the Malaria Elimination Oversight Committee and Malaria Elimination Certification Panel

Background: In March 2017, MPAC endorsed the creation of two new committees to support malaria elimination goals: the Malaria Elimination Oversight Committee (MEOC) and the Malaria Elimination Certification Panel (MECP). The MEOC will: evaluate national and regional progress towards malaria elimination according to established milestones and timelines; determine the need for corrective actions to address programmatic or operational bottlenecks, and evaluate plans developed to address such issues; identify any risks to malaria elimination that need to be addressed by WHO, regional initiatives or national programmes; provide GMP with observations and/or draft recommendations with respect to policies or guidance related to malaria elimination for MPAC's consideration; and question the status quo and confront difficult issues.

The MEOC is charged with helping countries reach malaria-free status, whereas the MECP is responsible for reviewing evidence and recommending when a country has met the criteria for elimination and therefore should be certified by the Director-General. The specific duties of the MECP are to: review submitted country documentation and national elimination reports; conduct country assessments and field missions to verify findings in the national elimination report; and develop a final evaluation report and submit it to MPAC through WHO/GMP with a recommendation either to certify malaria elimination or to postpone certification, based on the analyses described above. Both groups are in the process of being established and are expected to be convened in person or by phone in the next few months.

MPAC conclusions: MPAC agreed that it was important to separate the functions of the groups and clarified its expected role in reviewing the panel reports and endorsing recommendations for malaria-free certification to the Director-General.

Proposed evidence review group on malaria mortality estimates

Background: WHO country estimates of mortality are used by various agencies to track the global progress against malaria; to determine which countries have the highest malaria burdens in order to prioritize resource allocation decisions; to understand national trends over time in order to assess the success of strategies; and to prioritize malaria in relation to other health conditions. However, measuring malaria mortality is challenging, as weaknesses in most malaria endemic countries' civil, vital registration and routine health information systems do not allow for reliable analyses of causes of death. WHO has produced estimates of malaria cases and deaths for every year since 2000. These estimates include lower and upper bounds, as well as a point estimate. For countries with strong surveillance systems, the number of cases and deaths reported by national programmes are used. These are generally countries at the latter stages of malaria elimination. Countries with where routine data reporting from the public health sector is adequate but there is a high usage of the private sector from which case data are not available, case fatality rates for *P. falciparum* and *P. vivax* are used as necessary. This method is used mainly for countries outside Africa. In countries in which routine health information systems are insufficient to estimate mortality, models are used that capture the relationship between parasite prevalence, clinical incidence and malaria mortality. There are also other malaria morality estimation models used by groups outside the WHO. The various estimation methods have resulted in estimates with substantially different mean values for the same year, albeit with wide and generally overlapping confidence intervals. Consequently, there has been a great deal of controversy and confusion both for countries and for the wider public in terms of the real progress made against malaria. Methodological issues raised include the use of static case fatality rate (CFR) measures that do not account for changes in malaria case management; the use of CFR data that are geographically very sparse to impute mortality rates of geographically highly disaggregated entities; the susceptibility of underlying mortality outcomes to overall clinical burden estimated; and inappropriate age attribution of estimated malaria deaths. For these reasons, WHO seeks to convene an ERG on malaria mortality to review existing data and methods and to provide advice on the best approaches for implementation.

There have been significant changes since the last ERG for malaria burden estimation met in 2012 and 2013 and it would be useful to convene another ERG to address the following issues:

1. Re-review existing methods for mortality estimation with a focus on addressing issues related to temporal trends in CFR, age attribution of malaria mortality, and the role of geospatial approaches to modelling mortality estimation;

2. Re-visit the pending recommendations from the ERG 2012–2013 in light of any new data and develop proposals for best approaches to ensure they are fulfilled;

3. Re-focus on the indirect consequences of malaria infection and disease and their likely contribution to morbidity (for example anaemia) and mortality.

MPAC conclusions: MPAC supported the convening of an ERG for malaria mortality estimates and noted three key issues to consider: 1) the need to develop methods to estimate the burden of indirect deaths from malaria; 2) the need to ensure the engagement of country programmes, especially those with highest burden and weak surveillance systems, so as for them to understand the estimation approaches and provide input; and 3) expansion of the ERG to include the methods for estimating malaria morbidity as these require further discussion and have implications for mortality estimation. MPAC noted that it will be important to engage with other groups that are collecting data and working on estimates to be able to account for differences in estimates. The Secretariat clarified that the intention is that the outcome of the ERG

would be reflected where possible in the World Malaria Report 2018, but the issue of direct and indirect malaria burden, its geographic distribution and implications for global and national policies is a long term activity.

Review revised recommendations for achieving universal coverage with long-lasting insecticidal nets in malaria control

Background: LLINs have played an important role in the remarkable success of reducing the global malaria burden over the past decade. They are a core prevention tool widely used by people at risk of malaria. Ensuring universal coverage of all people at risk of malaria with LLINs or indoor residual spraying forms part of pillar 1 of the *Global Technical Strategy for Malaria 2016–2030*. The Vector Control Technical Expert Group reviewed existing WHO recommendations for achieving universal coverage with long-lasting insecticidal nets (LLINs) and proposed updates to this guidance based on recent analysis of data on the effect of user preference on LLIN use from Sub-Saharan Africa.

MPAC conclusions: MPAC endorsed the revised recommendations with some minor adjustments to the text. An area of discussion included the need to ensure high coverage for teens, a group that typically demonstrates coverage gaps and includes girls who may become pregnant, which might not necessarily be achieved through specific school programmes. Another area of discussion focused on user preference for types of nets. Country representatives suggested that the choice of the type of LLINs procured should be left to countries, but evidence from Sub-Saharan Africa indicates that in the many settings meeting user preference does not translate into significantly higher use. Using financial resources to meet user preferences, rather than to increase coverage, is therefore often not justified. It was recognized that there are exceptions to this rule, for example in other regions or in specific settings within sub-Saharan Africa. The recommendations support meeting these requirements where data support such decision.

Endnotes

1.   WHO policy recommendation on malaria diagnostics in low transmission settings. March 2014. http://www.who.int/malaria/publications/atoz/diagnotics-low-transmission-settings/en/

2.   A threshold of 5% was selected because it somewhere around this point that the proportion of cases missed by HRP2 RDTs due to non-hrp2 expression may be greater than the proportion of cases that would be missed by less-sensitive pLDH-based RDTs.

3.   The evaluation process for vector control products. Information Note. June 2017, World Health Organization. http://apps.who.int/iris/bitstream/10665/255644/1/WHO-HTM-GMP-2017.13-eng.pdf

4.   The fifth draft recommendation was as follows: SumiShield® 50 WG cannot be recommended for insecticide resistance management at present. The product has only been assessed for efficacy as an IRS product, not against a claim of being effective in controlling insecticide resistant mosquitoes. Formulation of a claim of efficacy against insecticide resistant mosquitoes should, however, be encouraged, following the generation of data to support this claim and a WHO assessment of these data. This would be the basis for an extended recommendation to potentially include SumiShield® 50 WG for insecticide resistance management.

All documentation related to this meeting can be found at: http://www.who.int/malaria/mpac/oct2017/en/

All previous MPAC meeting reports can be found here: http://www.who.int/malaria/mpac/meeting_reports/en/

To sign up for news and latest updates from the WHO Global Malaria Programme, please visit this page: http://www.who.int/malaria/news/sign_up_form/en/