Fourth meeting of the WHO Strategic Advisory Group on malaria eradication

Meeting report
28–29 November 2018, Geneva, Switzerland

Summary

On 28–29 November 2018, the WHO Strategic Advisory Group on malaria eradication (SAGme) convened for its fourth meeting in Geneva, Switzerland. Major discussion points included the review of progress made by SAGme members, WHO staff, WHO collaborating centres and other partners on six work packages, and presentation and discussion of the preliminary conclusions drawn from these analyses. In addition, the SAGme discussed the format of the final product to be provided to the Director-General.

This meeting involved 10 SAGme members, representatives from five WHO collaborating centres and other key malaria stakeholders, including observers from technical partners (PATH, CDC) and industry (Novartis), along with other UN agencies (UNICEF) and the Secretariat (WHO’s Global Malaria Programme [GMP]).

Three new members joined the SAGme: Dr Scott Barrett (Columbia University, USA), Dr Neena Valecha (National Institute for Malaria Research, India) and Dr Philip Welkhoff (Bill & Melinda Gates Foundation [BMGF], USA), who assumed the place formerly held by Dr Chris Elias (BMGF, USA).

The objectives for this meeting included the presentation of the preliminary findings and conclusions of six work packages. Members of each work package group met during the first day of the meeting to receive feedback, guidance and course corrections from the Advisory Group in order to determine the next steps, and presentations to the plenary were completed on the second day. In addition, the Group was updated on course activities undertaken in the year, such as informal meetings in September and October 2018, teleconferences and internal meetings in preparation for this fourth meeting.

Background

WHO’s GMP convened the inaugural SAGme meeting in August 2016. Thirteen eminent experts representing a range of disciplines and geographies were selected as members and supported by representatives from WHO collaborating centres, WHO staff, and other key malaria stakeholders. The terms of reference for the SAGme outline its role in advising the Organization on the relevance, potential strategies and cost of malaria eradication over the next decades through a process of

1 This report is considered preliminary while SAGme members complete their review of the document.

2 Update received at the end of December 2017: On behalf of the Department for Governing Bodies, the SAGme will not have to report to the Executive Board and will only report to the Director-General of WHO. A progress report from WHO/GMP will be presented to the Seventy-second World Health Assembly, during which additional information can be provided.

3 Update from January 2019: Dr Neena Valecha has been officially nominated as WHO Malaria Regional Adviser for the South-East Asia Regional Office in New Delhi, India and so will not be able to continue her appointment as SAGme member.

**Updates from the Global Malaria Programme**

Dr Pedro Alonso, GMP Director, presented the latest data from the World Malaria Report 2018, which was launched in Maputo, Mozambique in November 2018. The report documents the continuing high toll of malaria, with more than 200 million new cases in 2017. Despite significant progress in reducing cases and deaths between 2000 and 2014, the trend seems to have flatlined since 2015 with no further decreases reported. Dr Alonso noted that we are off track in meeting the targeted reductions in morbidity and mortality set out in WHO’s GTS, i.e., a 40% reduction by 2020 (from 2015 levels); moreover, prospects for achieving these milestones are quite discouraging.

Despite the overall lack of progress on morbidity and mortality indicators, the data show signs of progress in some countries and regions of the world. To mention a few examples:

- The number of countries with fewer than 100 indigenous cases – a strong indicator that elimination by 2020 is within reach – increased from 15 countries in 2010 to 26 countries in 2017, while the number of countries moving towards elimination and reporting fewer than 10 000 malaria cases increased from 38 to 46 countries in the same time period.
- China and El Salvador reached zero indigenous cases of malaria for the first time in 2017, while WHO certified Paraguay as malaria-free in 2018. Paraguay is the first country in the Americas to be granted this status in 45 years.
- Focusing on the countries that represent the highest burden of global malaria, India registered an impressive 24% reduction in cases in 2017 compared to 2016, while countries such as Ethiopia, Pakistan and Rwanda noted considerable declines in cases in 2017 – by 8.9%, 20.5% and 6.6%, respectively.
- The African region, which has the highest burden of malaria, has significantly expanded access to diagnostic testing in the public sector, with a median of 74% of febrile children under 5 receiving a malaria diagnostic test prior to antimalarial treatment – an important increase from 35% in the period 2010–2012.

As a result of the stagnation in progress and to get the global malaria response back on track towards achieving the GTS goals, the GMP Director presented the new country-driven approach “*High burden to high impact: a targeted malaria response*”, which was launched on 19 November 2018. This aggressive approach has been catalyzed by WHO and the RBM Partnership to End Malaria and will be led by the 11 countries that carry the highest burden of the disease. The approach aims to become the response to a critical inflection point for malaria.

**Meeting opening**

The Chair of the SAGme, Dr Marcel Tanner, opened the fourth meeting with a brief overview of the background and purpose of the SAGme, an introduction to the new members who had recently joined the group in 2018, and a summary of the work done over the past year by the different work groups and the GMP Secretariat.

Since the last meeting, work groups have held several internal meetings, regular calls and discussions with experts and members of their groups to incorporate all inputs and suggestions from the Advisory Group.
In brief:

- At the third SAGme meeting in December 2017, Rwanda was selected as a relevant context for field-testing the community engagement framework for quality, people-centred and resilient health services (CEQ)\(^4\) and for validating a process to co-develop and co-learn with national malaria programmes how to improve community engagement. In January 2018, WHO received approval from the Ministry of Health in Rwanda to convene a three-day technical meeting in May to introduce the CEQ, further develop the preliminary assessment tools, and verify their relevance and utility for malaria control and elimination. The meeting was an opportunity to co-design with the national team an appropriate approach to field-testing.

- In September 2018, several of the work group leaders convened for an informal meeting at GMP to present an update of their work progress from Q1–Q2 2018 in order to ensure that the directions being taken were in agreement with SAGme guidance.

- In October 2018, GMP held a symposium on the *Lessons from the history of global policies against malaria and aspects of contemporary developments in global health governance* by Dr Julian Eckl from the University of Hamburg and University of St. Gallen. Dr Eckl contributed a historical perspective on past and present sociopolitical considerations for achieving a world free of malaria. This work package will be part of the historical and contextual background for the SAGme to consider when finalizing its recommendations.

In terms of structure, this fourth meeting started with a day-long breakout session to review the evidence generated by the work groups and develop preliminary conclusions for each work package. The objective was for these final products and recommendations to be presented at a closing meeting of the SAGme in the second quarter of 2019. The second day of the meeting included brief presentations of the key findings from each work group and a discussion of the preliminary conclusions in Plenary. The findings and preliminary conclusions will be captured in a final report and presented to the WHO Director-General.

This meeting report gathers the key outcomes and points of discussion from the six work packages presented. All supporting documents and presentations (PDFs) can be downloaded from the Dropbox link. These materials complement the background sections and support key points addressed during the meeting. *If you have problems accessing or downloading the files, please contact the GMP Secretariat.*

**Key findings and preliminary conclusions of the work packages**

**Lessons from the history of global policies against malaria and aspects of contemporary developments in global health governance**

The sociopolitical dimension of malaria control that was discussed contributes to the work of SAGme by: (i) analysing historical experiences to better understand continuous challenges as well as present sociopolitical considerations for achieving a world free of malaria; (ii) analysing contemporary global health governance in order to put malaria into a broader context and to address the question of how malaria relates to (or could be linked to) the various other health and development challenges; and (iii) drawing on the previous two steps and on theoretical-conceptual literature in order to help SAGme better understand the character of the policy options that it might propose in light of its other findings.

This historical perspective demonstrates that the fight against malaria has had its challenges and successes. Moreover, successes in one place have often prematurely been seen as evidence of what

can be achieved elsewhere and at a global level. These historical experiences resemble contemporary patterns, suggesting a continuity of malaria trends throughout history. For example, while there has been successful control and reduction of burden over the past decade, on the other hand, the plateauing of funding, emerging resistance and other rising challenges have stalled progress.

Building on the historical perspective, the challenge was discussed in terms of how different actors interpret the malaria problem in divergent ways. There are three interrelated questions that help to identify specific interpretations of the malaria problem: (i) what is the problem?; (ii) who should solve it?; and (iii) what is the solution? Various consequences follow from these divergent interpretations, one of which is that the overall complexity is easily overlooked by individual interpretations. Another consequence is that there is often a difference between global and local interpretations, while a third is that each interpretation necessitates the cooperation of specific actors and makes specific approaches to solving the malaria problem plausible.

Policy-making can be seen as a process during which several interpretations of the malaria problem are discussed, but at some point, one interpretation becomes the basis for the way forward. This process consists of three main stages or phases: perception of a problem and agenda setting (first phase); formulation of policy alternatives and decision-making – i.e., legislation (second phase); and implementation and evaluation (third phase). These phases can be thought of as the “dramatic structure” of the policy process, since the second phase is often viewed as the climax. The problem with this understanding, however, is that it implicitly takes for granted the required cooperation of various actors who are central during the implementation process in the third phase and whose roles vary with different interpretations of the malaria problem. By the same token, the specifics of global health governance (including WHO) as a political system are often overlooked. A related challenge is that, in global health, decisions are often taken in a decentralized manner (exit-based policy-making), which results in parallel processes and complicates implementation further.

In light of the historical record, it is pertinent to pay greater attention to phase three in general and to implementation in particular. In turn, a closer look at phase three shows that implementation has multiple facets. Most importantly, there is a notable difference between output, outcome and impact: output describes the immediate results of the activities of an organization; outcome comprises the behavioural change by target actors; and impact covers relevant changes in the policy area. Moreover, the specifics of the form, scope and domain of WHO’s (contested) authority must be taken into consideration. It is also key to acknowledge the difference between “selling” and sustaining a decision. As a related point, the political commitment that eradication, in particular, implies and requires must not be downplayed. Furthermore, the challenge of opportunity costs has to be taken seriously.

Some tentative conclusions were drawn from the historical record, from contemporary developments and from the theoretical-conceptual literature. For example, it was stated that SAGme would make an important contribution if it clarified the characteristics of the available options, and it was recognized that it is important to specify the behavioural changes that are required to do so.

Another key conclusion discussed was that the perspectives, roles and contributions of affected countries and populations need to be integral elements in the decision-making process; it is not enough to mobilize affected countries as executors of global programmes, as seen in previous efforts, for example, with the Global Malaria Eradication Programme (GMEP).

The SAGme agreed that the vision of a malaria-free world is not in question, but there is a disagreement over the exact next steps to be taken to achieve this vision. This disagreement is due to another point of discussion about varying interpretations of malaria. The challenge of differing approaches to achieving the vision of a malaria-free world remains to be addressed, as does the fact that malaria eradication is not a priority for everyone. It was suggested that the SAGme link its recommendations to other contemporary developments – both for strategic reasons and for the sake of clarity.
To contextualize the way forward, a few steps WHO has taken to build on the GTS were summarized. To offer some examples: the “High burden to high impact” response and the most recent World Malaria Report are practical steps that have been agreed upon in a broader context to address the challenges facing the malaria world. With WHO undergoing a transitional period, the work towards the Sustainable Development Goals (SDG3.3 but also other SDGs as determinants of health) and the 13th General Programme of Work provide other examples of WHO increasing its representation in country offices, putting implementation onboard and taking practical steps towards greater integration among the country level, Member States and WHO, as well as with key stakeholders and funders.

The SAGme positively valued the presentation on the historical perspective, contemporary developments and theoretical-conceptual literature, recognizing the importance of the different levels and scenarios in which the malaria landscape operates. This complexity may at times hinder the broader vision and goals of the fight against the disease. The presentation also highlighted the importance of political will and elevating the issue to higher level discussion as part of the global health agenda. There was discussion on how to tackle political will in a broader context and link to the SDGs as determinants of health, as well as how the elimination of malaria can have a positive influence on these areas. Furthermore, there is a huge opportunity to look at this mutual relationship and to some extent highlight the importance of increasing mobilization and keeping up with momentum. The group agreed to the point around global thinking in terms of policy-making and raising the profile of the issue to secure a sustained investment and strong political commitment.

Considering the preliminary conclusions presented, the majority of the SAGme acknowledged a note of caution when calling for a World Health Assembly resolution, understanding that the global health context and political will differ greatly from previous times. However, the SAGme insisted that resource mobilization (locally and internationally) and political investment remain important, despite being highly dependent on the context of each country. Regarding the behavioural change this would require, SAGme acknowledged that it would take a global effort from all actors in the malaria space – from regional and local programmes to funding agencies – to align with the final outcome the SAGme would present to WHO.

The SAGme requested to see a final presentation at the meeting in June 2019.

**Community engagement**

In previous SAGme meetings, it was agreed that there has been growing appreciation of the importance of community engagement (CE) as fundamental to providing quality health care and services and core to achieving Universal Health Coverage (UHC). Paradoxically, despite this belief, there continues to be a lack of consensus on the definition of CE. The literature shows multiple definitions of CE that have been used in various settings. Most of these definitions have been underpinned by top-down, linear conceptualizations, with community members often considered to be passive recipients. Demonstrating the value of such approaches has been generally challenging and inconclusive, and across sectors, these approaches have not yielded the hoped-for gains in progress and/or development. A more helpful definition of CE would need to incorporate the notion of complexity in living human systems.

“The world and its systems are complex, dynamic, and unpredictable. Yet development approaches are largely fixed and tied firmly to preordained plans and change theories. As a result, development interventions often fail and are very rarely sustainable.”


The work package presented how approaches based on complexity and systems thinking would require a change in mindset in a health system to acknowledge that everything and everyone is connected (systemic) and that the quality and performance of the system emerges in those
connections. From this perspective, CE is founded upon an understanding of the relationships between people, and the nature and quality of those relationships shape collaboration, co-creation, coordination and trust. Empowerment and partnership become co-constructed through the interactions between people. Engagement represents a relational and systemic process – a dialogue through which a shared vision arises.

The WHO Community Engagement Framework for Quality, People-Centred and Resilient Health Systems (CEQ) was created through a collaborative process to address the need to shift health systems, programmes and services from an almost vertically driven, transactional model of engagement to a relational model.

Three key conclusions/implications were agreed upon during and following the SAGme meeting in November 2017: (i) to adapt the WHO CEQ to the malaria context; (ii) to test and validate the adapted WHO CEQ for malaria control and elimination in collaboration with the National Malaria Control Programme in Rwanda; and (iii) in light of the adaptation and field-testing, to review the current status of WHO’s policy, technical and strategic guidance and recommendations on CE for malaria. The findings would be critically reviewed considering the CE case studies being developed by the University of California, San Francisco (UCSF).

Rwanda was selected as the country to test the CEQ not only to provide valuable inputs on how the national programme can better engage and build relationships with its communities and stakeholders, but also to help the SAGme build these national experiences into global discussions and reinforce recommendations discussed during the meeting in November 2017.

The work package was presented at the CE technical meeting that took place in May 2018 in Kigali, Rwanda. Meeting participants included one SAGme member, technical leadership from the Rwanda National Malaria Control Programme, community health workers, implementing partners and stakeholders, and staff from the WHO Country Office and headquarters. The CEQ was introduced and discussed, and a team was established to develop a proposal to field-test a set of analytical tools.

The development and findings of this meeting were presented at the SAGme meeting, along with an overview and discussion of the data collection methods and pilot assessments carried out in the four selected districts in October 2018.

The SAGme recognized the progress of the CE work package and highlighted the request made from the work group regarding the opportunity to review the status of WHO recommendations on CE at policy, programme implementation and guideline levels with respect to achieving malaria elimination and eradication. SAGme noted that there would be an opportunity for the group to integrate the CE work at three different levels:

1. At the level of strategy and implementation, CE is included in technical guidance and strategy. However, through the SAGme work, there is an opportunity to emphasize how CE needs to be addressed at the start of the process and integrated throughout.

2. Reflecting on existing malaria-related guidance and interventions, it was also noted that there was a need to generate people-centred approaches that incorporate co-design of strategies and interventions.

3. At the operational level, the findings that emerge from the CEQ field-testing can help to make connections between different levels of the health system in a way that enhances and optimizes existing WHO guidelines, which need to be adapted and used, e.g., community health worker guidelines.

At the end of the review, the SAGme discussed and asked questions about the sustainability of the CEQ and the ability to scale up the findings. It was noted that the CEQ is broad enough in scope to include an understanding of how dynamic systems operate, while taking into account country and regional contexts and specificities. The process of introducing and field-testing the CEQ should include
developing the skills, knowledge and mindset to embed learning throughout the programme. Once the skills and conceptual knowledge have been developed, the people/community will be supported to engage in a different way. This could prove to be a much more cost-effective way to build engagement with communities in a way that is more enduring and more suited to individuals in a situation than it has been in the past.

The SAGme requested a presentation of the final data findings at the meeting in June 2019.

**Health systems readiness for malaria control and eradication**

The main objective of the analyses conducted by the Swiss TPH, a WHO Collaborating Centre, was to identify the characteristics of health systems that were most predictive of successful malaria control in the 2000–2016 period. The group presented all available information on health systems, combined in a new health systems database and linked to the most recent data on changes in malaria burden. Multivariable regression models were used along with a range of model selection algorithms in order to identify the factors most strongly associated with successful malaria programmes.

After reviewing the analyses, the group concluded the following:

- Overall, the health systems variables seem to be predictive of malaria progress in the period 2000–2016.
- Across subperiods, however, the best models identified do not seem to be very stable, and the best models based on the first period (2000–2008) do not seem to predict the subsequent period very strongly (2008–2016).
- One of the primary reasons as to why this seems to be the case is the substantial trend reversals in some high-burden countries with highly ranked health systems.

The SAGme recognized the progress made in the work package, although a few members were concerned about the ability to arrive at specifics, such as being able to isolate specific features associated with more rapid progress in malaria control over the study period. Another point of discussion was around the private sector issue, which was raised in previous meetings and has not been entirely addressed. Some members mentioned that a large proportion of patients attend private facilities, and these are not reflected in the data collected.

**Megatrends**

For the fourth meeting of the SAGme, the megatrends work group presented an overview of the preliminary results characterizing expected global changes in a range of megatrends through 2050 and assessing the potential of these megatrends to compromise or accelerate malaria eradication. The megatrends taken into consideration were population growth, demographic shifts, urbanization, climate change, land use change, migration and economic development. The SAGme had previously acknowledged the importance of prioritizing megatrends in factors having direct and significant impacts on malaria, given the potentially enormous number of megatrends that could be possibly considered.

Literature reviews were conducted for each of the megatrends to provide descriptions of how these factors are thought to affect malaria transmission in various places around the world, the direction the trends are likely to take and, therefore, the implications for malaria eradication in the future.

**Population growth and demographic shifts**

As the global population expands from the current 7.6 billion to 9.8 billion by 2050, 60% of that growth will occur in sub-Saharan Africa. In fact, 50% of the world’s population growth in this period will occur

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5 All accessible pre-reads under the meeting folder on Dropbox - to access please click on the following [link](#)
in just eight malaria-endemic countries: India, Nigeria, Democratic Republic of the Congo, Pakistan, Ethiopia, United Republic of Tanzania, Uganda and Indonesia. At the same time, the population aged 10–24 years will increase substantially in Africa.

The implications for malaria eradication are evident, in that, increasing populations in Africa will require greater amounts of preventive, diagnostic and curative tools. Additionally, as the number of adolescents and young adults increases, and any remaining immunity is present in older adults, older adults may become an important reservoir for infection.

**Urbanization**

The majority of the world’s population already lives in cities. By 2030, 60% of the world’s population is expected to live in cities, with this figure rising to 66% by 2050. The United Nations estimates that more than 90% of future urban population growth will be in low- and middle-income countries (LMICs).

Cities are engines for economic growth, responsible for over 80% of global economic activity. Comparatively well resourced, cities have more health workers, financial resources and facilities, and better electricity supply, refrigeration and supply chain management than rural areas. High population density facilitates large-scale access to health care providers, and medical and other products. However, high population densities mean that people can be clustered around risks. Increased mobility and contact with people can result in increased risk of disease transmission.

The growth of cities has, however, been associated with reductions in the risks of malaria. Indeed, there is clear evidence that vectors are less plentiful and the prevalence of infection is lower in cities than in the surrounding rural areas. Nevertheless, given the vast numbers of people living in cities, even a low risk of urban malaria can translate into a considerable public health problem. Cities offer both opportunities and risks for malaria eradication, and links to urban planning will need to be made for malaria eradication in the future.

**Climate change**

Climate influences malaria both directly through vector and parasite development and indirectly through its influence on socioeconomic systems and processes relevant to malaria infection, control and elimination. Climate observations and forecasts may inform a wide range of decisions related to malaria elimination and eradication through an improved understanding of the mechanisms of infection transmission, better monitoring and evaluation of interventions, mapping of spatial variations in risk and management of temporal variations in risk (from subseasonal to decadal).

Although there is great uncertainty in estimating future climate patterns, we know that temperatures have risen significantly in almost all parts of the world and are expected to continue to rise. Rainfall changes in many regions are less clear. Although future projections are highly uncertain, there have been changes in extreme weather patterns and climatic events. Climate change will be felt not through trends, but through changes in the intensity, frequency and geographical extent of weather and climate shocks, seasonality and other components of climate variability. An important point to consider is that the climate change projections for the future are highly uncertain, particularly at the spatial and temporal scale relevant for decision-making. The conclusion is that eradication strategies will have to be flexible, building in monitoring and forecasting of climate impacts and evaluation of evidence of climate change affecting malaria.

**Land use and land cover change**

Land use and land cover change (LULCC) is primarily driven by agricultural expansion, deforestation and urbanization. These changes to the physical environment can affect mosquito breeding sites and, to a lesser degree, adult mosquito resting sites. LULCC may also push or pull human population movement, thereby affecting parasite movement as well. Remote sensing techniques can be used to monitor physical changes in the environment in order to predict near-future malaria risk. Overall, the
impacts of LULCC on malaria transmission are highly complex and context-specific, and dependent on the spatial and temporal units of data being analysed. Land use change is a dynamic process, with disease transmission finding a new equilibrium after each disruption.

**Migration**

The importance of migration to malaria elimination is that parasites move with people. Movement of (possibly asymptotically) infected people into areas that have eliminated malaria but remain able to support transmission raises the spectre of reintroduction of the disease. Areas moving towards elimination may have their progress impeded by inward migration of parasites from outside. However, analysis of global migration patterns shows that internal migrants within a country outnumber international migrants three to one (740 million cumulative internal migrants in 2018 compared to 244 international migrants). It is expected that 35 million people will migrate from less developed countries (largely malaria-endemic) to more developed countries in Europe and North America through 2030. Nevertheless, this is not expected to pose a large challenge to the populations of the receiving countries, as they are generally less receptive to transmission than the sending countries. Review of these trends makes it generally clear that internal population movements within countries and subregions, and on a short time scale, will be more important to malaria eradication than population movements across continents.

**Quantitative exploration of malaria trajectories in Africa to 2050**

The Malaria Atlas Project at University of Oxford, a WHO Collaborating Centre in geospatial disease modelling, combined the effect of several megatrends to generate maps of malaria risk in Africa for 2030 and 2050. The Project explored the impact of keeping malaria interventions at current levels or increasing them to examine the effect of full-scale implementation. The first step was to characterize the relationship between environmental conditions, intervention coverage and malaria transmission. Data were combined in a Bayesian geostatistical model that allowed the empirical relationships to be characterized. Subsequently, plausible environmental conditions were projected spatially into 2030 and 2050 under particular scenarios of global change. Using the empirical relationships developed during the first step, the malaria scenarios in 2030 and 2050 were computed. Finally, enhanced coverage of current tools and innovation of new tools were added to the models to generate best case scenarios for the future.

The results indicate that malaria prevalence will decline substantially in 2030 and 2050 as a result of the combined effects of megatrends if current intervention impacts are maintained. However, malaria will not be eliminated in Africa. Scaling up existing interventions and adding new tools currently in the pipeline further reduces malaria but does not achieve elimination in Africa.

**Eradicating in the hardest areas**

Building on the megatrends work package, it was discussed and agreed that the Malaria Atlas Project at the University of Oxford, in support of the SAGme, would analyse the future malaria scenarios in 2030 and 2050 in order to (i) understand the factors that are most important in determining the hardest or last places to eliminate, and (ii) identify potential strategies to mitigate those factors and facilitate eradication. This analysis will be presented at the final SAGme meeting in June 2019.

**Potential risks that could threaten or delay eradication**

**Simian malaria**

During the last meeting of the SAGme, the group felt that there needed to be an acknowledgment that zoonotic malaria poses a risk to eradication, and the SAGme needed to be more proactive regarding the potential threat posed by zoonotic malaria. Systematic, longitudinal monitoring of populations at risk of simian malaria is required, and surveillance should be conducted in areas...
identified as at high risk for zoonotic malaria. Moreover, it was recognized that there is a lack of information and tools to easily facilitate monitoring of simian malaria, and further investment in research and development is needed.

In reviewing the reports, the SAGme concluded that (i) while zoonotic reservoirs of plasmodium parasites exist, there have yet to be documented cases of sustained human-to-human transmission of zoonotic malaria. Efforts to eradicate human malaria should not be derailed by focusing on simian malaria; (ii) existing prevention and treatment tools are currently effective at controlling zoonotic malaria; and (iii) the transmission potential of zoonotic malaria could change and thus continued surveillance and research are merited.

In addition, as part of the work package, the UCSF Global Health Group’s Malaria Elimination Initiative (MEI) conducted and worked with GMP to present preliminary results on a series of short case studies developed to investigate malaria control and elimination efforts in the context of violent conflicts, natural disasters and other health emergencies, drawing out challenges, successes and lessons learned. In the previous meeting, the SAGme suggested an investigation of government health system breakdowns, complex emergencies and natural disasters. Preliminary findings were presented from case studies looking at violent conflict, focusing on Afghanistan; natural disasters, focusing on the 2010 earthquake in Haiti; and other health emergencies, focusing on the 2014–2015 Ebola outbreak in Sierra Leone.

The SAGme acknowledged that, although there is no one-size-fits-all approach that can span emergency types or locations, general lessons can be derived from countries that have dealt with a range of complex emergencies at various points along the malaria transmission continuum from high burden to eliminating and prevention of re-establishment.

After reviewing the case studies, the SAGme concluded that (i) complex emergencies are likely to cause disruptions in the progress towards elimination and eradication, but that should not deter us from pursuing this goal; and (ii) the impact of these inevitable events can be mitigated through various measures. For example:

- Robust health systems, complemented by specific emergency preparedness plans, play a key role in helping to mitigate the impact of disasters and hasten recovery.

- However, especially in terms of the endgame, this will need to be supplemented by a vertical approach with surge capacity at different levels.

- The potential for malaria resurgence needs to be included in the broader global and local discussions regarding disaster risk reduction and response.

**Economics**

The economics work package presented an overview of the work developed over the past year. Three studies were presented: (i) a retrospective cross-country regression study of the correlation between measures of malaria intensity and the level and growth of per capita income over the period 2000–2015; (ii) a cross-country modelling study of the impact of reaching malaria control targets on national and per capita income levels over the period 2016–2030 (towards a potential investment case on health benefits and economic returns); and (iii) a theoretical piece on the economics of malaria eradication that develops a conceptual framework for decisions about pursuing malaria eradication versus optimal control, focusing on human behaviour dynamics in order to study the feasibility and desirability of policy options.

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6 On drug resistance, a general agreement among the group was to consider it a risk and that it would be developed in-house by GMP given the significant attention it is already receiving.
From the first macro study (macro study 1), the group gave an update on the econometric analysis of the relationship between GDP and malaria, reviewing and replicating the highly cited paper by Gallup and Sachs (2001). The work estimates the association between case incidence and macroeconomic outcomes over the period 2000–2015, using recent data and updated econometric techniques. It concludes that if all malaria-endemic countries had eliminated over the same period, their GDP per capita would have been 5% higher on average and their GDP per capita would have grown 1% per annum faster on average.

From the second macroeconomic study (macro study 2), the group presented an estimate of the economic impact of return on investment from scaling up the coverage of malaria control interventions in accordance with GTS targets compared to a baseline of sustained coverage (at their 2015 level) over the period 2016–2030. Using the Economic Projections of Illness and Cost (EPIC) tool, this work analysed the impact of improved malaria control on the economic outputs of a set of 29 countries that accounted for 95% of global malaria burden in 2016.

For the conceptual piece, the discussions revolved around the challenges in developing a framework for malaria eradication. This third paper was presented on the malaria eradication game by Scott Barrett, economist and member of the SAGme, who is currently working on a study that looks at human behaviour dynamics in the context of a single country; further developments are required to think about the framework at regional and global levels. The research provides a conceptual framework for thinking about whether to pursue eradication versus optimal control (namely, country-specific optima). The study focuses on human behaviour feedbacks and steady-state analysis to study the feasibility and need for policy interventions, which can vary according to the intervention features.

In general, the research shows that technical feasibility needs to be combined with policy actions (e.g., subsidy) in order to achieve elimination and potentially future eradication.

The SAGme valued the updates on the studies and concluded that the key contributions were, first, additional historical evidence on the relationship between malaria intensity and economic growth in terms of GDP and, second, evidence of increases in economic output attributable to improvements in malaria control.

The plateauing of progress in reducing the malaria burden calls for a rapid, immediate and sustained increase in funding, pointing to the question of the feasibility and sustainability of such increasing funding needs over the long term. Continued progress towards a malaria-free world would need to be demonstrated in order to sustain willingness of donors to pay for malaria eradication. One challenge is that “malaria is not a priority for everyone,” which suggests that there should be a stronger representation of malaria in global, regional and national health financing dialogues. A final point of discussion regarding these studies was on funding sources. It was emphasized that the development assistance for health would likely be limited and not sustainable in a UHC context, and that governments of endemic countries play a critical role in terms of political commitment and increased resource allocation for health and malaria.

Final conclusions and next steps

The SAGme received all reports from the working groups and appreciated the thought and experience that had gone into preparing the evidence base, as well as the careful consideration of the implications of the findings in light of the SAGme’s terms of reference. A spirited discussion followed to draw preliminary conclusions from the meeting that would contribute to a final document back to the Director-General. The SAGme determined that one additional meeting would be required in 2019 to allow sufficient time to digest the findings and foster thoughtful reflection on the final conclusions and recommendations of the SAGme.
At the final session, the SAGme’s preliminary conclusions were as follows:

1. Global megatrends are likely to contribute to reductions in malaria, but they will not be enough to eradicate by 2050, even with a full scale-up of current interventions.
2. New tools will be needed to achieve eradication.
3. Good, people-centred health systems will be fundamental to achieving eradication.
4. Willingness of Member States to embark on eradication is likely to be affected by the consequences of and reflections on the polio transition.
5. It will not be possible to estimate costs until the strategy is clearer.
6. Targets for the GTS are achievable, but while this will contribute significantly to eradication, it will not get the world to eradication.
7. In sum, in preparation for the launch of a successful malaria eradication campaign, the GTS 2030 targets must be met along with several key conditions.

The GMP Director concluded that the meeting had crystallized a lot of the work developed since the November 2017 meeting. The GMP Director explained that the new WHO administration was undergoing a transitional period over Q1 2019 to transform the Organization, and therefore the SAGme should reconvene for a last meeting in June 2019 in order to finalize the recommendations it will present to the Director-General.

It was agreed that the most effective way to capture the contributions of all work packages would be in a final report coordinated by the GMP Secretariat. An interim outline and draft executive summary will be presented at the next meeting.
List of participants

Members

Dr Scott Barrett
Lenfest-Earth Institute Professor of Natural Resource Economics
Columbia University, School of International and Public Affairs & Earth Institute
USA

Professor Sir Richard Feachem
Director
The Global Health Group
University of California San Francisco
USA

Professor Nyovani J. Madise
Director
Research and Development Policy
Head of Malawi Office
MALAWI

Dr Lindiwe Makubalo
Health Expert
Permanent Mission of South Africa to the United Nations Office and other International Organizations
SWITZERLAND

Dr Cheikh Mbacké
Senior Independent Advisor, Global Development and Population
SENEGAL

Dr Mirta Roses
Senior Independent Advisor, Global Public Health
Special Envoy for the Global Network for Neglected Tropic Diseases
ARGENTINA

Professor Marcel Tanner (Chair)
Director Emeritus
Swiss Tropical and Public Health Institute
SWITZERLAND

Dr Philip Welkhoff
Director, Malaria
Bill & Melinda Gates Foundation
USA

Professor Xiao-Nong Zhou
Director
National Institute of Parasitic Diseases
Chinese Center for Disease Control and Prevention
CHINA

Dr Neena Valecha (unable to attend)
Director
National Institute for Malaria Research
Indian Council of Medical Research
INDIA

Dr Alex Coutinho (unable to attend)
Global Health Consultant
UGANDA

Dr Kevin Marsh (unable to attend)
Senior Adviser
African Academy of Sciences
KENYA

Invited Speakers

Dr Julian Eckl
Post-doctoral Research Fellow
University of St. Gallen
SWITZERLAND

Dr Justin Cohen
Senior Director, Global Malaria
Clinton Health Access Initiative
USA

Dr John Parrish-Sprowl
Director, Global Health Communication Center
Indiana University Purdue University Indianapolis
USA
Professor Chris Drakeley  
Professor of Infection and Immunity  
London School of Hygiene & Tropical Medicine  
UNITED KINGDOM

WHO Collaborating Centres – Observers

Dr Regina Rabinovich  
Director  
Malaria Elimination Initiative  
Barcelona Institute for Global Health  
SPAIN

Professor Peter Gething  
Professor of Epidemiology  
Big Data Institute  
Nuffield Department of Medicine  
University of Oxford  
UNITED KINGDOM

Amelia Bertozzi-Villa  
Postgraduate Research Scientist, Institute for Disease Modeling, Seattle  
Dphil Student, Malaria Atlas Project  
University of Oxford  
UNITED KINGDOM

Dr Peter D. McElroy  
Chief, Program Implementation Unit  
Malaria Branch  
Centers for Disease Control and Prevention  
USA

Dr Hannah Nissan  
Associate Research Scientist  
International Research Institute for Climate and Society – Earth Institute  
Columbia University  
USA

Dr Guenther Fink  
Head of Unit, Household Economics and Health Systems Research  
Swiss Tropical Public Health Institute  
SWITZERLAND

Maitreyi Sahu  
Scientific Assistant, Health Systems and Policy  
Swiss Tropical Public Health Institute  
SWITZERLAND

Partners – Observers

Dr Larry Slutsker  
Director  
Center for Malaria Control and Elimination  
PATH  
USA

Dr Bruno Moonen  
Deputy Director for Malaria  
Bill & Melinda Gates Foundation  
USA

Dr Scott Filler  
Senior Disease Coordinator, Malaria  
The Global Fund to Fight AIDS, Tuberculosis and Malaria  
SWITZERLAND

Dr Beverly Fenton Hall  
Chief, Parasitology & International Programs  
National Institutes of Health  
USA

Dr Valentina Buj de Lauwerier  
Global Malaria Advisor  
Health Section, Programme Division  
UNICEF  
SWITZERLAND

Dr Ingrid Chen  
Assistant Professor, Department of Epidemiology and Biostatistics  
Associate Director, Eradication Research  
Malaria Elimination Initiative, Global Health Group  
University of California, San Francisco  
USA

Dr Wiweka Kaszubska  
Head of R&D Drug Development Team  
Medicines for Malaria Venture  
SWITZERLAND

Dr Lutz Hegemann  
Global Development Head  
Established Medicines & Anti-Infectives  
Novartis Pharma AG  
Global Drug Development  
SWITZERLAND
<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Unit</th>
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<tbody>
<tr>
<td>Dr Richard Steketee</td>
<td>Deputy U.S. Global Malaria Coordinator</td>
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<tr>
<td></td>
<td>U.S. President’s Malaria Initiative USA</td>
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<tr>
<td>Janet Kristen Ginnard</td>
<td>Strategy Director Unitaid SWITZERLAND</td>
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<tr>
<td>Dr David Schellenberg</td>
<td>Scientific Adviser Global Malaria Programme</td>
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<tr>
<td>Dr Abdisalan Mohamed Noor</td>
<td>Surveillance, Monitoring and Evaluation Unit Global Malaria Programme</td>
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<tr>
<td>Prof Jean-Louis Arcand</td>
<td>Head, International Economics Department</td>
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<tr>
<td></td>
<td>Head, PhD in Development Economics Programme</td>
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<tr>
<td>Seoni Han, PhD candidate</td>
<td>Graduate Institute of International and Development Studies SWITZERLAND</td>
</tr>
<tr>
<td>Dr Jeremy Lauer</td>
<td>Health Economist Global Malaria Programme</td>
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<tr>
<td>Nayantara Sarma, PhD candidate</td>
<td>Graduate Institute of International and Development Studies SWITZERLAND</td>
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<tr>
<td>Dr Li Xiao Hong</td>
<td>Technical Officer Global Malaria Programme</td>
</tr>
<tr>
<td>Asiya Odugleh-Kolev</td>
<td>Technical Officer, Community and Social Interventions Quality Systems and Resilience Unit Universal Health Coverage and Health Systems</td>
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<tr>
<td>WHO Secretariat</td>
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<tr>
<td>Dr Soumya Swaminathan</td>
<td>Deputy Director General for Programmes</td>
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<tr>
<td>Dr Pedro Alonso</td>
<td>Director, Global Malaria Programme</td>
</tr>
<tr>
<td>Dr Kim Lindblade</td>
<td>Team Leader and SAGme Coordinator</td>
</tr>
<tr>
<td>Dr Salim Sadruddin</td>
<td>Team Leader Rapid Access Expansion (Race) Programme Global Malaria Programme</td>
</tr>
<tr>
<td>Dr John Aponte</td>
<td>Epidemiologist Surveillance, Monitoring and Evaluation Unit Global Malaria Programme</td>
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# Agenda

## Wednesday 28 November 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chair</th>
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<tbody>
<tr>
<td>8.00 – 8.30</td>
<td>Registration</td>
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<tr>
<td>8.30 – 8.45</td>
<td>Welcome and opening of the meeting</td>
<td>Pedro Alonso</td>
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<tr>
<td>8.45 – 9.10</td>
<td>Update from GMP Director and round of introductions</td>
<td>Marcel Tanner</td>
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<tr>
<td>9.10 – 9.30</td>
<td>Structure and expected outcomes of this meeting:</td>
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<tr>
<td></td>
<td>- First day, breakout into groups to review progress and work</td>
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<td>- Second day, outcomes of each group’s work</td>
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<td>- Discussion on key set of conclusions/implications for SAGme to</td>
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<td>consider</td>
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<tr>
<td>9.30 – 10.15</td>
<td>Lessons from the history of global policies against malaria and aspects of contemporary developments in global health governance</td>
<td>Julian Eckl</td>
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<tr>
<td>10.15 – 10.30</td>
<td>Introduction to breakout sessions; group divisions and structure</td>
<td>Marcel Tanner</td>
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### Breakout session

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chair</th>
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<tbody>
<tr>
<td>11.00 – 13.00</td>
<td>Plenary breaks into working groups:</td>
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<td></td>
<td>- Summary of work developed over the past year; background and timeline progression of work package, methods, results</td>
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<td>- 3–5 key implications/conclusions for SAGme</td>
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<td></td>
<td>- Final steps</td>
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<tr>
<td>14.00 – 15.30</td>
<td>Continue with breakout session</td>
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<tr>
<td>16.00 – 17.30</td>
<td>Continue with breakout session – please send final presentations and outcomes by the end of the day</td>
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## Session 2, Chair: Marcel Tanner

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chair</th>
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<tbody>
<tr>
<td>17.30 – 18.00</td>
<td>Summary, outlook for second day and close</td>
<td>Marcel Tanner</td>
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## Thursday 29 November 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chair</th>
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<tbody>
<tr>
<td>8.00 – 9.00</td>
<td>Working breakfast for SAGme members at the Mandarin Oriental, Geneva</td>
<td>Closed</td>
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## Session 3, Chair: Lindiwe Makubalo

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9.00 – 9.30</td>
<td>Presentation 1 – Community engagement</td>
<td>Presenter: TBD</td>
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<tr>
<td>9.30 – 10.00</td>
<td>Presentation 2 – Health systems readiness</td>
<td>Presenter: TBD</td>
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<tr>
<td>10.30 – 11.00</td>
<td>Presentation 3 – Megatrends</td>
<td>Presenter: TBD</td>
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<tr>
<td>11.00 – 11.30</td>
<td>Presentation 4 – High transmission areas to eliminate</td>
<td>Presenter: TBD</td>
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<tr>
<td>11.30 – 12.00</td>
<td>Presentation 5 – Threats towards eradication</td>
<td>Presenter: TBD</td>
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<tr>
<td>13.00 – 13.30</td>
<td>Presentation 6 – Economics</td>
<td>Presenter: TBD</td>
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<tr>
<td>Session 4, Chair: Marcel Tanner</td>
<td>Open</td>
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<tr>
<td>13.30 – 13.45</td>
<td>Introduction to final session</td>
<td>Marcel Tanner</td>
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<tr>
<td>13.45 – 15.30</td>
<td>Preliminary conclusions</td>
<td>SAGme</td>
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<tr>
<th>Session 5, Chair: Marcel Tanner</th>
<th>Open</th>
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<tr>
<td>17.00 – 18.00</td>
<td>Strategic Directions: Report back on 2020 GTS milestones and process to update the GTS to incorporate SAGme conclusions</td>
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| 18.00 – 18.30                  | Update of SAGme timeline  
Summary of meeting and close | Marcel Tanner |

*Please note the agenda is subject to change. You will be notified of any changes*