The Malaria Elimination Group (MEG) held its tenth meeting in Swaziland on November 16–19, 2015. These notes represent highlights from presentations and discussions and are not comprehensive.

Key points from MEG X discussions

1. Swaziland is a fantastic example of a strong malaria program which is well-managed, pragmatic, and adjusts its activities based on new evidence and evolving circumstances. Strong surveillance and response is the heart of a successful elimination program and Swaziland demonstrates great speed and completeness in its surveillance and response effort.

2. Swaziland is rapidly moving towards elimination, and when they sustain zero local cases for three years, they will apply for WHO certification. To this end, clarification is needed when referencing ‘zero local cases.’ Depending on the definition, certain countries that are already malaria-free and sustain small, controlled outbreaks would be disqualified.

3. The Elimination 8 (E8) Regional Initiative has made incredible progress over the past year, topped off with the signing of a $17.8M USD regional grant from the Global Fund. The E8 has become a model of what can be achieved with the right leadership, dedication, and forward thinking. All partners are called on to collectively and harmoniously support this important initiative.

4. As programs close in on their elimination goals, countries must proactively advocate for sustained funding—even after achieving zero. Resurgence remains a realistic threat to all eliminating counties.

5. With new global frameworks for elimination and eradication, the next five years are critical for and will need to include new financing, new tools, and new strategies.

Welcome and objectives for MEG X

Richard Feachem

- There has been remarkable change in collective thinking about what is possible and how to make it happen. There are three new global frameworks that chart the way forward: Action and Investment to Defeat Malaria (2016–2030); Global Technical Strategy for Malaria 2016–2030, and; From Aspiration to Action: What Will It Take to End Malaria?
- We have seen great global progress—more than half of the world’s countries have eliminated malaria. Thirty-five countries are actively working towards evidence-based elimination goals.
- By 2030, endemic malaria will be almost entirely restricted to a few countries in Africa. The end game is 2040, with no human malaria on the planet. Two regions are leading us towards that vision: the Asia Pacific and southern Africa. The leading country in southern Africa is Swaziland.
- Key topics for discussion at MEG X include: review elimination progress and strategy updates since MEG IX; discuss advocacy opportunities for increasing domestic financing; shine a light on Swaziland’s success and provide input on Swaziland’s surveillance and response effort; provide input on E8 regional progress; and discuss the process for achieving WHO certification.
Session 1: Global and regional elimination strategy updates
Chair: Larry Slutsker

Africa regional elimination strategy, presented by Waqar Ahem Butt
- The Africa Regional Strategy is still being developed with the first draft being written by WHO. It has been a multi-stakeholder process and has included partners such as ALMA, PMI, WHO, World Bank Group, research institutions, and national country programs. The ARS will be split into two documents: the Africa Malaria Strategy and its corresponding Implementation framework.
- The Africa Malaria Strategy will include strategic approaches, priorities for the African region, and key challenges, all of which will be centered on the goal of eliminating malaria in Africa by 2030. The regional elimination strategy is closely aligned with the WHO Global Technical Strategy.
- The Africa Regional Strategy will be available to all AFRO member states and other stakeholders in April 2016 for feedback and broader consultations within the malaria community.

Latin America regional elimination strategy, presented by Keith Carter
- In 2014, the Latin American region reported 375,000 confirmed cases. It has achieved a 67% reduction compared to 2000. A majority of cases in the region (73%) were due to P. vivax. Fourteen countries in the region have already achieved the MDG goal of a reduction of >75%.
- Venezuela is challenging for the region and experienced an increase from 29,736 cases (2000) to 105,000 cases (2014). In contrast, Argentina, Costa Rica, and Paraguay have experienced zero cases.
- National governments fund over 90% of the malaria programs in the region.
- Some top priorities in the region include building capacity within national programs, enhancing community ownership and participation, improving coordination, and preventing reintroduction.

WHO-GMP elimination update, presented by Shiva Murugasampillay
- The Global Technical Strategy for Malaria 2016–2030 (GTS) is the beginning of a new era for malaria.
- Malaria elimination requires a consistent, coherent, coordinated, and collaborative approach. It requires community empowerment, access to health services, decentralized programs, real-time data, case-based surveillance, elimination of active foci, and a motivated workforce.
- In July 2015, WHO began updating its elimination field manual, to be completed in December 2015.
- New cross-border initiatives have been established including MOSASWA—a collaboration between Mozambique, South Africa, and Swaziland—and certain countries are quickly approaching elimination, e.g. Swaziland and Botswana.

From aspiration to action: What will it take to end malaria?, presented by Diana Measham
- From Aspiration to Action: What Will It Take to End Malaria? (A2A) is a conversation starter which recognizes that global eradication can only be achieved if we move beyond existing norms. With the right level of political will, technical innovation, and strategic rigor, we are able to chart that path better than ever before.
- Eradication is the only sustainable solution to malaria. We must think about the end game and work towards this goal.

Highlights from Session 1 Discussion
- Stakeholder input and feedback into the Africa Malaria Strategy will be critical. With its most recent restructuring, the WHO is also working on scaling up its technical support to country programs.

Session 2: Advocating to increase domestic financing for malaria elimination
Chair: Samson Katikiti

Presenter: Erika Larson
- Approximately $100B USD is needed to reach our elimination goals by 2030.
- Although donor funding for malaria has gone up overall, the proportion of donor funding for eliminating countries has decreased.
- Key challenges to financing elimination include: high short-term costs of elimination, funding withdrawal for malaria, competing health priorities, and transitioning from donor to domestic financing. History has repeatedly shown us that resurgence occurs as funding is withdrawn (India, Sudan, etc.), so sustainable financing must be a top priority.
- Countries can improve their advocacy efforts to mobilize sustained and increased resources for elimination. A coherent advocacy strategy must include: identifying financing gaps; identifying a resource mobilization objective that is specific,
measurable, achievable, realistic, and time-bound (SMART); mapping pathways of key stakeholders and decision makers that have power over interim outcomes and the SMART objective; highlighting supportive evidence; and developing an advocacy M&E framework and work plan.

**Highlights of Session 2 Discussion**

- We must improve our ways of articulating the benefits that can result from investing in malaria. Country programs must have a clear quantification of their financial need prior to approaching their Ministers. Elimination financing is no longer about commodities; it’s about strengthening surveillance, management, health systems, and capacity.
- Due to policy and budget-allocation cycles, advocacy and resource mobilization efforts take a significant amount of time to reap benefits. Therefore, countries approaching a financial cliff within the next couple of years will need to begin their advocacy efforts now.
- It has been suggested that innovative financing mechanisms are the solution for generating an increase in elimination financing. However, countries would like to see more examples of where they are being used and what impact they have had (e.g. Philippines’ Sin Tax).
- Better links can be made between investing in malaria elimination as an investment in universal health care; targeted malaria elimination interventions can increase access to health services for high-risk populations.

**Session 3: Deep-dive in to Swaziland’s malaria elimination program: Best practices and key challenges for elimination**

**Chair: Simon Kunene**

- Swaziland’s 2015 elimination goal refers to the end of the 2015 transmission season (June 2016).
- Swaziland’s strategic plan is from 2015–2020 but is only funded through 2017. The program’s total budget for five years is $13M USD; its total government contribution is $6M USD (43%); total unfunded is $6.7M USD (48%).

**Diagnostics and case management, presented by Stanley Chitundu**

- Case management in Swaziland operates on three different levels: national, regional, and facility level. Swaziland rolled out RDTs to all health facilities in Feb 2010 for confirmation of all malaria cases. They currently have an 89% confirmation rate but are aiming for 100%.
- Diagnostic challenges include waning microscopy skills and weak quality assurance.

**Surveillance, presented by Nomcebo Mkhonta**

- Swaziland has experienced 603 cases from July 2014–June 2015.
- The transmission drivers in Swaziland include declining coverage of primary vector control interventions, asymptomatic infections sustaining a parasite reservoir, imported cases, and poor uptake of preventative measures when travelling to high endemic areas.
- Swaziland is doing both passive and active surveillance. Their passive surveillance system centers on their Immediate Disease Notification System where health facility staff use a toll-free number to report all confirmed cases within 48 hours of diagnosis. The NMCP then investigates all cases.
- Their active surveillance system involves active case investigation (follow up visit at the patient’s home within 48 hours) and active case detection (community testing with RDTs and dried blood spots within 500m of a confirmed case). All individuals that test positive through active surveillance processes are transferred to the nearest health facility for treatment. In 2015, 92% of Swaziland’s positive cases were investigated within 48hrs.
- The NMCP also conducts proactive case detection by screening high-risk communities even if no cases have been reported.
- Fifty percent of investigated cases were classified as imported (276). Eighty two percent of imported cases reported travel to Mozambique.
- Implementation challenges include low 48hr investigation rate, transporting collected samples from the field to the lab, and ensuring that all cases are reported to the disease notification system.

**Vector management, presented by Quinton Dlamini**

- All traditional structures are sprayed with DDT and modern structures sprayed with pyrethroids. However, there has been a decrease in IRS coverage.
- Some of the key challenges have been strengthening vector management and entomological capacity within the NMCP, delays of supplies, and transportation.
Highlights of Session 3 Discussion

• Swaziland has received guidance from the WHO recommending that the program expand its current screening radius (500m) to 3km. However, evidence has shown that 90–95% of secondary cases are found within the home of the index case. The overwhelming opinion of MEG was that the NMCP should keep its 500m screening radius, and focus on improving the case investigation response time.

• An example from another eliminating country was offered: China has transitioned their staff into mentors and trainers for other countries as a way of maintaining the motivation of their staff as they approach elimination. They also have microscopist competitions which serve as incentives for their staff to keep their technical skills up-to-date.

• The trend in Swaziland shows that a majority of all malaria cases are adult males (70%). Therefore, this raises the question as to what activities are putting men at higher risk.

• There is a politically sensitive debate around the continued use of DDT in the region. However, the E8 Ministers of Health have decided that DDT will continue to be used until better alternatives are available. Pyrethroids are expensive and most countries can’t afford them.

Optional Google Earth Engine mapping tool informational session

Presented by Hugh Sturrock

• The Disease Surveillance and Risk Mapping (DiSARM) tool uses Google Earth Engine to help countries generate risk maps in an automated way to target their interventions towards high risk areas. It allows country programs to tailor the platform to their country’s context, adding intervention data and other relevant layers.

• There is a lot of potential for this mapping tool to help programs better target their interventions. However, its accuracy is dependent on having reliable data inputs. Plans are in place to integrate the tool into surveillance systems in Swaziland and Zimbabwe. Thailand is also thinking about integrating this system with their current mapping program.

Highlights of Google Session Discussion

• This program shows what is possible when countries are able to produce good data.

• Although there is no additional cost for countries to use this platform (since Google Earth is an open source platform), there may be some added costs for maintaining the mapping tool in the long term (i.e. technical assistance).

Session 4: Elimination 8 status update

Chair: Allison Phillips

Presented by Kudzai Makomva

• As countries in southern Africa individually progress towards elimination, there is need for a harmonized approach to reaching zero. The E8 is in the early stages of implementing its strategic plan which includes developing a regional surveillance system, strengthening and harmonizing quality assured diagnostics, improving diagnostics and treatment in the border areas, deploying mobile border surveillance units, and providing a platform for regional coordination and planning.

• Transmission intensity varies widely across the E8 region. However, the region remains highly connected through human movement. In 2013, southern Africa recorded more than 4 million formal migrants crossing the region’s borders. This figure does not capture the high volume of informal and undocumented travelers. More than half of the migration occurs across the South Africa border.

• The E8 is gradually increasing financial commitments to malaria, but the available resources remain far short of what is needed to eliminate. The E8 was recently awarded a $17.8M USD grant from the Global Fund to implement many of the key pieces of the E8 Strategic Plan.

Highlights of Session 4 Discussion

• Most of the discussion regarding cross border transmission involved southern Mozambique and southern Angola. However, evidence shows that the parasite movement within Angola and Mozambique comes from the northern regions. Questions were put forth as to whether or not the E8 should focus more attention on the northern regions of the second-line countries. Additionally, in order for the E8 to achieve regional elimination, at what point should they move beyond the second-line countries and incorporate other endemic countries such as DRC, Sudan, etc.?

• It is advised that the E8 work closely with organizations that have implemented border posts in the past. The lessons from these experiences will be critical to the success of the E8’s malaria posts.

• The success of the E8’s regional grant to the Global Fund was a significant achievement for the region. The world and the Global Fund are watching southern Africa. Any successes, or failures, that come out of the grant will have implications for regional funding in the future.
Session 5: To test and treat, or treat without test: Updates from evaluations in Zambia and Swaziland

Chair: David Mumbengegwi

Reactive case detection learnings and plans for targeted parasite elimination in Swaziland, presented by Michelle Hsiang

- Reactive case detection (RACD) consists of screening household members and neighbors of passively detected cases.
- Some of the conclusions from the RACD Swaziland study suggest that the sensitivity of RDTs for detecting additional infections is low. Additionally, asymptomatic infections more frequently cluster within households of index cases. Highly sensitive point of care diagnostics are also needed to improve the yield and potential effectiveness of RACD. In the absence of highly sensitive point of care diagnostics, presumptive treatment strategies should be considered.
- There is renewed global interest in mass drug administration (MDA). WHO plans to recommend MDA as a good option for low transmission settings when there are no imported cases and when used in combination with another intervention.
- Taking a reactive approach allows programs to target limited resources to areas with confirmed infections, and is thus more operationally feasible to achieve high coverage.

Changes in malaria parasite populations with application of MDA in Zambia, presented by Diana Measham on behalf of MACEPA

- Zambia has made much progress during the past decade. Additional steps were taken in 2012-2013 to clear the human reservoir of infection with “mass test and treat” using RDTs and artemether-lumefantrine (AL). However, only modest reductions in infection rates were achieved.
- A new study of MDA and focal MDA (fMDA) is underway in Zambia. The preliminary results of the study showed that MDA and fMDA reached about 85% of the population, and showed a substantial reduction in malaria infections. MDA in low transmission settings experienced the greatest statistically significant benefit in which the parasite prevalence went from ~8% to 0.5%. Additionally, the high transmission areas experienced substantial reductions in parasite prevalence as well and reached a prevalence rate similar to the starting point for the low transmission areas.
- The next steps in the study include quantifying effective coverage, conducting a PCR survey, and continuing with Year 2 of the trial.

Highlights of Session 5 Discussion

- MDA requires a very limited set of circumstances for success, and always requires strong surveillance. Due to its strong surveillance system, Swaziland may be well positioned to use MDA.
- These aren’t just trials about MDA but are also trials about community engagement.

Session 6: Technical challenges and solutions to eliminating malaria from southern Africa—surveillance

Chair: Francisco Saute

Migration in southern Africa, presented by Erick Ventura

- In Africa, there are 19.3 million international migrants. Migrants are highly susceptible to communicable diseases (HIV, TB, malaria).
- Contrary to standard belief, migrants are often healthy and underutilize health services.
- Migration is an important topic in malaria control and elimination because human mobility and importation can result in reintroduction, and poor treatment-seeking behavior and/or compliance can lead to anti-malarial drug resistance.
- Migrant issues require a multi-sectorial approach including engagement from the private sector as well as cross-border and inter-regional coordination.

Populations at high-risk for malaria, presented by Adam Bennett

- In very low transmission areas, infection risk may be associated more strongly with behavior rather than location, and specific groups may be at high risk due to shared behaviors. The first step to targeting surveillance to high risk groups is determining risk factors and whether these risk factors cluster in specific groups. This can be done through formative qualitative research and case-control studies, such as with the MERFAT tool.
- Once risk factors and potential risk groups and locations are identified, strategies for accessing these groups must be determined based upon whether they are hard to access or easy to access.
E8 regional surveillance system and database, presented by Kudzai Makomva

• The E8 Regional Initiative is in the process of developing a regional surveillance database which would include high resolution data inputs from the eight NMCPs via a harmonized set of indicators and an automated reporting portal. Analysis of all data would be integrated and feedback would be regularly provided to all eight countries. A central database would also be kept and would allow the E8 countries to link the regional surveillance system to existing national systems such as DHIS2.

• Various surveillance methods are being used by NMCPs in the E8 region. They differ in terms of frequency, type of surveillance, and type of tools they are using. However, many of the E8 countries are experiencing similar challenges in implementing their surveillance systems such as lack of human resources, poor reporting from the private sector, and overall reporting delays.

• Regional data sharing has been a sensitive issue in the region and the E8 Ministers of Health have been brought into the discussion to address this issue in particular. All eight Ministers recognize the importance of a cohesive regional strategy and endorsed the activities outlined in the E8 concept note including a regional surveillance system and the development of malaria border posts.

Highlights of Session 6 Discussion

• There is a need to make sure there are no duplicative surveillance systems in the E8 region. The E8 has conducted extensive consultations with country programs and partners including WHO and found that there are currently no surveillance systems that meet the needs of achieving and maintaining elimination in the E8 region. Therefore, the E8 countries are designing a surveillance system that will address the key issues that the E8 member states have identified. All technical partners are called on to support the E8 surveillance system in any way that they can.

• There is interest in further engaging the private sector to improve accessibility to underserved populations. The International Office for Migration has a few initiatives with the private sector (eg Illovo Sugar Company) but they are not malaria specific. More collaboration is needed.

• Similarities can be drawn between the E8 and Asia Pacific Malaria Elimination Network (APMEN). Countries should participate in peer exchange programs to share best practices and lessons learned in order to build capacity in any countries lagging behind.

Session 7: Technical challenges and solutions to eliminating malaria from Southern Africa—diagnostics

Chair: Anders Bjorkman

Highly sensitive point of care diagnostics, presented by David Bell

• History has shown us that you can eliminate malaria without highly sensitive tools. However, highly sensitive diagnostics can accelerate the process.

• In order to detect cases from within the reservoir, we need to be able to get below PCR/LAMP level of detection. In Swaziland, there is still a reservoir that is getting missed, even with PCR.

• The malaria community should not be evaluating MDA versus screening; instead, we should use both interventions and ensure that they are targeted and monitored appropriately.

Role of serology and genotyping in elimination, presented by Bryan Greenhouse

• Serology and genotyping can be used to improve routine surveillance data. Serology can provide historic data about transmission overtime and should be considered for inclusion in active surveillance as an adjunct to parasite prevalence, increasing sensitivity for detecting transmission and giving greater precision with smaller samples.

• Genotyping can help link cases in very low transmission settings to understand where, in whom, and to what degree local transmission (vs. imported or introduced cases) is being sustained as opposed to just where cases are being detected. In particular, determining the length of local transmission chains may be valuable in deciding how close to elimination an area is. Genotyping studies are underway in the E8 region and include study sites in Namibia, Swaziland, and (soon) Mozambique.

Findings from an assessment on national lab capacity in E8 countries, presented by Charlotte Dolenz

• A regional diagnostics landscape assessment across the E8 region looks at issues including policy and guidance, uptake and adherence, and quality assurance and control.

• Some of the preliminary findings from the assessment include: diagnosis-related policies differ across the region and sometimes deviate from best practices; QA/QC activities are limited across the region; there is low engagement of private providers.
The assessment identified four concrete areas of support needed moving forward: standardizing processes and procedures, training and accreditation, data management and analytical support, and building external and internal quality assurance capacity.

**Highlights of Session 7 Discussion**
- Genotyping can be used to determine imported versus local cases. As transmission is reduced, the countries may want to consider collecting dried blood spots as part of routine surveillance allowing the addition of serology and genotyping to track transmission.
- Conventional wisdom is that as transmission goes down, diversity of parasites will go down. However, in reality we see that as importation becomes the more dominant, diversity increases.

**Session 8: Technical challenges and solutions to eliminating malaria from Southern Africa—vector control**

*Chair: Raj Maharaj*

**Using modern technology to monitor IRS coverage**, presented by Dan Bridges
- Historic efforts to plan, monitor, and evaluate IRS campaigns have a number of issues. Enumeration via satellite imagery is quicker and more cost-effective than ground enumeration. There is a need to change the way we measure successful IRS campaigns.
- The goal is to someday be able to map all household interventions on a unified platform, to evaluate the overlay of interventions and determine which intervention is working best.

**Residual transmission**, presented by Gerry Killeen
- Residual transmission is essentially what’s left once the main LLIN and IRS interventions have been implemented, and is mediated by mosquitoes exhibiting behaviors that allow them to avoid fatal contact with these measures inside houses.
- While there are a lot of different options for achieving improved impact upon transmission, none of these have been evaluated sufficiently to recommend full scale up, so national programs are now encouraged by WHO to develop and evaluate selected options on pilot scales. The main issue facing national programs intending to develop such options is human capacity for creative application of existing entomological methods in programmatic contexts to select, refine, and evaluate optimal vector control measures.

**Highlights of Session 8 Discussion**
- First and foremost, we must get our existing interventions to do what they are supposed to do. Tools such as mSpray are only meant to improve effectiveness and efficiency of IRS.
- We rely too much on expert opinion rather than what the mosquitoes are telling us. There are a lot of cheap, simple solutions that can have impact. These need to be objectively assessed through direct comparisons based on simple, affordable entomological indicators before selecting options to take to full scale evaluations.

**Session 9: Managing effective elimination programs**

*Chair: Dennis Shanks*

**Program management in elimination: Cross case study analysis**, presented by Cara Smith Gueye
- Case studies have shown us that unstable and inadequate funding and personnel in elimination programs often contributed to resurgence.
- Some of the management best practices across the eliminating countries included sufficient investments in training, clear lines of accountability, flexibility and willingness to adapt to new methods and tools, anticipation and forward thinking, and strong political commitment.

**Malaria in Sabah, Malaysia: the end game**, presented by Christina Rundi
- The Malaysia NMCP focuses on three strategic areas: strengthening malaria surveillance, integrated vector control management, and early detection and prompt treatment.
- Successful programs require clear direction, sufficient commitment of resources, close monitoring and evaluation, and collaboration with key stakeholders.

**Highlights of Session 9 Discussion**
- There is a clear connection between successful programs, management, and consistent resources.
Session 10: Preparing for the WHO malaria-free certification process

Chair: Jimee Hwang

Presented by Shiva Murugasampillay

- The definition of achieving elimination is zero local cases for three years. At that point, an NMCP can then apply to the WHO for malaria-free certification.
- Steps for WHO certification include submitting a country application, developing a WHO certification plan, compiling the necessary country documents, carrying out an independent assessment, and reviewing the assessment by an expert committee.

Highlights of Session 10 Discussion

- There was much debate over the use a “zero local cases” as an elimination definition as there is ambiguity in determining what is ‘local’ or a ‘case’. The WHO is working on providing more clarification on its definition of zero local cases as well as the WHO certification process as a whole.
- Zero local cases as a target is an unreasonable standard. Secondary cases are common in many malaria-free countries including the US and UK. The real issue that should be assessed is that the NMCP rapidly manages all imported cases and ensures that there is no resurgence or outbreak.
- An Expert Reference Group, which advises WHO, is revisiting the definitions about what constitutes a case, the definition of a local case, what an outbreak is, etc.

MEG X: Closing remarks

Richard Feachem

- We must remind ourselves that 100 countries have eliminated malaria through strong program management, pragmatism, and day-by-day activities.
- Swaziland will not meet its 2015 elimination goal. Therefore, it must revise its target by looking at its data, setting a new date, sticking to it, advertising it widely, and achieving it.
- Swaziland’s program successfully functions on approximately $2M USD annually. However, these resources won’t last forever. Swaziland must figure out how to maintain this investment. Mobilizing resources takes time and removing the investment will jeopardize its gains.
- The E8 has made remarkable progress over the last year, topped off with the awarding of the E8’s first Global Fund grant. The E8 must continue to be decisive, take bold action based on collective decision making. If the E8 is successful, it will set the stage for other regions to follow.