

The Malaria Elimination Group Scope and Summary of First Meeting Santa Cruz, California, March 23 – 26, 2008

Preamble

The Malaria Elimination Group (MEG) is comprised of roughly 40 experts from all parts of the world convened by the Global Health Group of UCSF Global Health Sciences. MEG members serve in their personal capacities and bring expertise across many disciplines - ranging from molecular biology to program management. MEG concentrates on scientific, clinical, technical, operational, economic and programmatic issues and will not concern itself with international architecture or institutional roles and responsibilities.

The purpose of MEG is to make available intellectual and practical guidance, advice and opinions that can be used by countries embarking on, or considering embarking on, a pathway to malaria elimination. MEG deliberations focus primarily on those countries which are considering or have embarked on elimination, and with which the Global Health Group and its partners are working. These currently include Botswana, China, Namibia, Solomon Islands, South Africa, Swaziland and Vanuatu. MEG also intends to contribute to elimination discussions and actions in other countries in all regions.

MEG will particularly explore the strategic advantages of spatially progressive elimination, starting at the natural endemic margins and moving inwards. MEG will also provide guidance to those exceptional countries in the interior of endemic zone which believe that they may have the preconditions to take on an elimination goal.

MEG anticipates that its findings and products will also be of interest and value to the broader malaria community and to the overarching efforts to eventually achieve malaria eradication. MEG will interface with and provide input to other ongoing global discussions and activities concerning malaria control, elimination and eradication.

MEG intends to produce and disseminate a *Prospectus on Malaria Elimination* and other products from time to time.

MEG held its first meeting in Santa Cruz, California during March 23-26, 2008. It plans to hold a second meeting in October 2008 in Southern Africa. The paragraphs that follow provide selected highlights from the discussions that occurred during the first meeting of MEG.

The History of Malaria Elimination

Presented by Dennis Shanks, chaired by Marcel Tanner

- We can learn much from previous malaria elimination and eradication efforts – both successful and unsuccessful. There is also much to learn from comparable elimination efforts in other disease areas, particularly the Onchocerciasis Control Program: how it moved from a global and tool-driven program towards a country- and community-based effort.
- The lessons learned from historical experiences (including partial successes and failures) for new malaria elimination agendas in the prevailing global health and political context include the following.
 - A single approach for all areas is not applicable.
 - Cost-effective surveillance systems must be established and maintained.
 - We need a clear understanding of the epidemiological situation in each area.
 - Population movements (within countries and cross-border) need to be understood and monitored.
 - Efforts must include tackling residual *P.vivax* infections, probably through mass-drug administration using 8 aminoquinoline drugs and other available means.
 - Technical resources and political focus at high levels must be maintained for long periods (decades in many cases).
 - Local/country ownership of programs is a prerequisite which means that responsibility and authority is placed at the national level and should not reside in international circles and/or among funding agencies.
 - An iterative process between control activities and research is required – the research and development agenda must be an integral part of any global plan of malaria elimination.
 - A systemic approach is required. The integrated application of each control tool needs to be designed within the local health systems context (health systems entail the public, private and charity sectors as well as community/civil society organizations), which also allows (i) tailoring operations to local socio-ecological conditions, (ii) establishing the partnerships for implementation and sustained financing through a clear definition of roles and responsibilities, and (iii) obtaining social acceptance for all interventions and program activities.

The Mathematics of Malaria Elimination
Presented by David Smith, chaired by Larry Slutsker

- Approaches to constructing and refining models should be based on practical questions about the implementation and/or impact of interventions.
- Models can be used to inspire or identify key research and development activities that in turn can provide better information for the next generation of models.
- Well-collected field data are needed to refine and test competing models; field scientists and modelers need to work in close association to improve the models. This iterative process is a part of the core research activity of eradication, to evaluate progress and help support decisions about course corrections.
- Models are useful in identifying spatio-temporal weaknesses in transmission intensity and indicating the use of targeted interventions when the parasite and vector are most vulnerable.
- Current assessments of the prospects for elimination are limited by our limited ability to assess vulnerability, receptivity, responsiveness, and heterogeneity. Better information about these factors will be needed, and mathematical modeling can be part of the evaluation process as a decision support tool.
- Most existing mathematical models of malaria do not consider the issues that are important for transmission in low intensity settings and under intensive control, especially the issue of imported malaria; these should be given high priority since they are important for the consolidation and maintenance phases of malaria elimination.
- Mathematical modeling can serve MEG and strategic planning by using existing databases (such as those collected by the Malaria Atlas Project) to set realistic quantitative targets and timelines, including general guidelines about how to measure malaria as populations move towards stable endemic control and eventual elimination.
- Finally, and importantly, existing models suggest that elimination is a ‘sticky’ state, in the sense that once the state is achieved it may be relatively easy to maintain.

Parasitological Challenges: Eliminating *Falciparum* and *Vivax* from the Human Population
Presented by John Reeder, chaired by Brian Greenwood

- Elimination requires a fundamental change in approach from dealing with the burden of disease to the burden of infection.
- In endemic situations where *P.vivax* and *P.falciparum* co-exist, the goal must be elimination of malaria, not elimination of *P.falciparum* alone.
- In low transmission settings, both *P.falciparum* and *P.vivax* occur significantly as asymptomatic conditions that are potentially infectious. A community-based approach to elimination could be adopted to monitor this.

- There is a need for better *P.vivax* diagnostics, particularly those with greater ability to detect low concentrations of parasites.
- New tools would greatly facilitate malaria elimination efforts. These may include drugs specifically to kill hypnozoites and block transmission, transmission blocking vaccine(s), and genetically modified mosquitoes. Tafenoquine is the only potential new tool for malaria elimination which has reached clinical trials. MEG endorses the development of drugs for malaria control/elimination and strongly endorses continuation of the evaluation of tafenoquine.

**Entomological Challenges: Reducing Vectorial Capacity Before and After Elimination
Presented by Janet Hemingway, chaired by Rajesh Garg**

- We should understand vector dynamics in different epidemiological settings before elimination interventions are implemented.
- We need increased capacity at the technical core of epidemiological entomology.
- There are insufficient numbers of entomologists trained or working in malarious regions. This could be improved through enhancing field skills at the technical level. Investments for training entomologists should be made.
- We need innovative thinking around the development of new tools to suppress vectors. Larviciding or transgenics could be promising if researched and developed further.
- DDT and IRS have been the fallback for too long. The technology used in the application of residual spraying is over 50 years old. We need new public health pesticides.
- We should engage the private sector in the development of new user-friendly technology and control interventions.
- Socio-economic issues need to be addressed when implementing control interventions. These issues pose a special challenge in trying to achieve high coverage with bednets or IRS. There is potential for social resistance to operations and control programs.
- To prevent and understand resistance, we need:
 - New tools to detect resistance, and new surveillance systems to track it. Community based or household sampling, monitoring and evaluation should be further explored.
 - An improved understanding of the vector's DNA, selective biting patterns and epidemiological factors around infections.
 - Stronger and faster tools for detection, particularly to enable us to communicate data to malaria control programs and researchers for immediate response.

Political and Capacity Challenges: Are There Places Where It Is Impossible?
Presented by Jim Tulloch, chaired by Patrick Moonasar

- Progress should be carefully measured and publicized. Elimination is the ultimate goal, but achievement of key milestones on the path to elimination can and should be highlighted as intermediate successes.
- Moving from control to elimination will require capacity for development and rapid review and adaptation of new policies and guidelines.
- In each country, malaria programs should seek to achieve broad strengthening of a few key elements of the health systems to benefit all health programs; e.g. drug supply management or strengthening of laboratory services.
- The major capacity constraint is human resources. Addressing this challenge may require:
 - Identifying and utilizing capacity outside the government health system; e.g. monitoring, evaluation, research or commodity distribution can be outsourced to Civil Society Organizations, Faith Based Organizations and other private sector entities.
 - Simplifying critical functions; e.g. better rapid diagnostic tests, simplified therapy, and monitoring tools.
 - Ensuring that salaries and incentives for health workers are sufficient to retain and motivate them.
 - Better definition of roles, responsibilities and priorities to maximize the use of limited human resources.

Economic and Financial Challenges: Can We Afford It and Should We Afford It?
Presented by Dean Jamison, chaired by Colin Boyle

- There exist good assessments of the economic and other benefits of enhanced control, of the costs of enhanced control, of the cost-effectiveness of interventions and of alternative modalities of finance (e.g. on user fees for bednets, or on global subsidies for ACTs). Most of the work has focused on holoendemic parts of Africa. While these analyses provide a useful starting point, analysis of the economics and finance of elimination will need to go well beyond what has been done.
- Existing work on the economics of eradication and elimination emphasize the decisive character of eradication as a goal. Eradication confers the major benefit of allowing control efforts to cease.
- Elimination results in transition to a different but still ongoing set of interventions (including surveillance and response). Little is known about what these interventions will cost, and these costs will be, in part, a function of the environment external to the zone of elimination.

Analysis of long-term total costs of alternative intervention mixes in the pre- and post-elimination environments needs to start.

- Related work on the benefits conferred by elimination (relative to high levels of control) also needs to be initiated. Three areas where there are plausibly important benefits of elimination are in creating a better environment for tourism, for foreign direct investment, and in an elusive sense of self-confidence for a country's health sector.
- An important task for the economic analysis will be to help define what constitutes an economically reasonable 'elimination goal'. Ecological and political boundaries will be important determinants. Also important will be population size, ratios of boundary length to area, and the particular characteristics of urban centers including their altitude. The economic viability of elimination depends on these parameters.
- The questions of who pays for what, and when, in elimination efforts will need to be answered. The answers to these finance questions will shape the incentive environment for the actors in the system and this interplay between technical design and financial architecture suggests that these elements must be developed together.
- Elimination financing will require long term predictable funding and novel approaches from donors. In view of the processes and systems that need to be put in place for elimination, the initial cost would be greater than it is at present but should decrease over time. The volume, predictability, and availability of donor financing for countries pursuing elimination is critical and a potential role for MEG is to provide guidance to donors and countries in this area.

Strategic Challenges: Where, When, How Fast?

Presented by Oliver Sabot, chaired by Rajendra Maharaj

- There is a need for a global malaria strategy that promptly addresses a range of challenges related to malaria elimination, including: when to implement control and when to proceed to elimination; which countries should target elimination; which strategies should be used; and what the costs of implementation are?
- Three approaches to elimination were proposed: (i) indiscriminate attack; (ii) sustained aggressive control and (iii) rolling back malaria from the margins combined with rapid scale-up of control in the endemic heartland. Each approach had its own pros and cons but the third approach, of targeting elimination at the margins of malaria endemicity while pursuing aggressive control in the heartland, was agreed on as the approach that should be pursued.
- The marginal areas targeted should be beyond those that have emerged to date (Southern Africa, Melanesia and China), including northern Sub-Saharan Africa, Meso and South America, and areas of South and East Asia.

- It was agreed that targeting malaria elimination in limited areas surrounded by high endemic zones should be considered (e.g. Thailand), though instances where this is feasible and advisable will be rare.
- Based on concrete country and regional examples, the pathway towards elimination should be carefully planned, and operational plans should be linked with financial planning, and iteratively assessed with modeling in order to provide concrete assistance and understanding of the critical operational and strategic decision points.
- The challenges of sustaining elimination need to be further investigated.
- The current WHO phasing of control and elimination and associated epidemiological triggers were deemed to be potentially inappropriate in some settings. The WHO concept that concerted efforts on control would lead to elimination is correct – it is the epidemiological triggers that need to be revised and updated. However, it was agreed that MEG should not spend its time and energy on global definitional debates such as this.
- MEG should consider developing integrated case studies using existing examples of countries or regions that are embarking on elimination. A country's elimination plan (e.g. Botswana or Vanuatu) could be evaluated by MEG with emphasis on (i) financial implications and costs of rolling out the plan, (ii) models to predict the course of control and show concrete operational, strategic and financial outcomes and challenges.