Roll Back Malaria Vector Control Working Group (RBM VCWG)
12th Annual Meeting, 8-10th February 2017
Moevenpick Hotel, Rue de Pre Bois 20, 1215 Geneva

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7th Larval Source Management Work Stream meeting
08:30-11:30, Thursday 9th February 2017
Co-leaders: Ulrike Fillinger and Silas Majambere

Welcome and introduction of agenda – Silas Majambere, Innovative Vector Control Consortium
The LSM work stream aims to update the evidence base and protocols for LSM, and to assess and help develop local capacity to integrate LSM into existing vector control where appropriate. The objectives of the meeting were to (1) review the draft work plan, (2) discuss and agree to the projects, (3) identify how the projects can be put into action, (4) identify key contacts, networks and volunteers to implement the activities and, (5) to identify sources of funding. Projects in the draft work plan are:

A. Advocating for environmental management including habitat modification and manipulation and inter-sectoral collaboration as priority intervention in LSM.
B. Review of all available larvicides/pupicides/surface films for control of immature mosquitoes.
C. Review and recommendations of using state of the art technology for LSM.
D. Reviewing operational LSM in vector control programmes.

Brief overview of the history of the LSM work stream – Steve Lindsay, Durham University
LSM is the bedrock of mosquito control in parts of Europe and USA, and has proved effective in the past. However, there were demands for evidence of effect before advocating its use in disease-endemic countries. A Cochrane review (September 2013) found up to 75-90% reduction in incidence in appropriate settings. Further evidence is still needed to evaluate the feasibility of LSM in rural Africa where larval habitats are more extensive. A WHO larval source management operational manual was produced in July 2013, advocating its use alongside conventional LLIN and IRS tools. Advocacy was also carried out with a series of talks at a RBM-sponsored LSM Symposium at MIM. LSM needs multi-sectoral collaboration and action to reach a wider audience.

The potential of larval control in malaria elimination – Moh Seng Chang, University Malaysia Sarawak
LSM can be used in the pre-elimination phase as a supplementary tool to reduce vectorial capacity, in the elimination phase; LSM can be targeted at malaria foci to prevent re-establishment of transmission. Larval control is an opportunity for community participation in elimination efforts. Malaria elimination in Vanuatu focused on the five southern Islands, this case study looked at LSM in elimination efforts in one of these islands, Tanna. There is only one local malaria vector, Anopheles farauti, which breeds in brackish water usually confined to <0.5km from the coast. LSM was carried out in the dry season when the mosquito population was already low as well as the wet season.
Larvicide treatments were carried out every 3 months and man-made breeding sites were targeted by community efforts.

**Discussion of LSM in malaria elimination context – All**
- A comment was made that the current interim statement on larval control that talks about “few, fixed and findable” breeding sites discourages countries from carrying out LSM. A review of this is urgently required. A strong statement from WHO RBM advocating LSM is needed in order to generate funding and push the adoption of LSM by more control programmes, and in particular elimination programmes. One approach would be to tackle the cost-effectiveness of LSM. In addition, the GCDPP 2014 statement recommends LSM. The work stream could produce a consensus statement that is put forward for approval. [Assigned to Jacob Williams and Steve Lindsay].
- It was asked how the work stream could help the implementation of LSM in countries that want to use LSM. Support is needed to help countries justify the use and scale up of LSM; this can include health benefits outside malaria.
- Resistance management needs to be built into all approaches of LSM, and we need to get away from the idea of LSM being equated with larviciding and push the environmental management side as well.

The African Development Bank is planning to invest $24 billion by 2025 on water resource development. These projects will be required to include vector control in their design and implementation. There are proven LSM methods for the design and operation of dams and reservoirs. These include water level fluctuations, water flushing, ground levelling, steep banks, self-draining structures, clearing ditched. Contact reduction can be addressed by thinking about the location and design of human settlements. Intra-ministry boards can be formed to borrow funds for these projects so that vector control can be included.

**Discussion and approval of project A in LSM work plan (Advocating for environmental management – Ulrike Fillinger and All**
- It was queried whether the cost-benefit analyses for these dams and in particular the addition of vector control to these projects have been carried out yet and whether the data could be mined and used to build an evidence base for LSM. That data may not have been collected or available, but we should make contact with Dr Mubarack Diop at the AfDB in order to explore this. [To action Eve Worrall].
- It was suggested that case studies are gathered of how engineering LSM solutions have helped in the reduction of disease transmission.
- It was queried whether DRC is included in these projects and whether the transport sectors have been included in areas where rivers are used for navigation. DRC projects were confirmed.
- A number of HEP projects were set up along the Mekong, and a lot of thought was often given to environmental management, but there was a missed opportunity to consider the resettlement programmes and LSM that can be carried out in those locations. This work stream should link up with the HEP companies to ensure this is not missed again.
- There is a need for smaller engineering project as well as these large civil projects.
**Presentation, discussion and approval of projects B and C in LSM work plan (Review of larvicides, review on modern LSM strategies) – Silas Majambere, Innovative Vector Control Consortium and All**

- An action point was suggested to review the larval control methods that are available and how these should be chosen for control programmes. The group need to remain independent of any particular brands. The European, American and Australian Mosquito Control Associations carry out a lot of LSM, and may be able to contribute knowledge and on-the-ground experience. A lot of the information is already available in WHOPES reports, but it seems that it will be useful to bring together all the information in one place. Brand names are not necessary for this, although registration information by country would be helpful. It was suggested that the work stream could provide guidance on how countries can evaluate LSM methods for themselves. Reference standards for resistance should also be included [Volunteers: Peter DeChant, Norbert Becker].
- An action point was suggested to review new technologies used in LSM (such as GIS, drones). A brief description of a small-scale project in Zanzibar was given. It is important to note that drone work may in the future require certifications or licences and timescales for these needs to be worked into projects.

**Reviewing operational LSM in vector control programmes - Eve Worrall, Liverpool School of Tropical Medicine, Ruth Du Plessis, Liverpool School of Tropical Medicine**

The number of countries reporting the use of LSM appears to be increasing. Randomised controlled trial evidence of effectiveness can generate policy adoption, but the gap between policy adoption and implementation is funding. Donor funding is already stretched by LLINs, so funding often comes from national governments and the private sector. However, these funding streams do not demand the level of monitoring and evaluation.

A scoping exercise was carried out in five countries who already report having adopted LSM. The Ministry of Health policy documents and reports, and GF reports were reviewed. Targeted environmental management (small scale) was the most widely used approach, followed by larviciding and larvivorous fish. The drivers for using LSM were insecticide resistance, water sanitation and successful pilot projects. Where specific funding was allocated to LSM, this came from government sources.

The next steps will be to review policy and funding of other countries and widen the search strategies to other funders. In addition efforts will be made to obtain missing data.

**Presentation, discussion and approval of project D in LSM work plan (Reviewing operational LSM in vector control programs) – All**

- An action point was suggested to help build the evidence base further, by providing guidance on how to quantify the impact of LSM through an M&E framework.
- Lobby WHO to add more questions and collect more data regarding LSM as at present it seems largely ignored.
- Ask donors to broaden monitoring and evaluation to include larviciding.
- A request was made to help countries to build capacity for LSM; the cost of the product is often low compared to the implementation costs. Following on, a request was made to track where the money that was spent on larviciding actual went. Where money flows back into the communities, funding may be more forthcoming. Getting access to this data may prove difficult.
- A request was made that the work stream makes a guideline to help harmonisation of data collection between donors.
• An action point was made for the work stream to produce a document for the guidance and advocacy of larviciding in emergencies [Action: Alice Cowley, MENTOR Initiative].

Session 2: Feedback from the work stream meeting and discussions

Previous achievements, the Cochrane review and Operational Manual were highlighted. It was agreed that LSM is not just a malaria control tool, it has been used successfully already against other vectors and this stream should not focus solely on *Anopheles*. The draft work plan was reviewed, including volunteers to realise projects and some discussion of funding.

Work Plan

1. Draft a consensus statement as RBM VCWG work stream with the aim to change WHO position on LSM.
   - Negotiate the language at global level, and remove statement of ‘fixed, few and findable’ which prevents countries from allocating (donor) funds for LSM; request position change to state that ‘ground application of larvicides is not appropriate for larger flooded areas’.
   - Statement needs to include updated information (LSM meta-analyses data, from Lucy Tusting; Labiofam Bti now WHOPEs approved; opportunities of integrated mosquito-borne disease control; cite GPIRM recommendation to include LSM for resistance management.
     ➢ To action: Chairs (draft, March 2017); Jacob Williams & Steve Lindsay (final draft May 2017).

2. Advocating for environmental management including habitat modification and manipulation and inter-sectoral collaboration as priority intervention in LSM.
   ➢ To action: Ulrike Fillinger (to reach out to Public Health Engineers); Ulrike Fillinger, Bill Jobin, Robert Bos, Jacob Williams, Steve Lindsay, Eve Worrell (to develop a way forward for advocating EM and inter-sectoral collaborations for mosquito control).

3. Update and expand spread sheet of WHOPEs approved larvicides as source of information; Compile SOPs on how to test larvicides how to test for resistance.
   ➢ To action: TBA (Establish a database); Peter DeChant and Norbert Becker (Compile SOPs).

4. Review state of the art technology for LSM (GIS, satellite imagery, motorised application equipment, aerial application, drones).
   ➢ To action: Silas Majambere (identify and contract reviewer, Feb-May 2017); TBR (produce review, June-Dec 2017).

5. Review operational LSM in vector control programmes – evidence of impact, and what training and support needs are there.
   ➢ To action: Eve Worrell, Ruth (Identify which countries use LSM and identify research products that could increase evidence base., Jan-Jul 2017); A support letter from RBM and some finding would be desirable in order to reach out to country programmes.
   ➢ To action: Eve Worrell (consult for LSM indicators to be reported to WHO, Feb-May.
   ➢ To action: Eve Worrell (estimate financial resources, Dec 2017-Feb 2018).
   ➢ To action: TBR (develop an assessment tool to see how countries monitor impact, 2018).
   ➢ To action: TBR (review evidence of impact of current national LSM programmes, 2018).
   ➢ To action: TBR (establish a list of LSM experts, Feb-May 2016).
   ➢ To action: TBR (increase visibility of LSM work stream, Jul-Dec 2017).
   ➢ To action: TBR (establish a training platform, 2018); first prepare a letter to AMCA to request help (Jacob Williams, Feb 2017).

6. Develop guidelines for LSM in emergency situations.
   ➢ To action: Alice Cowley (needs assessment, Feb-June 2017).
To action: TBR (draft guidelines, July-Dec 2017).

**Discussion**

- It was remarked this was a good opportunity to review the WHO manuals 1 and 66. This will require linking up with engineering experts. Funding for this may be available from the BBSRC grant application if successful and from the SDC multi-sectoral fund.
- Indian manual on LSM and expertise on *Aedes* control was offered by Rajander Sharma.
- It was noted that offering lots of separate training courses can make it difficult for people to attend, so integrating LSM into existing curricula could be a good solution.
- It was suggested that a student could be contracted to write the review.
- It was commented that transport ministries have been overlooked before, but should be included in inter-sectoral cooperation.
- It was commented that better harnessing of the capacity that already exists (for example by Africa-led projects) would help develop capacity and coordinate efforts across the region.
- It was suggested that NGOs should also be approached for information on who is carrying out LSM on the ground (including the ALMA secretariat). There is an MSF meeting on 10 March 2017 in Barcelona for innovations in vector control and it would be good to get LSM on to the agenda.
- It was commented that private institutions carrying out LSM are another potential source of guidelines and data.
- It was suggested that a robust M&E framework be incorporated into revised guidelines so that some of the more observational and operational results can be incorporated into the evidence base. (Anne Wilson volunteered to lead on M&E aspect).
- It was noted that training was part of the discussion in two other work streams, so perhaps it would be appropriate for the chairs to come together and move together as a group to deal with these training needs.
- It was suggested that the lobbying for a specific budget within emergencies for vector control. Donors are often happy to fund conventional tools (LLINs and IRS), but getting donors to prioritise other activities like LSM is more difficult. A dedicated vector control budget might help the emergency response be more flexible.