Development of a
Global vector control response

Entomology and Vector Control for Malaria Elimination
Bangkok, Thailand · 7 November 2016
Global situation of vector-borne diseases
Global Malaria Programme | Department of Control of Neglected Tropical Diseases | Special Programme for Research and Training in Tropical Diseases

Geographical overlap of major vector-borne diseases

Combined global distribution of malaria, dengue, lymphatic filariasis, leishmaniasis, Japanese encephalitis, yellow fever and Chagas disease.

Today more than **80% of the world’s population is at risk** from at least one major VBD, with more than half at risk from two or more.
### Significant global burden due to vector-borne diseases

<table>
<thead>
<tr>
<th>Vector</th>
<th>Disease</th>
<th>Estimated or reported annual number of cases</th>
<th>Estimated annual number of deaths</th>
<th>Estimated annual disability-adjusted life years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosquitoes</td>
<td>Malaria&lt;sup&gt;1&lt;/sup&gt;</td>
<td>214 000 000 (149 000 000–303 000 000)</td>
<td>438 000 (236 000–635 000)</td>
<td>55 111 000</td>
</tr>
<tr>
<td></td>
<td>Dengue</td>
<td>96 000 000 (67 000 000–136 000 000)&lt;sup&gt;7&lt;/sup&gt;</td>
<td>9110 (5630–10 842)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>1 143 000 (728 000 – 1 978 000)&lt;sup&gt;2,3&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Lymphatic filariasis</td>
<td>43 850 000 (36 942 000–52 906 000)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>NA</td>
<td>2 022 000 (1 096 000–3 294 000)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Chikungunya (Americas)</td>
<td>693 000&lt;sup&gt;9&lt;/sup&gt;</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Zika virus disease (Americas)</td>
<td>500 000&lt;sup&gt;8&lt;/sup&gt;</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Yellow fever (Africa)</td>
<td>130 000 (84 000–170 000)&lt;sup&gt;6&lt;/sup&gt;</td>
<td>500* (400–600)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>31 000* (25 000–37 000)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Japanese encephalitis&lt;sup&gt;10&lt;/sup&gt;</td>
<td>42 500* (35 000–50 000)</td>
<td>9250* (3500–15 000)</td>
<td>431 552* (107 435–755 670)</td>
</tr>
<tr>
<td>Blackfly</td>
<td>Onchocerciasis</td>
<td>16 956 400 (11 478 000–26 789 000)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>NA</td>
<td>1 180 000 (557 000–1 993 000)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sandfly</td>
<td>(Muco)cutaneous leishmaniasis</td>
<td>3 915 000 (3 301 000–4 670 000)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>NA</td>
<td>42 000 (19 000–80 000)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Visceral leishmaniasis</td>
<td>114 000 (94 000–141 000)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>62 500</td>
<td>4 242 000</td>
</tr>
<tr>
<td>Triatomine bugs</td>
<td>Chagas disease</td>
<td>9 434 000 (9 241 000–9 628 000)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>10 600</td>
<td>339 000</td>
</tr>
<tr>
<td>Tick</td>
<td>Lyme borreliosis (USA)</td>
<td>85 500&lt;sup&gt;11&lt;/sup&gt;</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tsetse fly</td>
<td>Human African trypanosomiasis</td>
<td>19 700 (10 600–34 300)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>6900 (3700–10 900)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>390 000 (211 000–615 000)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
... above all, the spread of Zika, the resurgence of dengue, and the emerging threat of Chikungunya are the price being paid for a massive policy failure that dropped the ball on mosquito control in the 1970s.

Margaret Chan
DG WHO
Opening Address
69 World Health Assembly
May 2016
Impact and potential of vector control against vector-borne diseases
Major gains made against malaria through vector control

1955 - 1967
- IRS contributed to elimination of malaria from Europe and USA
- Vector control, mainly by IRS lead to significant reductions in malaria in Asia

2000 – 2015
- A cumulative 1.2 billion fewer malaria cases and 6.2 million fewer malaria deaths resulted globally between 2001 and 2015 relative to 2000.

In sub-Saharan Africa, 70% of reductions were attributed to interventions. Of this, 69% was attributed to ITNs, 21% to ACTS and 10% to IRS.
Malaria eliminated from 16 countries since 2000

eg. Sri Lanka certified as malaria-free: 5 September 2016

Timeline of malaria elimination in Sri Lanka

- 1911: First anti-malaria centre set up (Kurunegala)
- 1913: Incrimination of vector *An. culicifacies*
- 1921: Appointment of first malarialogist
- 1946: Introduction of DDT
- 1948: Malaria eradication programme launched
- 1967–1968: Resurgence of malaria leads to a national epidemic
- 1984: Introduction of λ-cyhalothrin
- 1994: Anti-Malaria Campaign decentralized
- 1997: World Bank project commenced
- 1998: RBM launched
- 2003: Global Fund support begins
- 2007: ACT introduced
- 2012: Last indigenous case
- 2016: WHO malaria-free certification

Source: Anti-Malaria Campaign, Sri Lanka Ministry of Health
Increasing evidence of impact of vector control on dengue

- The Camino Verde (Green Way) is pesticide-free evidence based community mobilization, each community choosing and implementing its own mix of dengue prevention actions based on local vector reservoirs and community resources.

- Cluster randomised controlled trial indicated positive impact on:
  - serological evidence of dengue virus infection in children
  - reported illness at all ages
  - all dengue vector control indices

= first report of serological evidence of impact of community-based interventions
Vector control as a supplemental strategy against LF

- Measures such as ITNs, IRS or personal protection help protect people from filarial infection
- Vector control is therefore recommended as a supplemental strategy to MDA to help reduce transmission
- Vector control in combination with albendazole is the recommended strategy in *Loa loa* endemic areas
- Vector control has in select settings contributed to LF elimination, even in the absence of large-scale preventive chemotherapy
Visceral leishmaniasis elimination reliant on treatment & IRS

- Interventions dependent on settings – vector control includes IRS, LLINs, environmental management & personal protection
- SEAR endemic countries have adopted single dose AmBisome strategy (WHO is providing the medicines) used in combination with IRS
- The VL elimination target of <1/10,000 incidence (at subdistrict level) has been achieved in:
  - All districts in Nepal
  - >90% of Upazilas in Bangladesh
  - 67% of Blocks in India

Visceral leishmaniasis on the sub-Indian continent, 2000-2014
In a nutshell ....

- There have been gains made against numerous VBDs
  - However, many remain highly prevalent, some are increasing in distribution and burden, and emerging and re-emerging diseases are a major concern
- History and evidence indicate that vector control can be effective against most of the major VBDs when applied at high coverage and rigorously
  - However, despite the availability of effective vector control interventions these are not adequately applied in many cases due to lack of skilled personnel and dedicated finances.
- Economic development is improving the outlook for control of vector-borne diseases
  - However, increased urbanization in tropical areas is increasing risk of VBDs, particularly *Aedes*-borne diseases
Rationale for a global vector control response
Integrated vector management (IVM)

Full uptake implementation of IVM has generally been poor due to:
1. Complexity of communicating IVM
2. Limited human capacity to advocate, plan and implement
3. Fragmented global and national architecture that restricts multi-disease approach (e.g. disease-specific strategies and financing)
4. Insufficient political buy-in for reorientation and harmonization

= GVCR will go beyond IVM, and will be **simple, practical and actionable**
Rationale for a global vector control response (1)

- Major vector-borne diseases account for an estimated 17% of the global burden of all infectious diseases, and disproportionately affect poor populations.
- These diseases impede economic development through direct medical costs and indirect costs such as loss of productivity and tourism.
- Social, demographic and environmental factors have caused increases in many vector-borne diseases in recent years, with major outbreaks of dengue, malaria, chikungunya, yellow fever and Zika virus disease since 2014.
- Most vector-borne diseases are preventable by vector control if well implemented. Strong political commitment and massive investments have led to major reductions in malaria, onchocerciasis and Chagas disease.
• The full impact of vector control has yet to be achieved owing to inadequate delivery of interventions and limited investments resulting from a dire lack of public health entomology capacity, poor coordination within and between sectors, weak or non-existent monitoring systems and few proven interventions.

• Flexible vector control delivery and monitoring systems that support approaches tailored to local contexts are urgently needed along with new tools and approaches. This will necessitate re-alignment of national programmes as well as enhanced capacity and funding.
Numerous key challenges need to be addressed

1. Lack of public health entomologists
2. Lack of financial investments
3. Limited monitoring and evaluation
4. Insufficient basic and operational research
5. Multiple locally-adapted and integrated approaches needed
6. New diseases or clinical manifestations e.g. Zika, Chikungunya, CCHF
7. Other biological threats e.g. insecticide resistance, outdoor/residual transmission
8. Rapidly increasing global population
9. Other environmental changes, including climate change
Multiple opportunities can be leveraged

1. Linkages with Sustainable Development Goals
2. Successes in malaria control
3. Existing global/regional strategies eg. malaria, dengue
4. Collateral impact of VC interventions
5. Innovative research
6. Technological advances to assist programmes
7. New VC tools, including non-insecticidal approaches
8. WHO’s improved emergency responses
Development of a global vector control response (GVCR)

Led by:

WHO Global Malaria Programme
WHO Department for Control of Neglected Tropical Diseases
Special Programme for Research and Training in Tropical Diseases
Development timeline

**Status**

Third draft (v3.1) is currently being used for online consultation (1-30 Nov 2016)

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**Steering Committee**
- Formed
- 1st meeting
- TC
- 2nd meeting
- TC
- 3rd meeting

**Drafts available**
- Zero
- First
- Second
- Third
- Final

**Consultations**
- MPAC, STAG, STAC, Regional

**Submission and review**
- Executive Board

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**World Health Assembly**
## Involved in development thus far

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead</strong></td>
<td>GMP, NTD, TDR</td>
</tr>
<tr>
<td><strong>Steering Committee</strong></td>
<td>Co-Chairs: Prof. Thomas Scott, Dr Ana Santelli Regional advisors &amp; other experts</td>
</tr>
<tr>
<td><strong>WHO regional focal points</strong></td>
<td>AFRO, EMRO, EURO, PAHO, SEARO, WPRO</td>
</tr>
<tr>
<td><strong>National programmes</strong></td>
<td>Consultation meeting Johannesburg (16 national programmes + research &amp; academia)</td>
</tr>
<tr>
<td><strong>Private sector</strong></td>
<td>GCDPP</td>
</tr>
<tr>
<td><strong>Research &amp; academia</strong></td>
<td>Pan-African Mosquito Control Association 3rd meeting, Lagos (~150 delegates of national programmes, research, academia)</td>
</tr>
</tbody>
</table>
Steering Committee

- Provide guidance on the development of the GVCS and report to the WHO secretariat on progress
- Ensure that the process is rigorous and inclusive of regional and national input
- Align the GVCS with existing strategies, particularly the goals, objectives and targets
- Potentially constitute working groups to support the development process

First meeting of GVCR Steering Committee
Geneva, August 2016
Vision: A world free of human suffering from vector-borne diseases.

Aim: Reduce the burden and threat of vector-borne diseases through effective locally-adaptive and sustainable vector control.
### Goals

<table>
<thead>
<tr>
<th>Goals</th>
<th>Milestones</th>
<th>Targets</th>
</tr>
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<tbody>
<tr>
<td>Reduce mortality due to vector-borne diseases globally compared to 2016</td>
<td>At least 30%</td>
<td>At least 75%</td>
</tr>
<tr>
<td>Prevent global epidemics of vector-borne diseases</td>
<td></td>
<td>All countries</td>
</tr>
</tbody>
</table>

- apply to all major vector-borne diseases of humans
- countries will set their own national or subnational targets
- region-specific targets may also be set
Resilient and sustainable vector control systems require:

• Enhanced capacity for vector surveillance and control within all locally relevant sectors (including human, infrastructural, and health systems);

• Expanded basic and applied research and harnessed innovation.
Pillars of action

• Strengthen inter- and intra-sectoral action and collaboration;
• Enhance entomological surveillance, and vector control monitoring and evaluation;
• Scale up and integrate tools and approaches;
• Engage and mobilize communities.
Enabling factors

• Country leadership;
• Advocacy, resource mobilization and partner coordination;
• Regulatory, policy and normative support.
Framework overview

Reduce the burden and threat of vector-borne diseases that affect humans

Effective locally-adaptive and sustainable vector control

Pillars of action

- Strengthen inter- and intra-sectoral action and collaboration
- Enhance entomological surveillance and monitoring and evaluation
- Scale up and integrate tools and approaches
- Engage and mobilize communities

Foundation

- Enhance vector control capacity

Expand basic and applied research and harness innovation
Priority activities (1-5)

- National and regional vector control strategic plans developed/adapted to align with draft global vector control response
  1. National inter-ministerial task force for multi-sectoral engagement in vector control established and functioning
  2. National vector control needs assessment conducted or updated
  3. National entomological surveillance systems strengthened and integrated with health information systems to guide vector control
  4. National targets for protection of at-risk populations with appropriate vector control aligned across vector-borne diseases
  5. National plan for effective community mobilization and sustained ownership developed
Priority activities (6-10)

6. National entomology and vector control workforce established and maintained to meet identified requirements across all relevant sectors
7. National and regional institutional networks to support training/education in public health entomology established and functioning
8. Relevant staff from Ministries of Health and/or their supporting institutions trained in public health entomology
9. National and regional registries of appropriate experts to support entomological surveillance and vector control established and up-to-date
10. National agenda for basic and applied research on entomology and vector control established and/or progress reviewed
Status

• Third draft (version 3.1) to be used in online consultation for 1 – 30 November 2016:
  • [https://extranet.who.int/dataform/814351](https://extranet.who.int/dataform/814351)

• Fourth draft to be generated and used in further consultations
  • Due to time constraints, national/regional consultations to be conducted leveraging planned meetings

• Summary to be considered by WHO Executive Board in January 2017
Concluding points

• Country leadership of prevention and control efforts is critical.
• Policies and activities should not be limited to the health sector and should always be evidence-based.
• Action within countries and between countries should be harmonized and strengthened.
• Adoption of novel tools when validated for operational use is encouraged.
• Aim is to ensure all countries can achieve success, irrespective of their current capacities and resources.
• Emphasis on integrated, community-based approaches.