Malaria and Vector Control in 2012

... and where we go from here

Michael Macdonald, Sc.D.
WHO Global Malaria Programme
Vector Control Unit
2012... and where we go from here:

- Fragile gains
- Programme advances
- Challenges, and the work of the VCWG workstreams
2012: A year of fragile gains
Malaria Burden

Between 2000 and 2010:

malaria mortality rates fell by 26% globally.

Fell by 33% in the WHO African Region

≈ 1.1 million malaria deaths were averted, primarily due to scale-up of interventions.
International Funding:

Figure 3.1 Past and projected international funding for malaria control 2000–2015
LLIN delivery

Figure 4.1 Number of ITNs delivered by manufacturers to countries in sub-Saharan Africa, 2004–2012

- Five countries* with largest cumulative number of ITNs delivered
- Other countries

ITNs supplied (millions)

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*Note: Five countries with the largest cumulative number of ITNs delivered.
LLIN ownership and use

Figure 4.2 Estimated trend in proportion of households with at least one ITN and proportion of the population sleeping under an ITN in sub-Saharan Africa, 2000–2012.

- Households owning at least one ITN
- Population sleeping under an ITN
Indoor Residual Spraying

**Figure 4.5** Proportion of population at malaria risk protected by IRS by WHO Region, 2002–2011

- Western Pacific
- Eastern Mediterranean
- South-East Asia
- Americas
- Africa

**Figure 4.6** Proportion of population at malaria risk protected by ITNs or IRS, sub-Saharan Africa, 2011

- <25%
- 25–50%
- 50–80%
- >80%
- Not applicable
- No ongoing malaria transmission

*Source: NMCP reports*
After success, and immunity wanes, an obligation to maintain gains

The First Large-Scale Use of Synthetic Insecticide for Malaria Control in Tropical Africa: Lessons from Liberia, 1945–1962

J. HISTORY OF MEDICINE AND ALLIED SCIENCES 2010

In the Shadows of Immunity
The Long Struggle Against Malaria in Tropical Africa

Kampala Conference 1950
Epidemics in Madagascar 1985
Sao Tome 1986
Sudan 1990

James L.A. Webb Jr.
Department of History,
Colby College, USA
Scaling up diagnostic testing, treatment and surveillance

**Test.**
Every suspected malaria case should be tested.

**Treat.**
Every confirmed case should be treated with a quality-assured antimalarial medicine.

**Track.**
Every malaria case should be tracked in a surveillance system.
Improved Surveillance

Launched in Namibia by WHO Director-General on World Malaria Day – 24 April 2012
Integrated Community Case Management (iCCM)

- Diseases: malaria, pneumonia, diarrhea
- Tools: RDTs, timers, ACTs, antibiotics, zinc, ORS
- Workers: different cadres in different countries

UN Child Mortality Report 2010
Elimination: helping countries cross the finish line

Elimination case studies
• 10 case studies being produced jointly with Global Health Group
• Four launched in October 2012: Cape Verde, Mauritius, Sri Lanka, Turkmenistan
• To help NMCPs and other partners considering malaria elimination better understand process and risks
Technical resources for entomological monitoring and vector control
New Vector Control Guides

Entomology techniques

IVM

Resistance

Complex Emergencies
New Operational Guides

**LLINs**

*Continuous Long-lasting Insecticidal Net Distributions: A Guide to Concepts and Planning*

**IRS**

*Indoor Residual Spraying*

An operational manual for Indoor Residual Spraying (IRS) for malaria transmission control and elimination

**LSM**

*Operational Manual, under development, 2013*

*Interim Position Statement*

The role of larviciding for malaria control in sub-Saharan Africa
Malaria Policy Advisory Committee

Strategy

MPAC → Standing TEG on Vector Control

WHO DG → WHO COs

WHO GMP Secretariat → MoH and NMCPs

WHO ROs → RBM: Secretariat, WGs and SRNs

Tools

VCAG (with NTD)
Challenges to Maintaining Gains

Insecticide Resistance

Maintaining coverage in constrained financial times
- Framework for continuous distribution
- LLIN durability
- Improved resource allocation, including targeting for IRS and LLINs and LSM

Outdoor transmission (Artemisinin Resistance)

Entomological Capacity
convene, coordinate, communicate
Insecticide resistance identified in 64 countries to date, in most countries to pyrethroids

Areas of particular concern are Sub-Saharan Africa and India due to reports of widespread resistance and high rates of malaria transmission

Countries with ongoing malaria transmission and resistance to at least one insecticide

Countries with ongoing malaria transmission and no reports of insecticide resistance

From WHO regional entomologists in WHO Regional Offices, completed by literature review by the Global Malaria Programme.

1. Includes countries with confirmed susceptibility to all insecticides used and countries where susceptibility testing is not currently conducted or results are not available.
2. The map provides no indication of how widespread resistance is within a country; therefore, a single report of resistance would be sufficient to mark a country as having resistance.
GPIRM – Official Launch 15 May 2012

Overall goal of the GPIRM: maintain the effectiveness of malaria vector control
GPIRM strategy

Short-term (~3 years)
Preserve susceptibility and slow the spread of resistance on the basis of current knowledge, and reinforce monitoring capability and activities.

Medium-term (3–10 years)
Improve understanding of IR and tools to manage it, and adapt strategy for sustainable vector control accordingly.

Long-term (≥10 years)
Use innovative approaches for sustainable vector control at global scale.

Five pillars of strategy

I. Plan and implement insecticide resistance management strategies in malaria-endemic countries.

II. Ensure proper, timely entomological and resistance monitoring and effective data management.

III. Develop new, innovative vector control tools.

IV. Fill gaps in knowledge on mechanisms of insecticide resistance and the impact of current insecticide resistance management approaches.

V. Ensure that enabling mechanisms (advocacy, human and financial resources) are in place.
Managing insecticide resistance is shared responsibility between all stakeholders

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<th>Designing IRM strategies</th>
<th>Implementation</th>
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- ✓ Primary role
- ✓ Secondary role: support
Challenges to Maintaining Gains

Insecticide Resistance

**Maintaining coverage in constrained financial times**
- Framework for continuous distribution
- LLIN durability
- Improved resource allocation, incl. targeting for IRS and LLINs

outdoor transmission (Artemisinin Resistance)

Entomological Capacity
Integrated Vector Management:

A rational decision-making process for optimal use of resources for vector control

• Advocacy, social mobilization and legislation
• Cross sector collaboration
• Integrated approach
• Evidence-based decision-making
• Capacity-building
Optimizing access to LLINs

Technical support tools:

- NetCalc
- Guide for LLIN keep up
- Best Practices:
  - Vouchers
  - Logistics
  - Partnerships
  - Supply and Supervision
  - Strategies
- Consensus Statement on Continuous Distribution

Vector Control Working Group (VCWG)

Continuous LLIN Distribution Systems Work Stream

Leaders: Dr. Jayne Webster, LSHTM, UK
         Mr. Kojo Lokko, Johns Hopkins University Center for Communication Programs, USA

Working Group Secretariat: Dr. Konstantina Boutsika (Swiss TPH)
Monitoring LLIN Durability in the field

Activities:

• Laboratory predictors of field performance

• Protocols for field monitoring

• Inventory of prospective trials in >12 countries
Resource Allocation

IVM: a rational decision-making process for optimal use of resources for vector control
Revision of 1993 PEEM Guidelines

“The key objective of these guidelines is to provide health planners and managers of vector control programmes with a tool to generate a sound economic justification for vector control measures and to allow them to participate effectively in the intersectoral development dialogue.”
WHO Position statement “The role of larviciding for malaria control in sub-Saharan Africa”

- used only as a supplement to the core interventions (ITNs or IRS); larviciding; never as a substitute in areas with significant malaria risk.
- Larviciding is most likely to be cost-effective in urban areas, where “few, fixed, findable” breeding sites are more likely to be present.
- In rural settings, larviciding is not recommended unless there are particular circumstances limiting the breeding sites, as well as evidence confirming that such measures can reduce the malaria incidence rate in the local setting.
Targeting Resources: Lao PDR

Courtesy: D. Gopinath
Challenges to Maintaining Gains

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Entomological Capacity
Artemisinin Resistance: “Day 3 Positive”

WHO 2010

from 2010 report
new data
Global Plan for Artemisinin Resistance Containment (GPARC): January 2011

1. Stop the spread of resistant parasites
2. Increase monitoring & surveillance to evaluate the AR threat
3. Improve access to diagnostic s & rational treatment with ACTs
4. Invest in artemisinin resistance-related research
5. Motivate action and mobilize resources

Contain or eliminate artemisinin resistance where it already exists
Prevent artemisinin resistance where it has not yet appeared

Supplement LLINs: Outdoor Transmission
Challenges to Maintaining Gains

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- Advocacy, social mobilization and legislation
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- Evidence-based decision-making
- Capacity-building
Need for increased entomological capacity

For every complex problem, there is an answer that is clear, simple and wrong

- H.L. Menchen
Building capacity for entomology and vector control:

Directory of IVM institutions

Africa Network for Vector Resistance
IVM Capacity for entomological monitoring and vector control

**Identification**

<table>
<thead>
<tr>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
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<td>An. quadriannulatus</td>
<td>An. merus/melas</td>
<td>An. gambiae</td>
<td>An. arabiensis</td>
<td>1kb ladder</td>
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**PCR Identification**

- Lane 1: An. quadriannulatus
- Lane 2: An. merus/melas
- Lane 3: An. gambiae
- Lane 4: An. arabiensis
- Lane 5: 1kb ladder
IVM Capacity for entomological monitoring and vector control

Susceptibility Assays

Ace-1 resistance PCR-RFLP. Lane 1, 1kb ladder, lanes 2-4 An. gambiae homozygous for ace-1 resistance mutation, lane 5 homozygous An. arabiensis negative for the ace-1 mutation

oxidase enzyme bioassay with elevated enzyme levels indicated by the darker colors

East African PCR. Lane 1, 1kb ladder, 2, resistant, 3, susceptible, and 4, heterozygous
VCWG: Meeting the challenges

- Insecticide Resistance
- Maintaining coverage in constrained financial times
- Outdoor transmission
- Entomological Capacity
Summary of Day 1

• WHO & VCWG
  • Advocacy & Harmonisation
  • New WHO Structures

• AMP – Country Support

• Budget for VCWG ‘to be supported by Partners’
  • Potential for commercial bias...
  • New mechanism – publish agenda and invite pooled funds?

• Innovation Process
  • New WHO Structures

• Evidence
  • Proof of Principle
  • Generalizing from trials to other areas: Scope, role
Summary of Day 1

- Published Documents – still circulate?
- Nets – what if not enough for UC for all?
  - Depends on mass effect?

From intervention to impact: modelling the potential mortality impact achievable by different long-lasting, insecticide-treated net delivery strategies

Lucy C Okell, Lucy Smith Paintain, Jayne Webster, Kara Hanson and Jo Lines.
Summary:

*Success over past decade, but we in the vector control community need to...*

- Respond to resistance
- Enable programs to optimize resources and cost efficiencies
- Build next generation of public health entomologists and vector control professionals