Malaria Vector Monitoring in the Asia Pacific Region: How are we doing?

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Vector Surveillance Matters:

- Vectors are not static: Effective interventions leads to
  - Changes in vector distributions
  - Physiologic resistance to insecticides
  - Behavioural resistance to interventions
- Rapid Response to outbreaks depends on strong routine surveillance
- Where and when vector control can be withdrawn after elimination depends on receptivity
- Effective vector control targets vector vulnerabilities
Vector Surveillance Survey

With the support of the Bill and Melinda Gates Foundation, we are undertaking an evaluation of malaria vector surveillance in countries attempting malaria elimination in the E8, Greater Asia-Pacific Subregion and MesoAmerica. The overall objective is to establish a process to improve malaria vector surveillance, as we believe that good surveillance will maintain and improve the effectiveness of malaria vector control strategies. The process of improving vector surveillance encompasses several components. The following questionnaire which we are asking you to complete addresses the first component: to determine what surveillance activities are routinely (within the last year) carried out in the countries in which you work (if you are involved in malaria control in more than one country, please fill out a separate form for each country). This component includes a gap analysis of program capacity (including training) for vector surveillance as well as a data gap analyses to determine what vector parameters are being monitored, how they are measured and how the resulting vector information informs programmatic decisions. In the second component we will examine the capabilities of our surveillance tools (e.g., can the tools available provide the information that you require for effective decision-making or is there a technology gap). This analysis will be used to develop Target Product Profiles (TPPs) describing the requirements of future surveillance tools to improve how we monitor vectors.
Countries Completing the Vector Surveillance Survey

Africa: Angola, Burkina Faso, Cabo Verde, Ethiopia, Gabon, The Gambia, Liberia, Sierra Leone, Madagascar, Mozambique, Tanzania, Rwanda, South Sudan, Sudan, South Africa, Zambia, Zimbabwe (n=17)
Asia-Pacific: Bangladesh, Bhutan, Cambodia, China, Indonesia, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Thailand, Vietnam (n=14)
Americas Guatemala, Haiti, Honduras. (n=3)

* Surveys completed by NMCPs or CDC-PMI entomologists

Vector Control Used
91% - LLINs
31% - IRS
41% - LSM
The main objectives of entomological surveillance are to:

- Characterize receptivity to guide stratification and selection of interventions.
- Track the relative density of malaria vector species to **determine the seasonality of transmission and the optimal timing of interventions**.
- Track insecticide resistance for **choosing insecticide formulations**
- Identify other threats to the **effectiveness of vector control**.
- Monitor vector control intervention coverage and quality to **identify gaps and opportunities**.

**Surveillance for programmatic vector control decision-making**
- Characterize receptivity to guide stratification and selection of interventions. Potential malaria transmission within a country

**Vector Distribution**

- Africa: 7 countries
- Americas: 2 countries
- Asia-Pacific: 4 countries

**Vector Identification Methods**

- Africa: 10 countries
  - Molecular (32%)
  - Morphology

- Americas: 5 countries
  - Unknown
  - Provincial
  - Subdistrict
  - Villages: 38% in AP
  - Blank

- Asia-Pacific: 6 countries
  - Unknown
  - Provincial
  - Subdistrict
  - Villages
  - District.
  - Blank
• Track the relative density of malaria vector species to determine the seasonality of transmission and the optimal timing of interventions.

Vector densities: measured yearly  **56%**

Annual Seasonality Determined  **33%**
• Track insecticide resistance for choosing insecticide formulations

**Insecticide Resistance Tested Annually**

Adults 76% (28/33)  
Larvae 0% (0/14)
• Identify other threats to the effectiveness of vector control.
Summary of Vector Surveillance Activities

- Monitoring IR (frequency) [76%]
- Measuring species densities
- Identifying larval habitats
- Monitoring resistance mechanism
- Measuring peak biting time
- Measuring sporozoite rates
- Assessing exo-, endophagy
- Identifying vector species
- Measuring seasonality
- Determining anthropophily
### Summary of Vector Surveillance Activities

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**Graph:**
- The red bars represent the highest activities, with Monitoring IR (frequency) at 76% and Monitoring resistance mechanism at 41%.
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*Note: The activity 'Monitoring IR (frequency)' is the most commonly performed task, making up 56% of the surveillance activities.*
Determining anthropophily
Measuring seasonality
Identifying vector species
Assessing exo-, endophagy
Measuring sporozoite rates
Measuring peak biting time
Measuring species densities
Identifying larval habitats
Monitoring resistance mechanism
Monitoring IR (frequency)
Determining anthropophily

Summary of Vector Surveillance Activities

- Monitoring IR (frequency): 80%
- Measuring species densities: 60%
- Identifying larval habitats: 50%
- Monitoring resistance mechanism: 40%
- Measuring peak biting time: 40%
- Measuring sporozoite rates: 30%
- Assessing exo-, endophagy: 30%
- Identifying vector species: 32%
- Measuring seasonality: 20%
- Determining anthropophily: 10%
Weaknesses in malaria vector surveillance

- **Capacity**
  - Africa: 15
  - Americas: 5
  - Asia-Pacific: 10

- **Strategic plan**
  - Africa: 2
  - Americas: 1
  - Asia-Pacific: 2

- **Techniques**
  - Africa: 3
  - Americas: 2
  - Asia-Pacific: 5

Number of Countries

0 5 10 15 20 25 30
Weaknesses in Malaria Vector Surveillance

- **Coverage**
  - Africa
  - Americas
  - Asia-Pacific
- **Training**
  - Africa
  - Americas
  - Asia-Pacific
- **Manpower**
  - Africa
  - Americas
  - Asia-Pacific
- **Funding**
  - Africa
  - Americas
  - Asia-Pacific
- **Logistics**
  - Africa
  - Americas
  - Asia-Pacific
- **Resources**
  - Africa
  - Americas
  - Asia-Pacific
- **Infrastructure**
  - Africa
  - Americas
  - Asia-Pacific
- **Not prioritized**
  - Africa
  - Americas
  - Asia-Pacific
- **Guides**
  - Africa
  - Americas
  - Asia-Pacific
- **Data management**
  - Africa
  - Americas
  - Asia-Pacific
- **Data collection**
  - Africa
  - Americas
  - Asia-Pacific

**Capacity**

**Strategic Plans**

**Techniques**

Number of Countries
Methods used to measure adult vector densities

- Human landing catches outdoors
- Human landing catches indoors
- Indoor resting collections
- Pyrethrum spray catches
- CDC light trap outdoors
- CDC light trap indoors
- Outdoor resting collections
- Animal odor baited traps
- Other
- CO2 baited trap
- Window exit traps
- Human baited traps

Number of Countries

Africa
Americas
Asia-Pacific
Summary

• Surveillance data for 34 countries
  • Data was strongest for insecticide resistance
  • The need for surveillance will
    • increase as the number of interventions increases.
    • continue after elimination achieved in receptive areas
• The most common self-identified limitation - capacity

Surveillance data must be linked to programmatic decision-making
Acknowledgements

National Malaria Control Programs

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Angola, Haiti, Liberia, Sierra Leone, Madagascar, Mozambique, Tanzania, Zimbabwe

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