

Entomological Surveillance – Indicators for LNs

Amazon Malaria Initiative (AMI)

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- ☐ Relevance of entomological surveillance
- ☐ Why we need to incorporate entomological impact indicators?
- ☐ Surveillance approach

Vector control should guide by:

- Apply methods that are **cost-effective** (cost & impact under programme settings)
- Must have systems to **deliver** such tools/interventions
 - Technical – capacity to plan & implement
 - Human
 - Physical infrastructures
- **M&E** – from planning to impact assessment

Which Tools for Vector Control?

- In epidemiological terms a good tool
 - Must be able to reduce transmission to the lowest level i.e. impact on vectorial capacity

An important vector will make sure that:

- It bites humans frequently – if had a choice (**HBI**)
- Lives longer – increasing it's chance to transmit (**Parous rates**, ovarian dilatations)
- It is susceptible to the parasites - **sporogony**
- Ability to reproduce in large numbers - **density**

Based on these assumptions

Expect that LNs impact on:

- ☐ Biting rates
- ☐ Survivorship
- ☐ Sporogony
- ☐ Densities



> Vector
Exposure to
control
intervention



Heterogeneity of vector population biting
behavior

Let us look at these factors in detail

- **Biting rates – a^2**
 - Indoors/outdoors
 - Biting humans or other sources
 - Biting peaks indoors/outdoors
- **Survivorship – n^8**
 - Parous rates – dissections to determine whether laid eggs before or not
 - Age grading – number of ovarian coils – X times laid eggs
- **Density – m**
 - Numbers/person/night
 - Numbers/sleeping room/night
- **Sporogony – n^8**
 - Proportion with sporozoites – salivary dissections, PCR/ELISA
 - Entomological Innoculation Rate (EIR) – numbers/person/night x sporozoite rate

Where do you draw the line ...

- In an ideal world ... collect all indicators – process to impact – including entomological – biting, resting, densities, survivorship etc.
- But given the reality – let program concentrate on impact/coverage
 - **Coverage indicators**
 - **Entomological impact indicators**

Goal of Entomological Surveillance

Tool to sustained efficacy of vector control measures and provide basis for measuring their effectiveness

- Guide planning, implementation and evaluation
- No universal surveillance system
- Tailored according to malaria risk and resources available

Entomological Surveillance will aim to:

- ❑ Identify the vector population
- ❑ Guide optimal time and place to implement VC
- ❑ Detect behavior changes that would limit the efficacy of VC
- ❑ Monitor the entomological impact of VC
- ❑ Detect development of insecticide resistance and modes of action

Indicators

- ❑ Presence of malaria vectors and species
- ❑ Vector spatial and seasonal distribution
- ❑ Vector relative abundance
- ❑ Outdoor/indoor feeding behaviour
- ❑ Parous rates
- ❑ Insecticide susceptibility

Timing of Collection

		Indicators	ITN ¹ or IRS ²	Transmission season (Months)	
Moderate to low transmission	Entomological	Presence of vectors	● *	●	●
		Vector distribution and seasonality	● *	●	●
		Indoor/outdoor feeding	● *	●	●
		Relative abundance	● *	●	●
		Parity	● *	●	●
		Insecticide susceptibility	● *		
	Operational	ITN coverage	● *	●	
		ITN insecticide levels	● *	●	
		ITN physical durability/longevity	● *	●	
		IRS coverage	● *	●	
		Residual effect of IRS	● *	●	●
		Dosage and quality of insecticide	● *	●	

Surveillance approach

- Sentinel surveillance
- Baseline before intervention is implemented
- Indicators change from baseline
 - Data link to ongoing cases surveillance
 - Further investigation
 - Example: insecticide resistance is emerging
 - LNs physical and chemical barrier

Example:

- Impact of resistance on applied control tools (LNs):
- Depend on: mechanism conferring resistance
- Behavioral resistance
- LNs act at the same time as a physical and chemical barrier.

Experimental Hut Traps

Assess operational consequences of IR

Efficacy of LNs:

☐ Deterrence

☐ Blood feeding inhibition

☐ Induced exophily

☐ Mortality



Conclusions

Cost-effective

- It is always important to institute a M&E system when implementing vector control
- Stick to indicators that can be achieved by the control programme