

Decentralized Entomological Surveillance : Community-based Approach

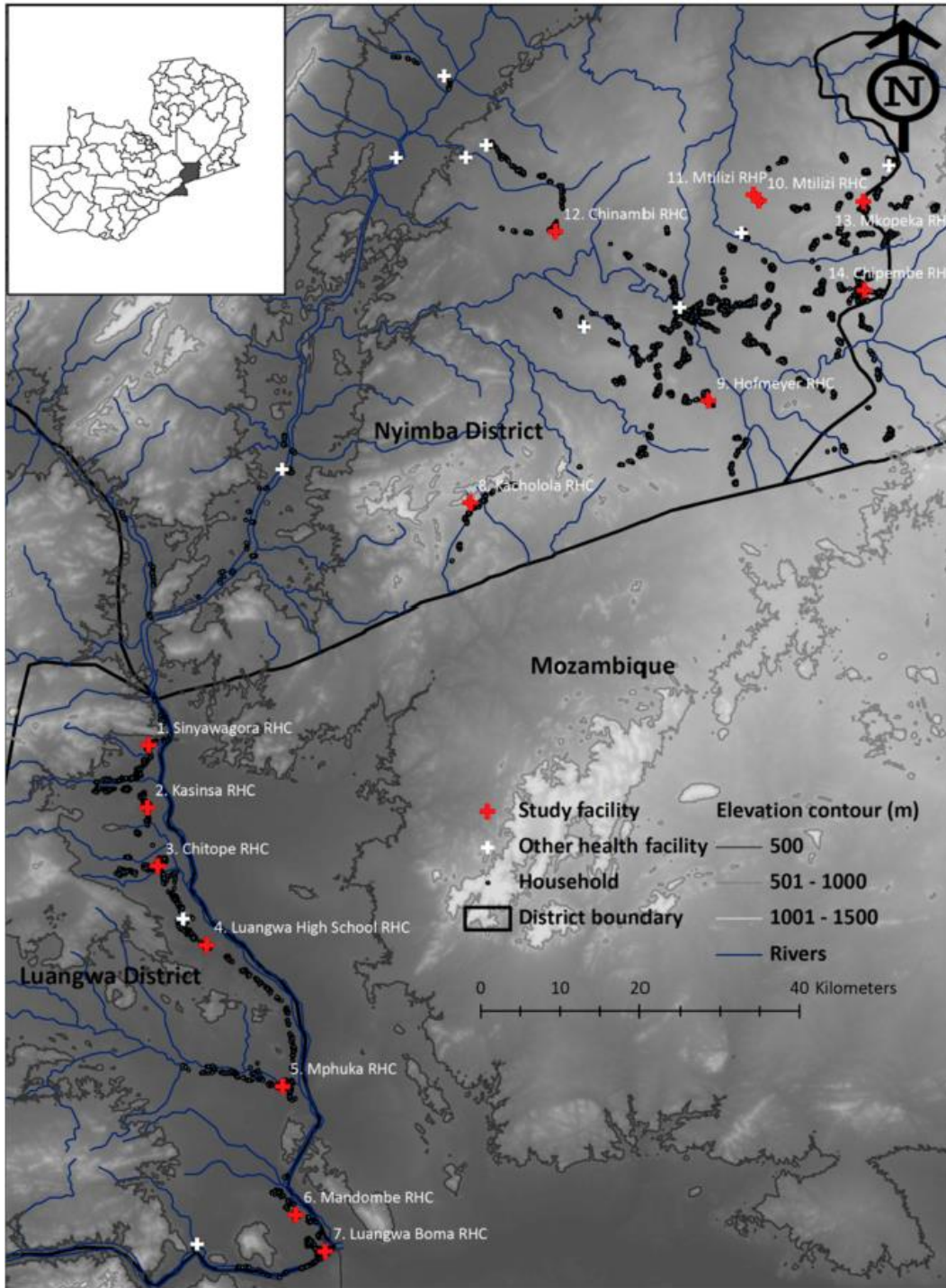
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Background

- Monitoring mosquito population dynamics to guide selection and evaluation of malaria vector control interventions
- Typically implemented by highly qualified, centrally-based experts
- *Piloted district based surveillance in 18 sentinel sites*
- Limitations in costs, timely visitations and frequency of implementation
- Community-based (CB) mosquito trapping schemes could complement efforts

Approach /Methodology

- A longitudinal Community – Based (CB) surveillance scheme
 - Monthly sampling and reporting cycle
 - Centers for Disease Control and Prevention light traps (LT) and Ifakara Tent Traps (ITT),
 - Trained Community health workers (CHW) within health facilities
- CHWs were trained
 - Basic operation of traps,
 - Basic sampling procedures
 - Morphological identification of mosquitoes
 - Storage, labelling and data entry in simplified form
- Quality assurance (QA) by central team to evaluate accuracy
 - Used Human Landing Catches (HLC), LTs and ITT
- Cost implication of the CB surveillance scheme
- Epidemiological relevance of CB through active surveillance of malaria parasite



Nyimba
(85K pop)

Luangwa
25K (pop)

Nyimba/Luangwa : 14 clusters, 1000/cluster

3 CHWs/cluster

CHW #1 CHW #2 CHW #3

60 HH ea

45 HH

15 HH

Epidemiological Survey (CHWs)

Entomological Survey (CHWs)

Active: Monthly finger stick blood samples

Passive → RDT +ve → treated (~20% were positive)

Entomological training
- use of trap (CDC-LT, ITT)
- Sort mosquitoes by eye (Genus)
- Storage (silica) / Dessication
- Simple recording (Anopheles/Culex)

Collections
- 1 night/month (299 HH) (1900-0700)
- Collection night was set per house
- Indoor LT (at foot of sleeping space)
- outdoor ITT (5m)

Monthly collection by NMCP team

- Morphological / molecular identification
- ELISA

Luangwa: January 2011 – April 2013
Nyimba: April 2011 – April 2013

Table 2: Crude estimates of the costs per sampling scheme per trap-night and per *Anopheles funestus* caught for the three months when community-based sampling was validated with quality assured sampling schemes

Estimated parameter	Units	Quality assured			Community-based	
		QA-HLC	QA-LT	QA-ITT	CB-LT	CB-ITT
Number of samples	Person-night	40	20	20	249	243
Numbers Caught	Number of <i>An. funestus</i>	526	41	32	637	156
Mean Caught	Number of <i>An. funestus</i> per person-night	13.2	2.1	1.6	2.6	0.6
Personal costs ^a	\$(ZMW)	2,180(11,401.4)	1,520(7,949.6)	1,076(5,627.5)	2509.4(13,124.2)	2,939.4(15,373.1)
<i>Per diem</i> costs ^b	\$(ZMW)	414(2,165.2)	1,243(6,500.9)	1,243(6,500.9)	621(3,247.8)	621(3,247.8)
Trap depreciation costs	\$(ZMW)	0(0)	87.5(457.6)	125(653.8)	87.5(457.6)	125(653.8)
Transport costs ^a	\$(ZMW)	225(1,176.8)	225(1,176.8)	225(1,176.8)	0(0)	0(0)
Vehicle maintenance costs ^c	\$(ZMW)	212(1,108.8)	211(1,108.8)	212(1,108.8)	71(371.3)	71(371.3)
Vehicle depreciation cost ^d	\$(ZMW)	2,500(13,075)	2,500(13,075)	2,500(13,075)	0(0)	0(0)
Bicycle repair costs ^c	\$(ZMW)	0(0)	0(0)	0(0)	94(491.6)	611(3,195.5)
Bicycle depreciation costs ^d	\$(ZMW)	0(0)	0(0)	0(0)	5(26.2)	5(26.2)
Total expenditure	\$(ZMW)	5,531(28,927.1)	5,788(30,268.6)	5,381(28,142.6)	3,388(17,718.7)	4,372(22,867.7)
Cost per person-night of sampling	\$(ZMW)	138.3(723.2)	289.4(1,513.4)	269.1(1,407.1)	13.6(71.2)	18.0(94.1)
Cost per specimen of <i>An. funestus</i> caught	\$(ZMW)	10.5(55)	141.2(738.3)	168.2(879.5)	5.3(27.8)	28.0(146.6)

^a Cost estimates were based on the approximated time and efforts spent on each trapping method

^b Assumptions made on the salaries paid and *per diem* to the central level teams during their visits

^c Estimated cost incurred for maintaining the equipment for transporting or visiting the trapping schemes per location

^d Monthly depreciation costs calculated when both trapping schemes were operational for three months

\$ - US dollar

ZWK - Zambian Kwacha

Note: 1\$ ≈ ZMK 5.23 which was the average exchange during the midpoint year of 2012

Quality Assurance

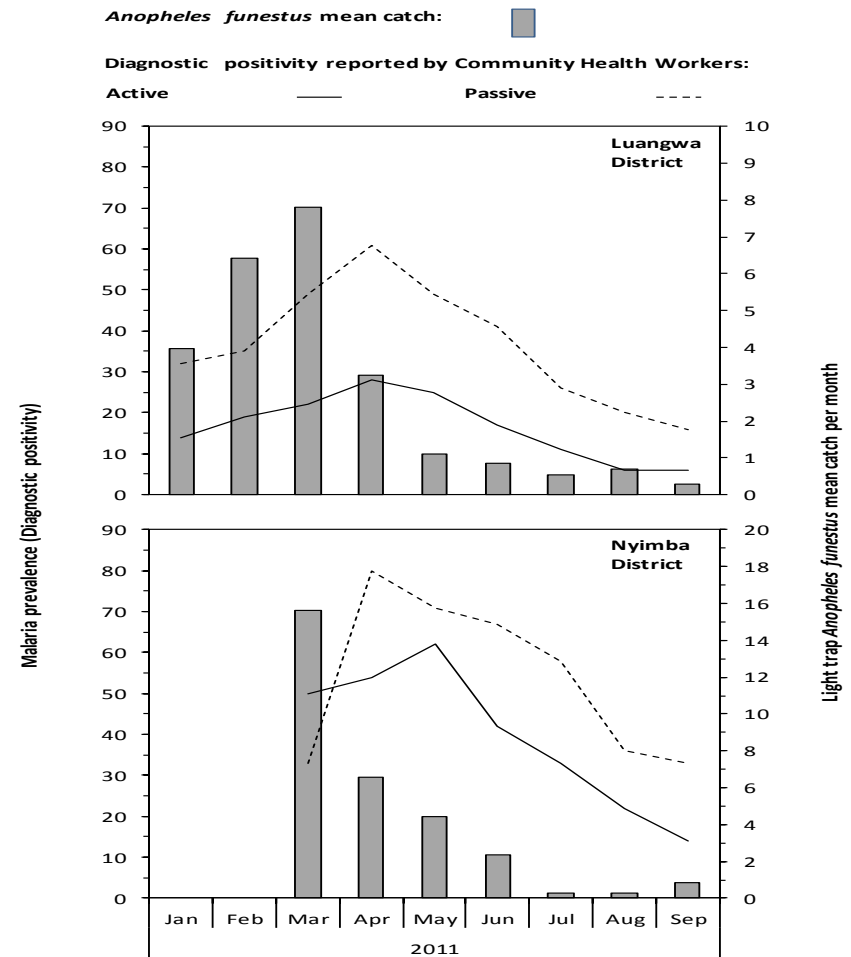
- ITT / CDC-LT / HLC (in /out)
- Experienced CHWs (Chisobe, Luangwa)
- Same HH visited 2 days earlier
 - Day 1: House 1: in/out HLC ; House 2: ITT/CDC-LT
 - Day 2: House 2: in/out HLC ; House 1: ITT/CDC-LT
- All clusters (but 1)
- Feb-April 2013 (last 3 months of study)

Challenges

- Training of CHWs required
 - CHWs conducted less catches when there were fewer mosquitoes (value of 0)
 - Re-training may be needed
- Communication (illness / reliability / resignation)
- Lower CB efficacy in trapping mosquitoes
 - QA needed to validate accuracy and identify limitations (quantify) – prerequisite to interpretations

Concluding Points

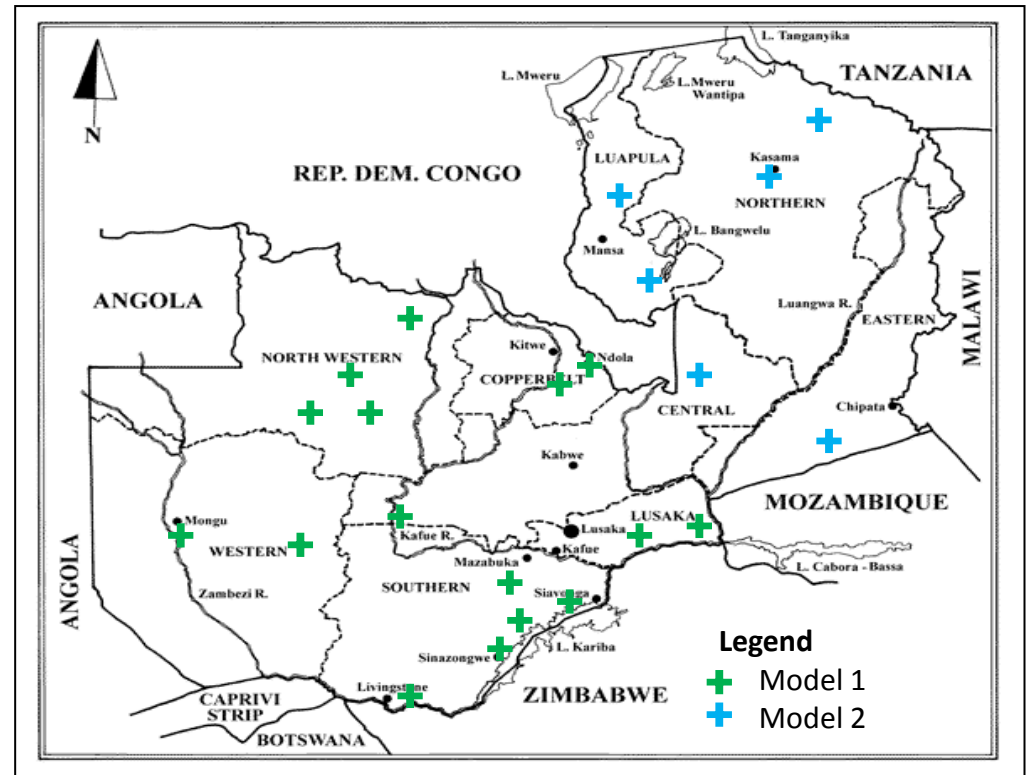
- Community engagement & ownership
- Practical and cost effective for routine entomological surveillance
- Higher frequency , captures temporal trends with far greater resolution
- Epidemiologically relevant
- *The QA validation exercise was short (three months)*
- *None continuous, none randomized*
- *Evaluation and Constant refresher trainings*



Temporal variations of *Anopheles funestus* mean catches by light traps and the malaria diagnostic positivity among human residents from January to September 2011 in 2 districts

Different models with different assumptions

- Different approaches adopted in sentinel sites
 - Communities engaged differently
 - Partnership and resource consideration
- Central level - Oversight, Insecticide resistance, molecular analysis and quality assurance strengthening
- Optimization to national level scales for sustainability



Model 1: CHWs limited to trap placement, health facility (district) level overseer & enter all data

Model 2: CHWs trap placement, initial data entry health facility (district) level verify

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A cost-effective, community-based, mosquito trapping scheme that captures spatial and temporal heterogeneities of malaria transmission in rural Zambia

Discussion

Thank you!