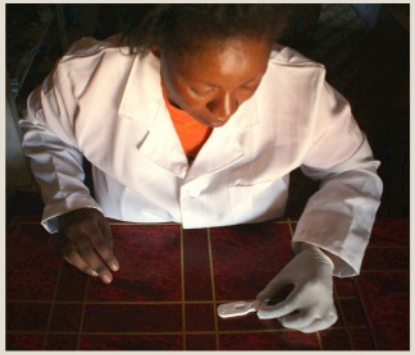
malaria consortium
disease control, better health
10th ANNIVERSARY
a decade in communicable disease control and child health

Addressing vector control challenges in our region

Dr Jeffrey Hii

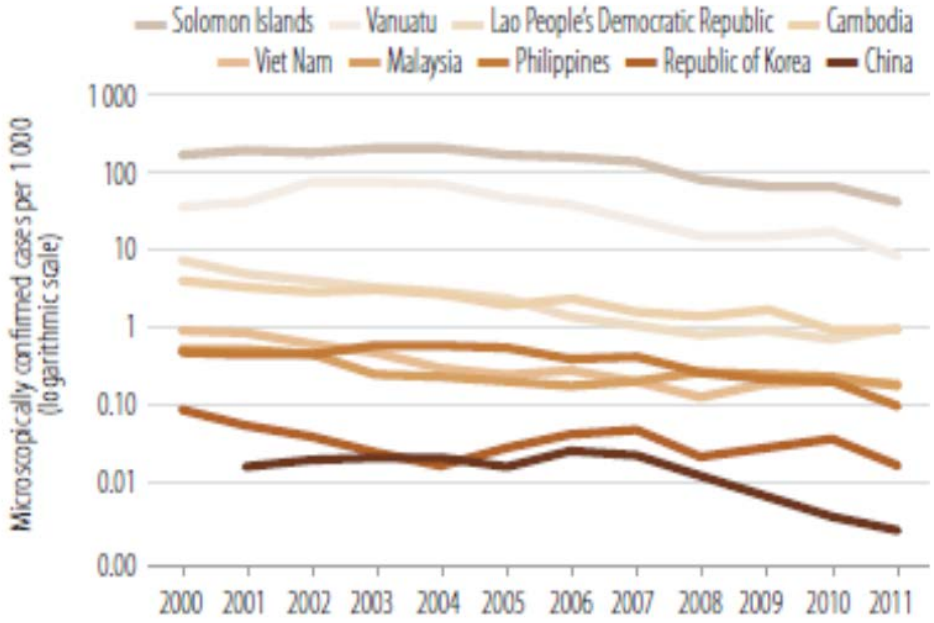
25 March 2014

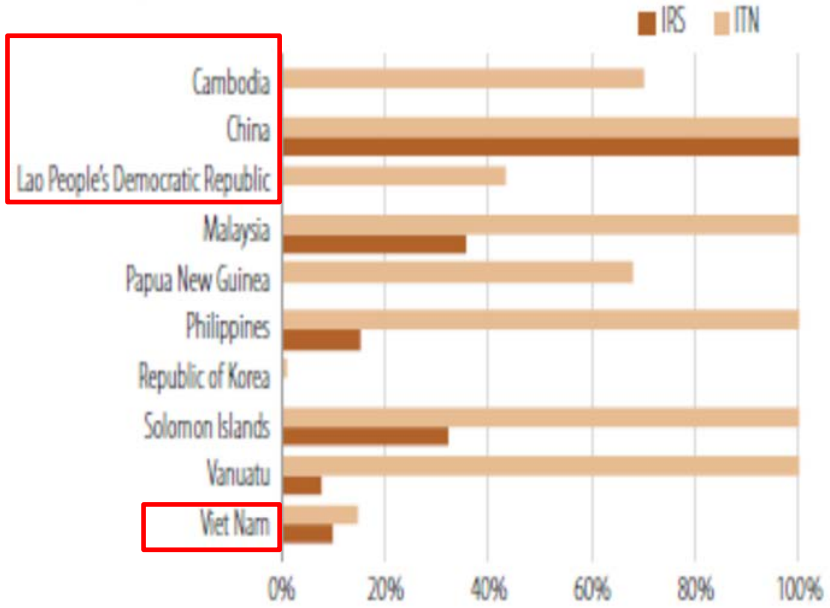
PREVENTION | DIAGNOSIS | TREATMENT | RESEARCH

Trends in malaria incidence (WMR 2012)

G – Countries projected to achieve ≥75% decrease in case incidence by 2015



I – Percentage of high risk population protected with IRS and ITNs, 2011

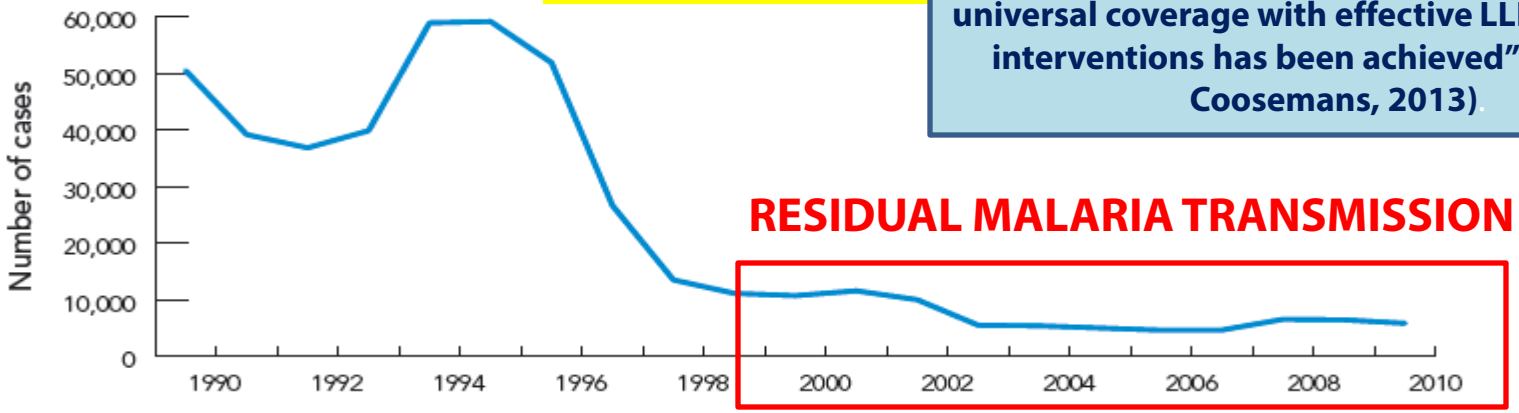


Factors: universal coverage **of LLLIN**, access to EDAT**, IRS**, surveillance, community mobilization, BCC, political support

Feb 2013: ERAR US$100 m, vector control investment ?

Malaysia

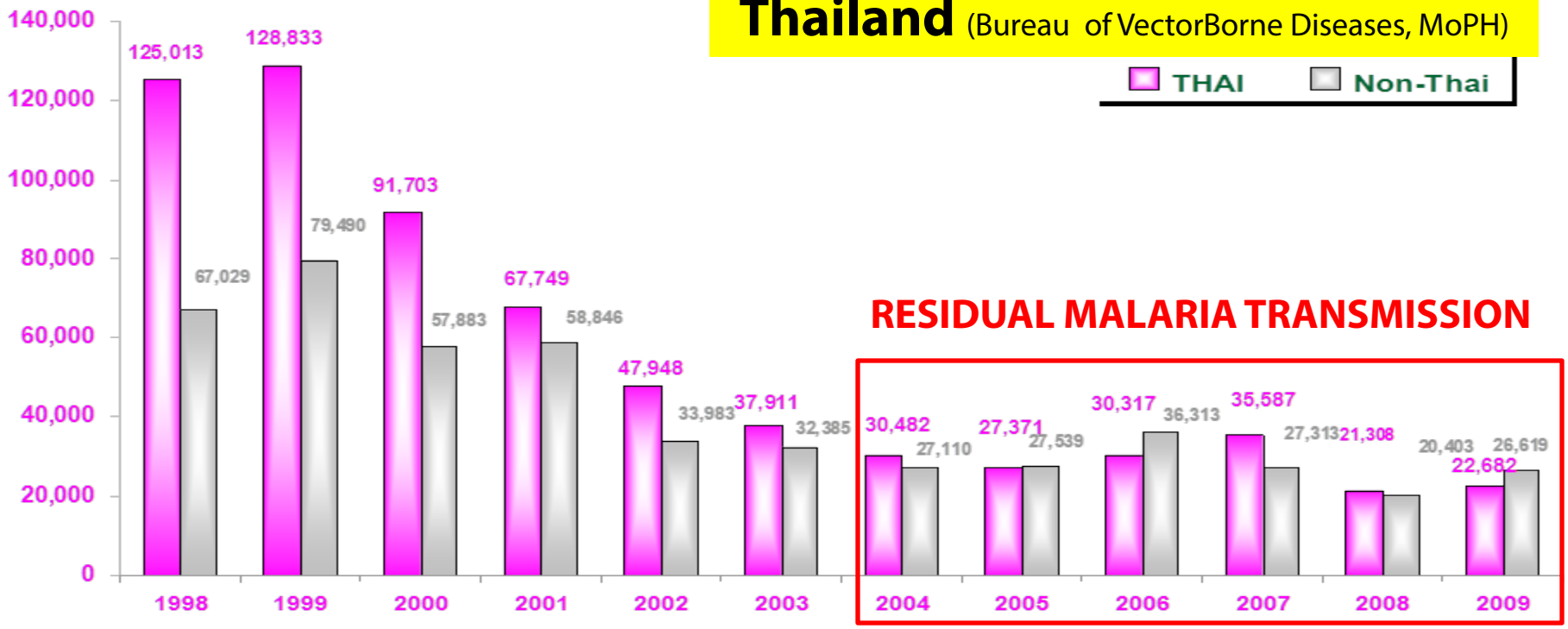
"All forms of transmission that persists after full universal coverage with effective LLIN and/or IRS interventions has been achieved" (Durnez & Coosemans, 2013).



After an initial increase in cases from 1992–1995, there has been a steady decline of malaria, possibly due insecticide-treated bed net use and community health volunteers, as well as increased laboratory diagnostic capability.

Source: World Health Organization, World Malaria Report 2011

Thailand (Bureau of VectorBorne Diseases, MoPH)



Malaria vector control strategies, GMS

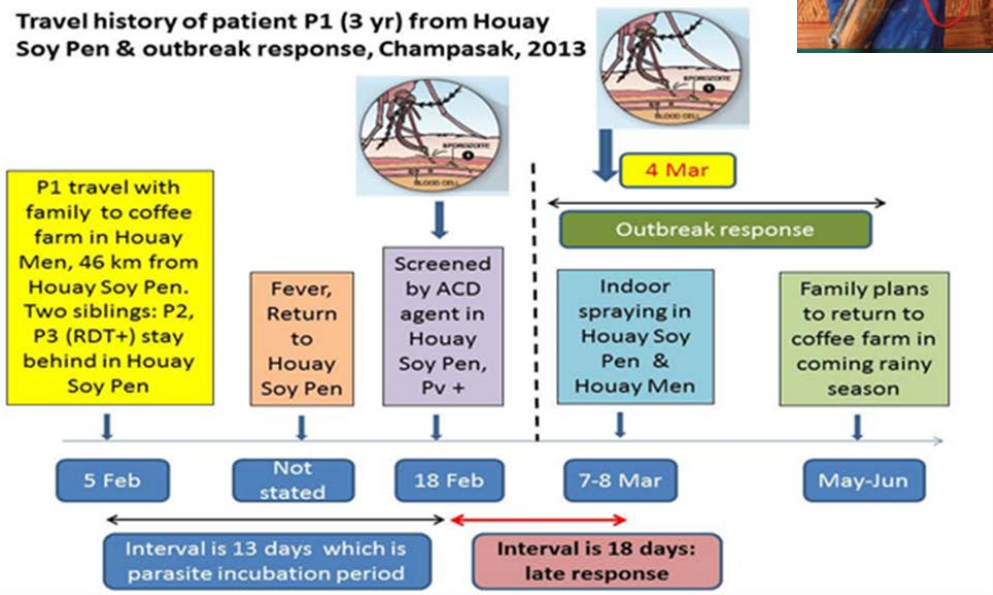
[LLIN: free distribution through campaigns to all age groups]

	Country	Malaria vector	Adult vector control strategies	Larval control
1	Cambodia	*A. minimus, A. dirus, A. maculatus, A. sundaicus*	LLINs, LLIH, IRS	
2	China	*A. minimus, A. dirus, A. lesteri, A. sinensis*	IRS, LLINs + ITNs	
3	Lao PDR	*A. minimus, A. dirus, A. maculatus, A. jeyporiensis*	IRS, LLINs + repellents	
4	Myanmar	*A. minimus, A. dirus, A. sundaicus, A annularis*	IRS, LLINs + ITNs	larvivorous fish is being observed
5	Thailand	*A. minimus, A. maculatus, A. dirus, A. sundaicus, A. campestris, A.. philippinensis*	IRS, LLINs + ITNs, repellents	larvivorous fish is being observed
6	Viet Nam	*A. minimus, A. dirus, A. sundaicus*	LLINs + ITNs, IRS, repellen	larvivorous fish is being observed, BTI
7	Malaysia	*A. maculatus, A. sundaicus, A. balabacensis, A. flavirostris, A. cracens A. latens*	IRS, ITNs	Environmental management

World Malaria Report, 2011; Vythilingam et al 2006; 2008; Hii & Rueda 2013

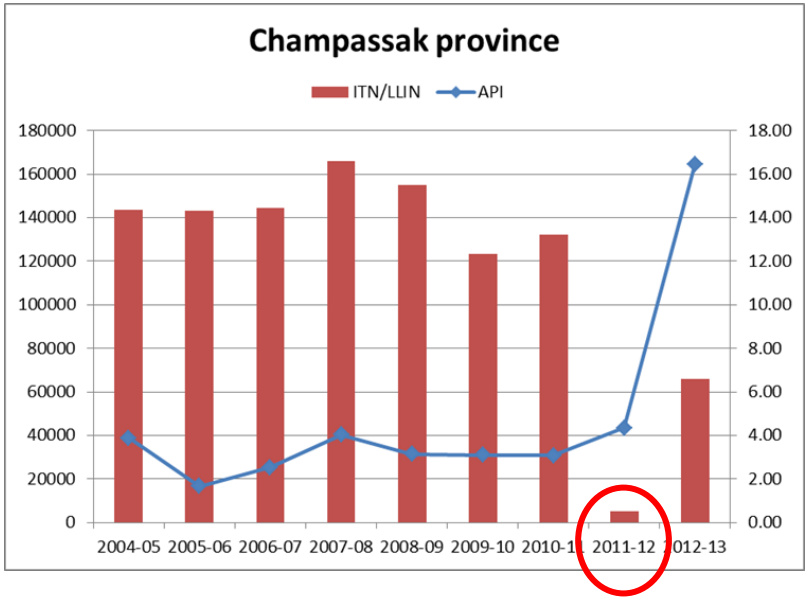
Issues with responsive focal spraying

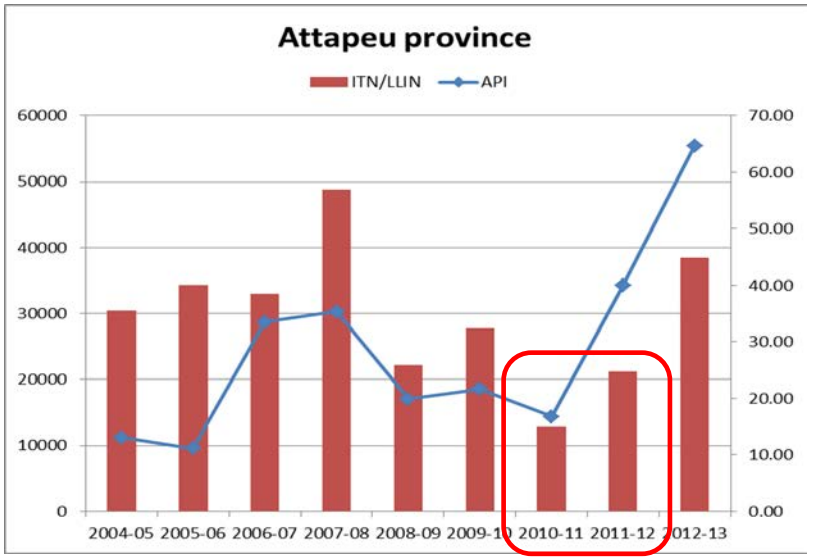
- Outbreaks or ‘transmission foci’
- Limited focal spraying
- Sub-optimal technical capacity
- Open house construction
- Development projects



Prioritising ITN/LLIN coverage in conditions of scarcity

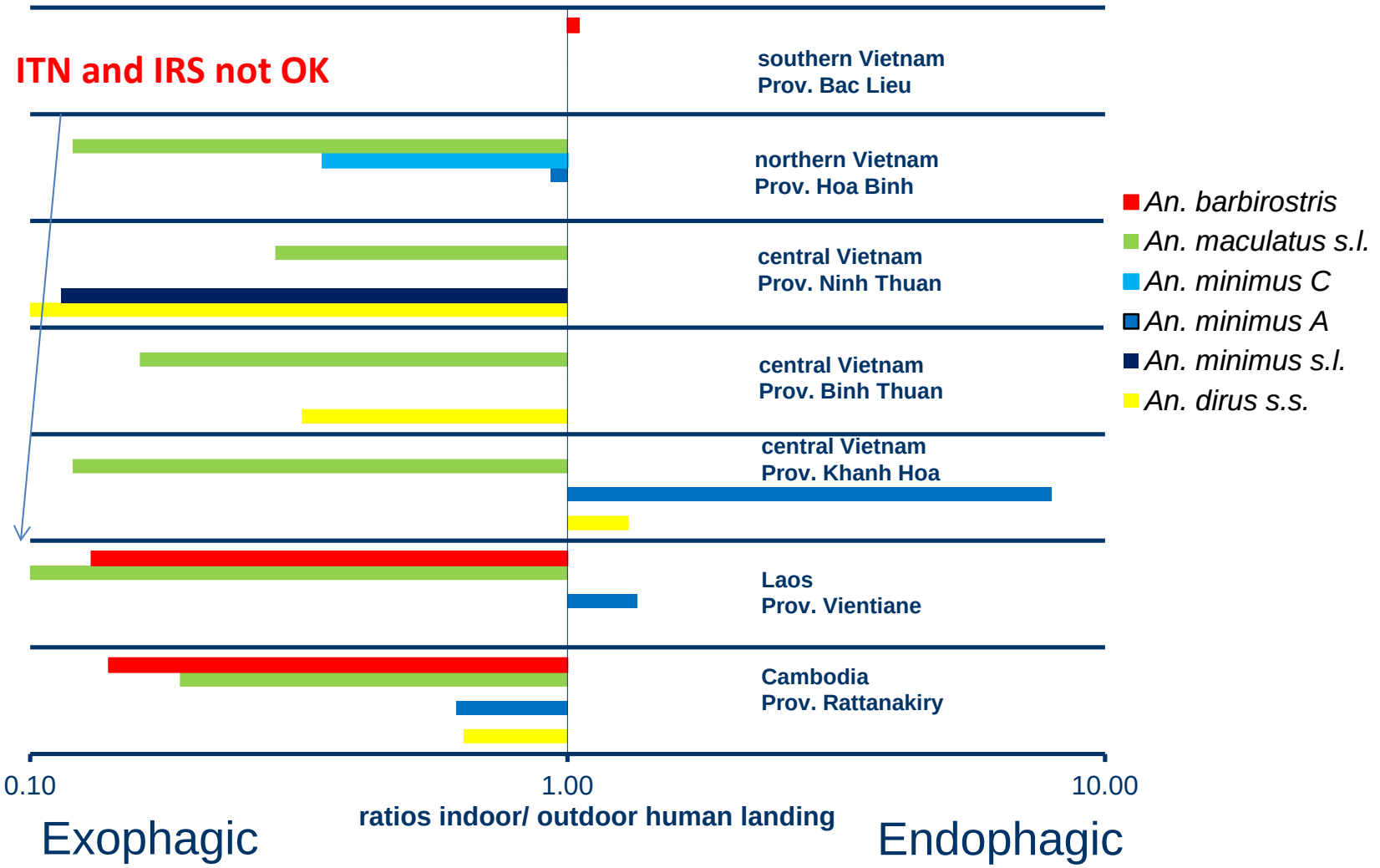
MPR 2013, CMPE, MOH





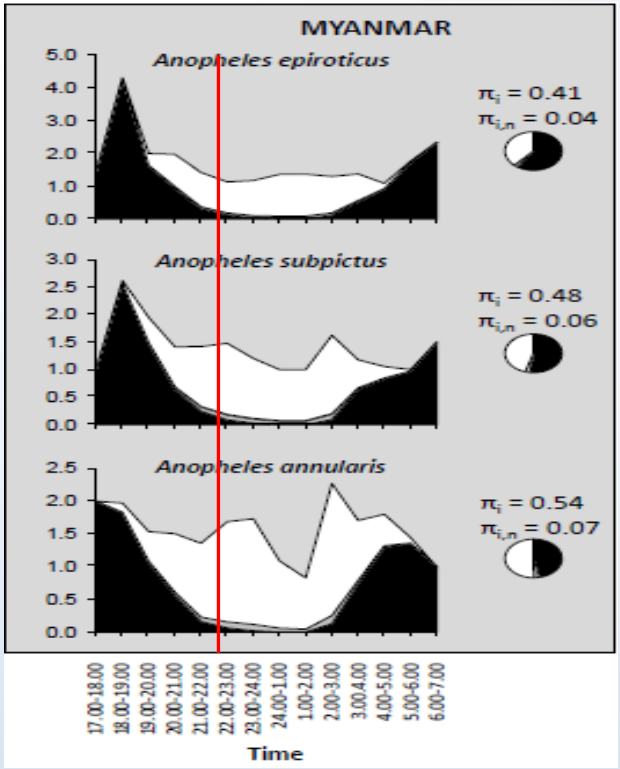
1. Insufficient LLINs & gaps in coverage → major epidemics
2. Fill the funding gap (MOH, donor agencies)
3. Interim strategy for damage limitation
4. Stratification tool

Outdoor biting in Greater Mekong Subregion

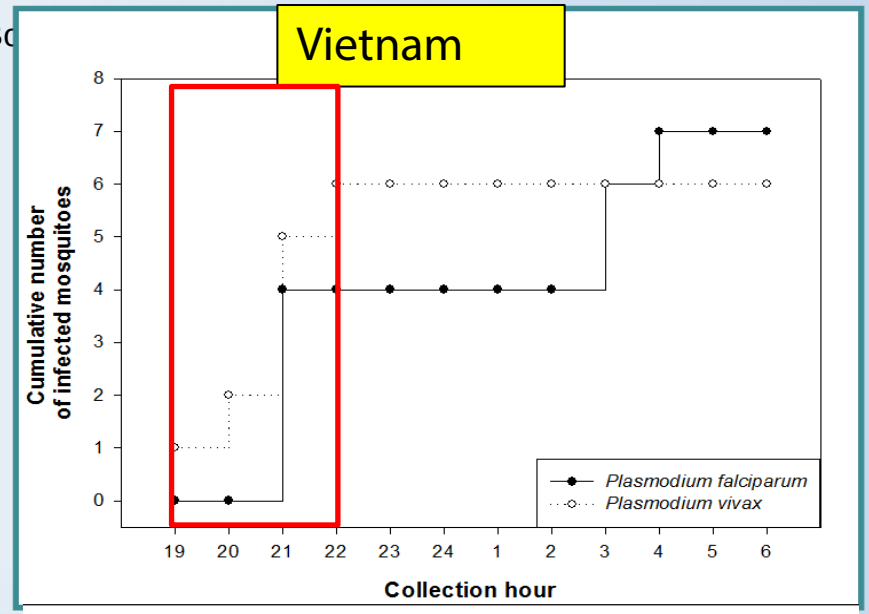


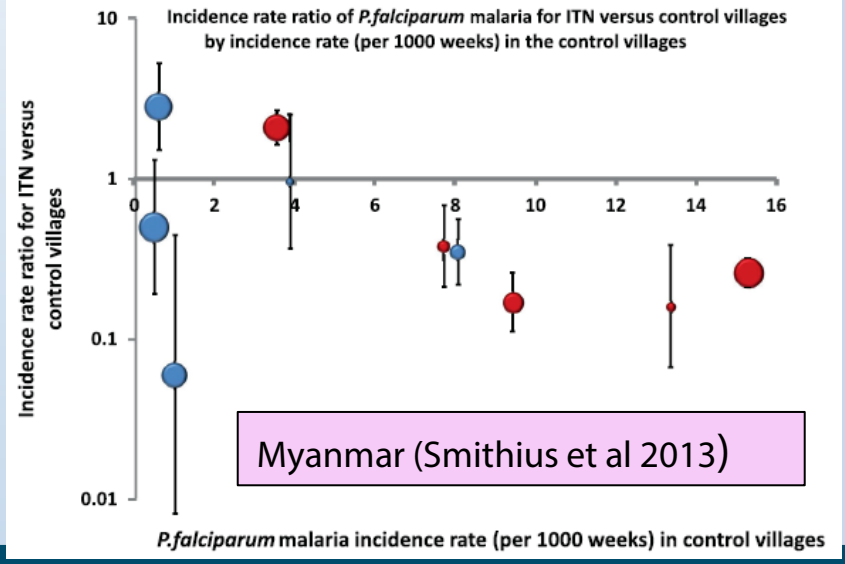
Trung et al, 2005 Trop Med Int Hlth, 10, 251-62; Coosemans & Van Bortel , 2006 Royal Academy of Overseas Sciences, pp. 551-569

Context: Early biting and transmission



Van Bo

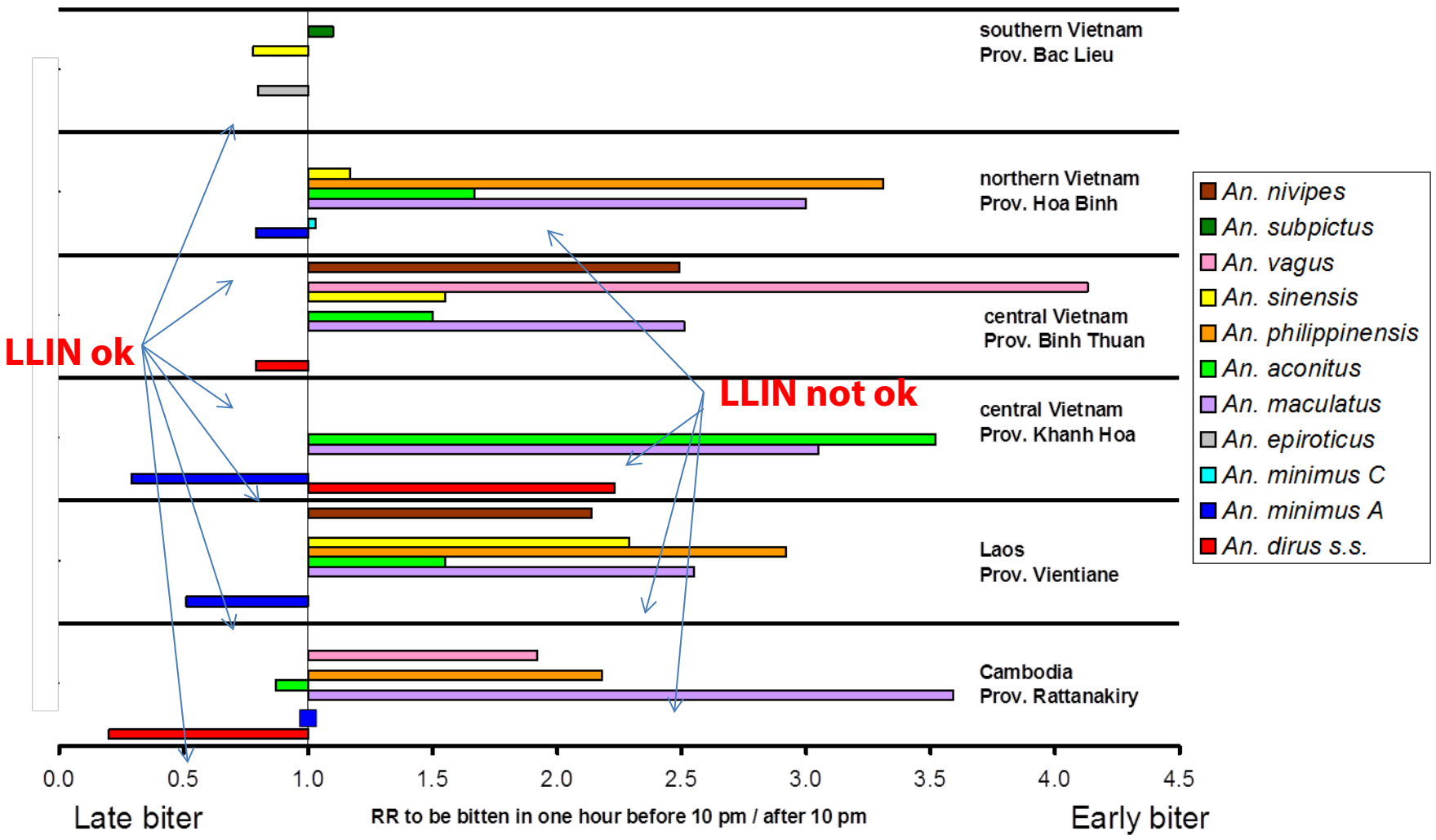




⇒ **60% of the vectors bite before sleeping time**

⇒ **All infective bites occur before 22h and after 4h (Van Bortel et al 2010)**

Early biting in Greater Mekong Subregion



Coosemans & van Bortel 2006; Royal Academy of Oversea Sciences, 551-569

Need for paradigms: the gaps (Durnez & Coosemans, 2013

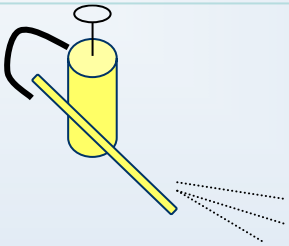
6 PM

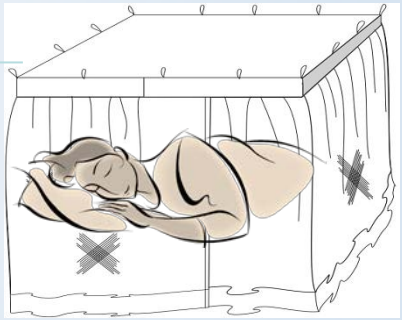
6 AM

10 PM

6 AM

GAP





GAP

LNs/IRS

6 PM

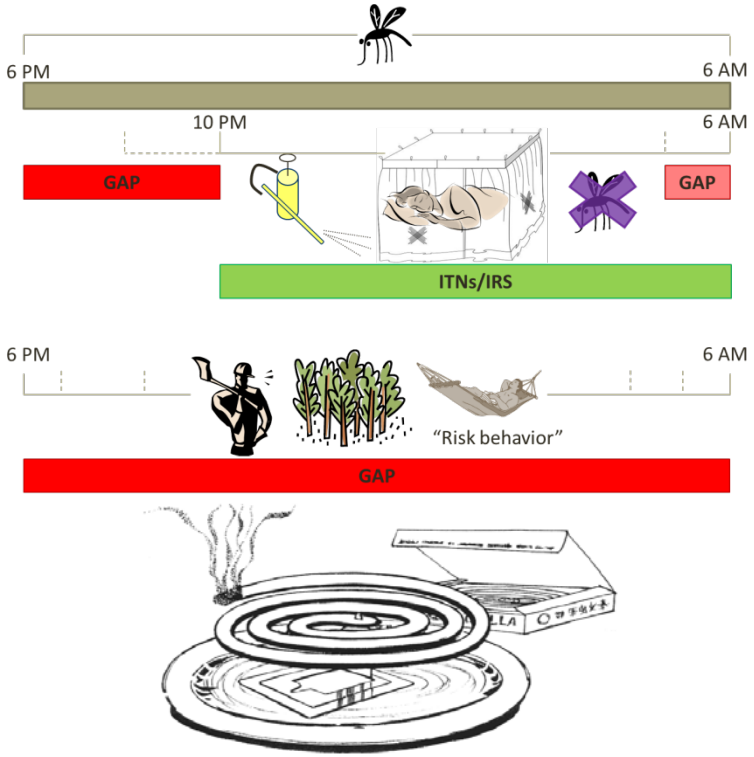
6 AM

"Risk behaviour"

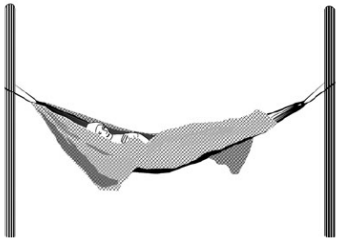
GAP

Due to scaling up of vector control, the GAP is increasing!

CLOSING THE GAP…



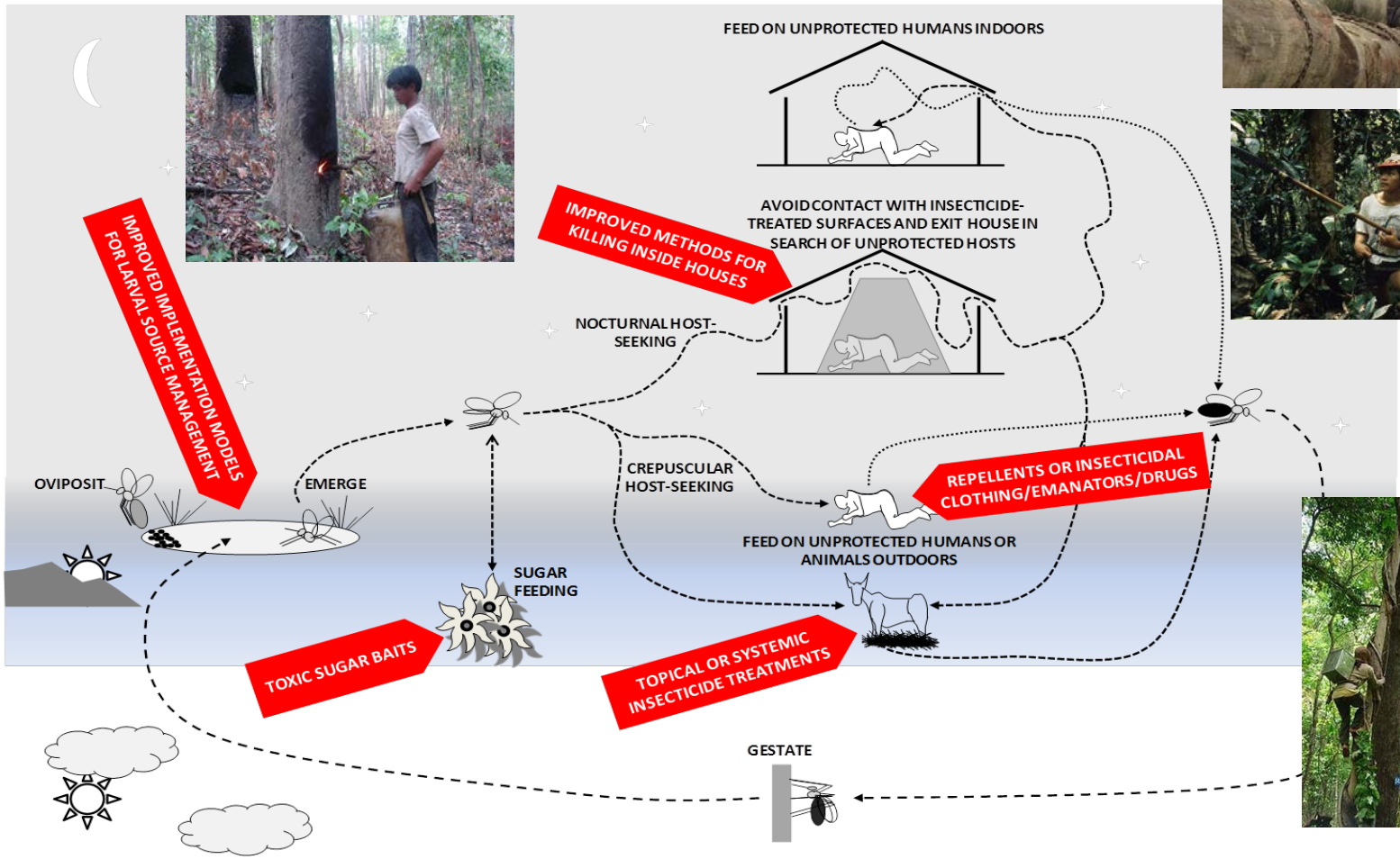
Shafique & Hii, 2013



Sochantha et al, 2010

ADDITIONAL TOOLS ARE REQUIRED FOR ADRESSING RESIDUAL MALARIA TRANSMISSION…

Transmission ecology (Killeen, 2014)



- Vector mapping: identification and stratification of malaria risk areas
- ASEAN legislation free movement of labour, 2015 → Most At Risk Locations (MARLs)

OPEN ACCESS Freely available online

PLOS ONE

Can Topical Insect Repellents Reduce Malaria? A Cluster-Randomised Controlled Trial of the Insect Repellent *N,N*-diethyl-*m*-toluamide (DEET) in Lao PDR

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Saysana Phanalasy[3], Steven W. Lindsay[1,4]**

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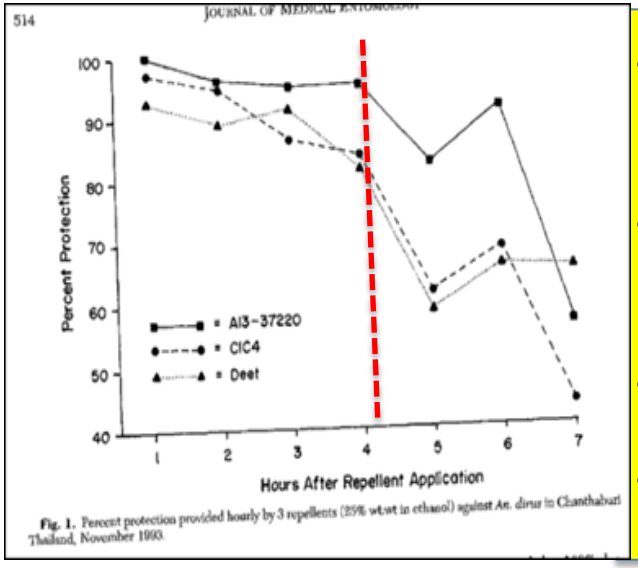


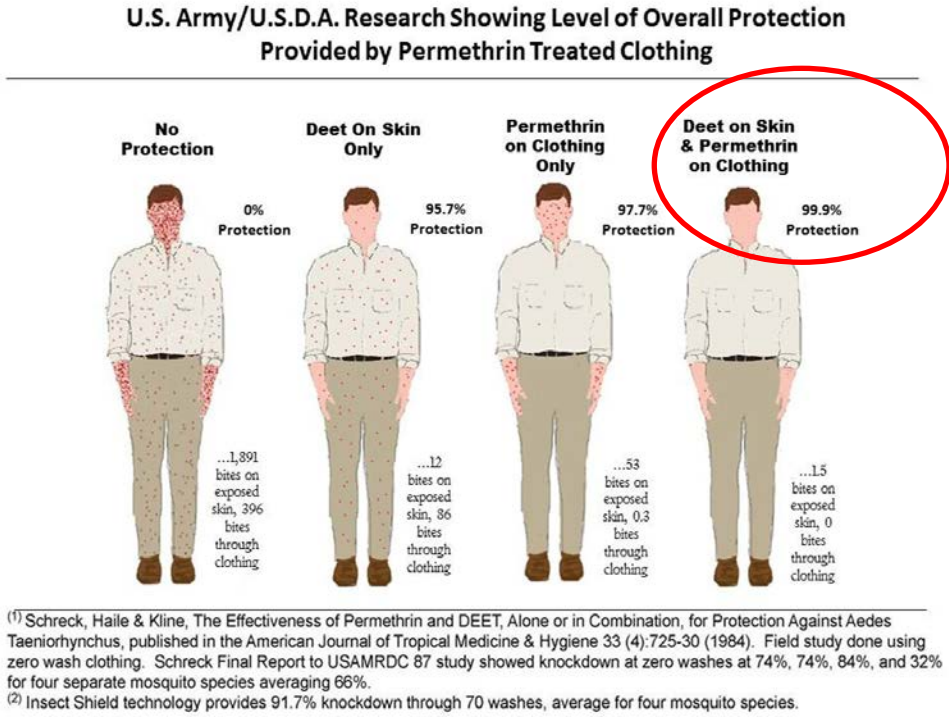
Fig. 1. Percent protection provided hourly by 3 repellents (25% wt:wt in ethanol) against An. dirus in Chanthaburi Thailand, November 1990.

- No effect on malaria incidence (Hazard ratio: 1.00; 95% CI: 0.99-1.01, p=0.868)
- Half of 1,597 households randomised to control (no DEET) and 15% Deet group
- Compliance was 48 to 60%
- No data on user preference and acceptability

Evidence today: Long lasting insecticidal hammocks efficacy, limited data on coverage, uptake & use

A. **Efficacy against mosquito bites** in Cambodia (Sochantha et al. 2010)

Reduction in bites:
An. dirus: 46.3%
An. minimus: 45.5%



(1) Schreck, Haile & Kline, The Effectiveness of Permethrin and DEET, Alone or in Combination, for Protection Against Aedes Taeniorhynchus, published in the American Journal of Tropical Medicine & Hygiene 33 (4):725-30 (1984). Field study done using zero wash clothing. Schreck Final Report to USAMRDC 87 study showed knockdown at zero washes at 74%, 74%, 84%, and 32% for four separate mosquito species averaging 66%.
(2) Insect Shield technology provides 91.7% knockdown through 70 washes, average for four mosquito species.

B. **Randomised community based trial**

of LLIHN in VN: Thang et al. 2009

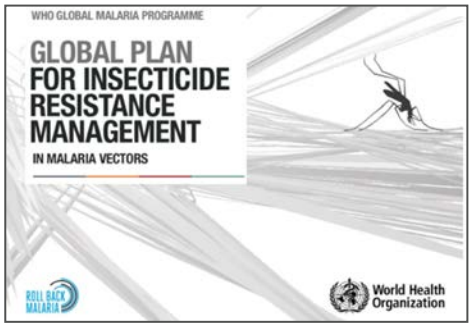
- malaria infection: 1.6 fold reduction
- incidence: 2 fold reduction

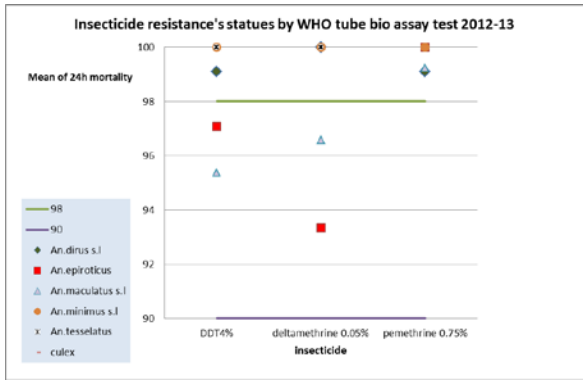
C. **Cost-effectveness of LLIN/LLIHNs, durability?**

D. **User acceptability and preference of hammocks and insecticide treated clothing?**

Monitoring insecticide resistance in GMS

- IRM Network
- Site selection: 1 site per 500,000 LLIN (GPIRM); TES sites?
- CDC bottle assays or WHO susceptibility test kits
- Procurement issues
- Collaboration with dengue programme

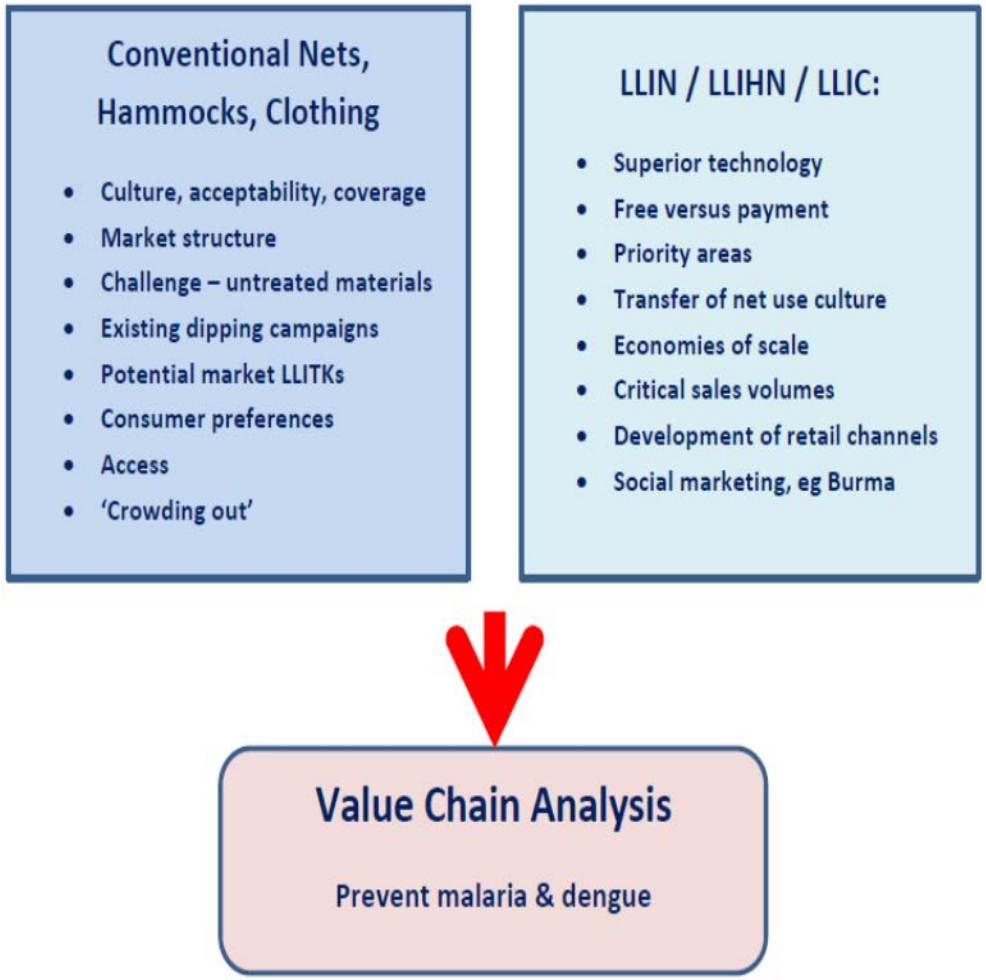




Sochanta 2013

Malaria Consortium: way forward to address challenges

1. Conduct operational research studies for deployment of new methods to address challenge of outdoor transmission
2. Private sector engagement
3. Lessons learned from malaria control to help meet the rising challenge of dengue



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Thank you

PREVENTION

DIAGNOSIS

TREATMENT

RESEARCH