Background

Cross-border population movement = potential threat to achieving elimination of malaria

➔ Borders frequented by migrant and mobile populations, vulnerable to infection

➔ BUT hard to target for surveillance and malaria interventions

➔ Need to identify asymptomatic infection

Aim: The purpose of this study is to provide real insights into how cross-border surveillance can be adapted and better targeted to the difficult to reach populations and, accordingly, whether it should be continued and scaled up further

Study sites:

⬤ **Phsar Prom (Thai border)**

◆ **Trapaing Kreal (Lao border)**

◆ **O'yadao (Vietnam border)**

Screening period:

August 2013 to February 2014

O'yadao, RTK

Trapaing Kreal, ST

Phsar Prom, PLN

- Temperature
- Malaria RDT
- DBS for PCR
- Interview
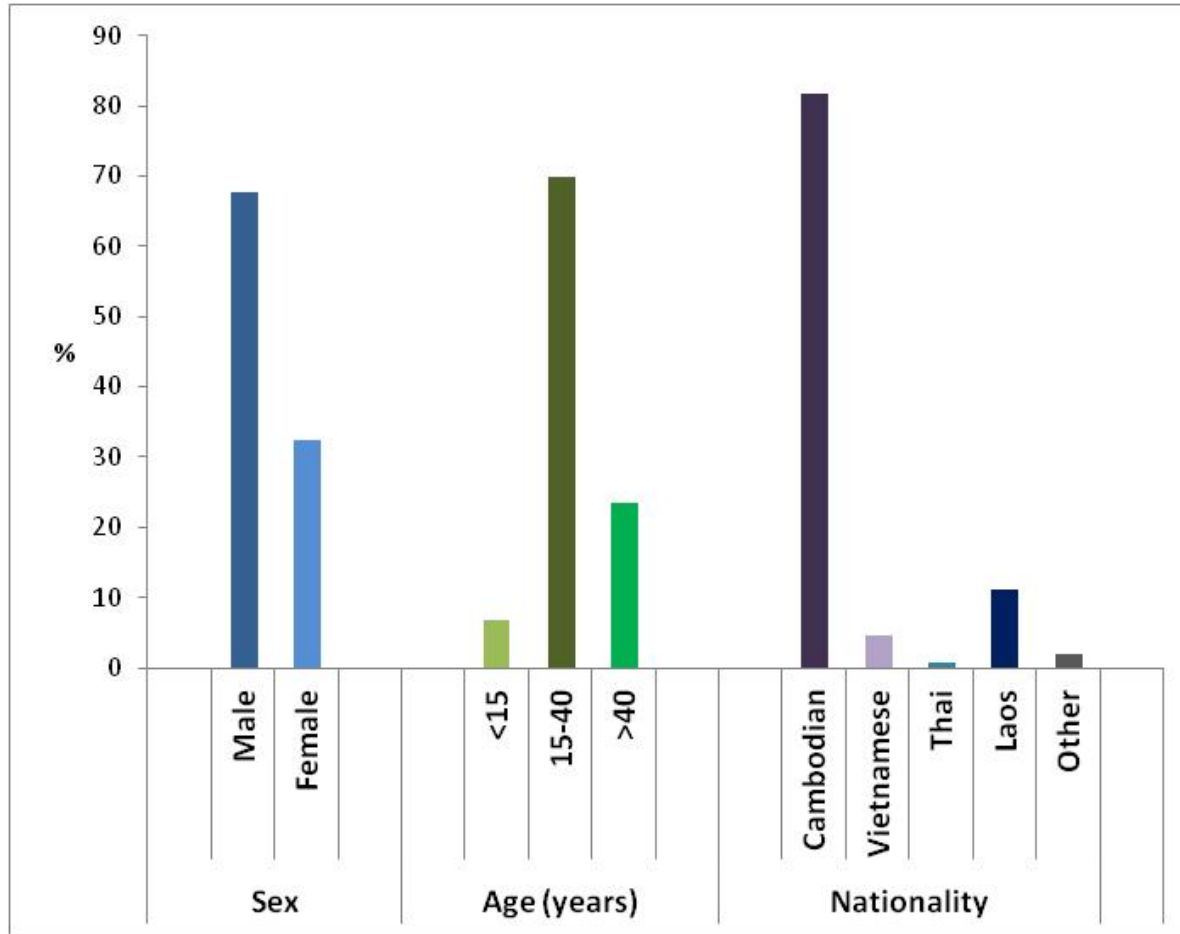
Who did we screen?

3,206 participants:

Thai border: 1055
Laos border: 1144
Vietnam border:
1007

Proportion of refusals

Total: 23%

Thai border: 26%
Laos border: 8%
Vietnam border:
33%

Results: malaria positivity rates

RDT

Border	# participants	# Positive cases	Positivity Rate %	# Pf (%)	# Pv (%)	# Mixed (%)
Thai	1,055	1	0.1	1	0	0
Vietnam	1,007	10	1.0	4	6	0
Laos	1,144	92	8.0	62	28	2
Total	3206	103	3.2	67 (65.0)	34 (33.0)	2 (1.9)

PCR

Border	# samples	# Positive cases	Positivity Rate %	# Pf (%)	# Pv (%)	# Pm (%)	# Pf/Pv (%)	# Pv/Pm (%)
Thai	586	3	0.5	2	1	0	0	0
Vietnam	326	9	2.8	0	7	1	0	1
Laos	473	67	14.2	28	27	0	12	0
Total	1385	79	5.7	30 (38.0)	35 (44.3)	1 (1.3)	12 (15.2)	1 (1.3)

Results (cont): symptomatic *vs* asymptomatic cases

Border Site	# of participants	Positive cases	Positivity rate (%)	Fever (≥37.5°C)	# symptomatic positive cases	# asymptomatic positive cases
Thai	1,055	1	0.1	13	0	1
Vietnam	1,007	10	1.0	39	4	6
Laos	1,144	92	8.0	154	30	62
Total	**3206**	**103**	**3.2**	**206**	**34**	**69**

If using fever only to trigger testing, we would have missed 67% of positive cases (asymptomatic carriers)!

Main risk factors for infection

Variable		Prevalence (%)	Adjusted OR	p-value
Fever	No	2.1	1	<0.0001
	Yes	17.2	3.9	
Age (years)	<15	2.3	4.9	0.004
	15-40	3.9	2.9	
	>40	1.5	1	
Occupation	Security/Armed forces	11.3	3.1	0.02
	Manual Labour	10.5	2.2	
	Agriculture	3.2	1.1	
	Other	1.1	1	
Forest-goer	No	0.9	1	<0.0001
	Yes	11.7	5.4	
Knowledge of prevention	< 2 methods	4.1	1	0.006
	2+ methods	1.4	0.4	
Previous malaria episode	Yes	7.0	5.5	<0.0001
	No	0.6	1	
	DK	0.9	1.4	

(variables also adjusted for sex)

Other risk factors for infection

- Sex…*Male*

- Travel to/from…*Laos*

- Length of trip…*>1week*

- Direction of travel…*Exit*

- Day of crossing…*Weekday*

- Calendar Period…*Aug-Sept, Oct-Nov*

- Time of crossing …*Afternoon*

Important programmatic variables to consider for future
cross-border activities
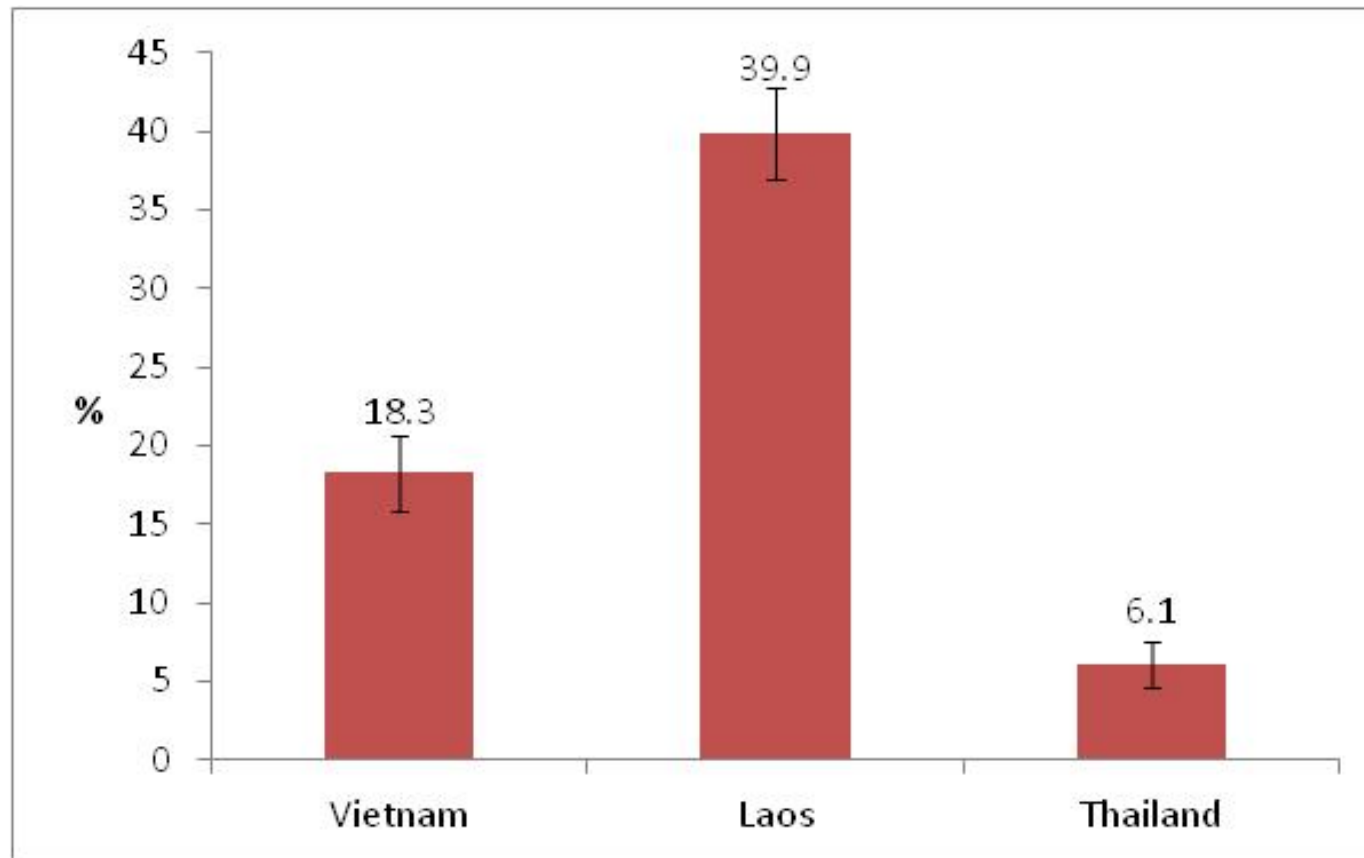
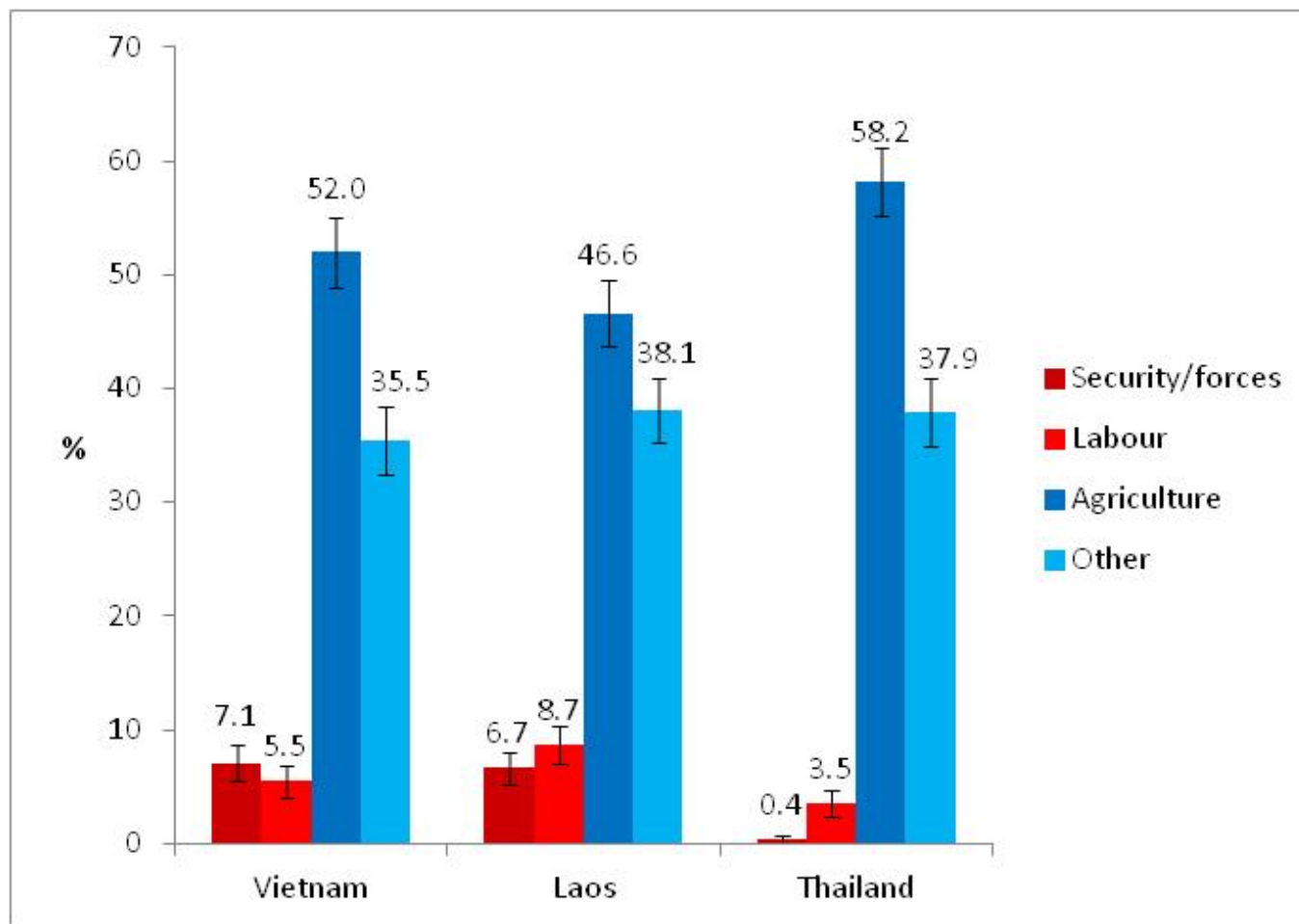# Why was Trapaing Kreal identified as a 'hot' border?

Prevalence of forest-goers in study population

Forest-goers can be targeted with BCC and programmatic initiatives

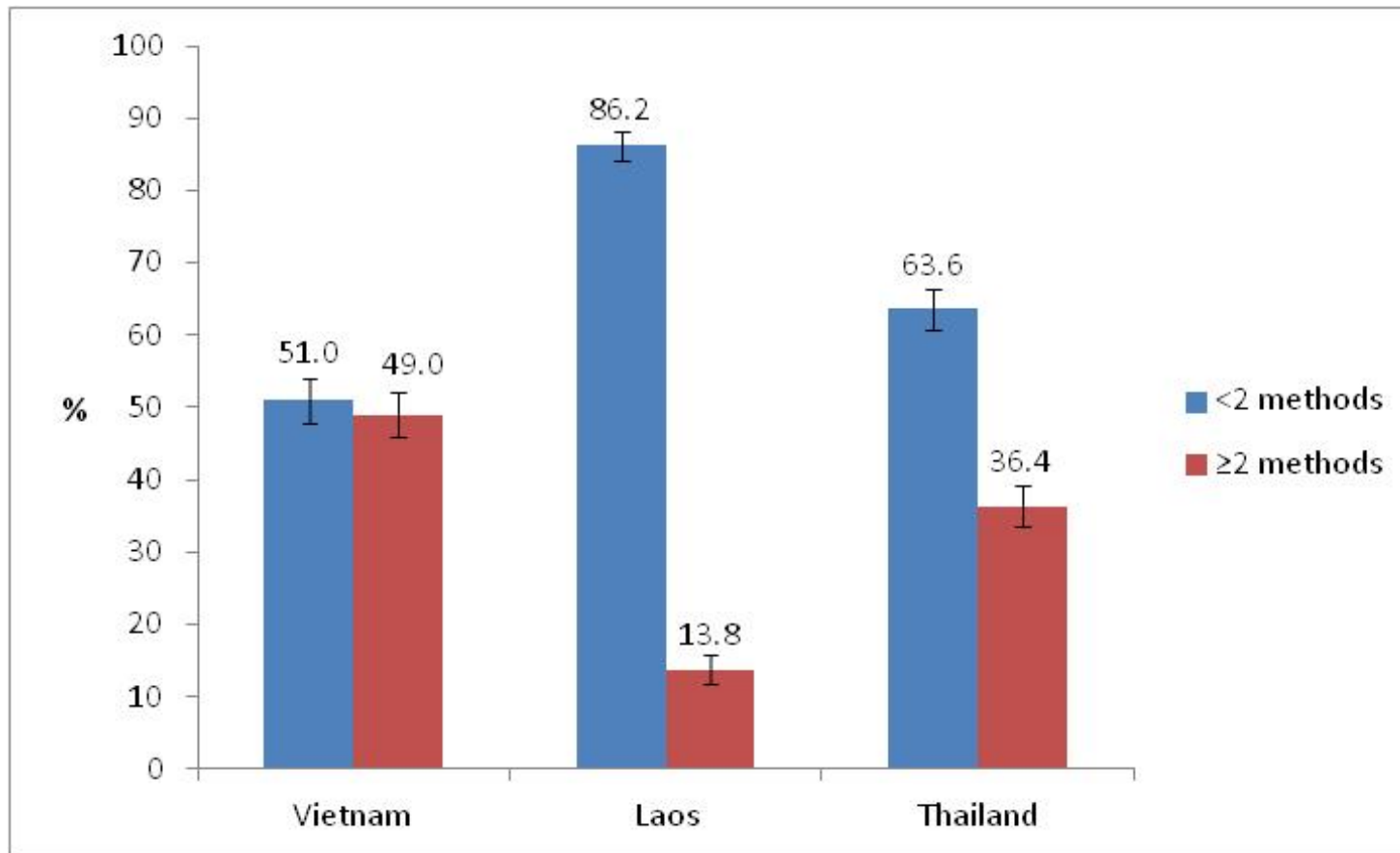# Distribution of occupation groups in study population

Security forces need to be targeted for malaria control activities

Prevalence of previous malaria episode in study population
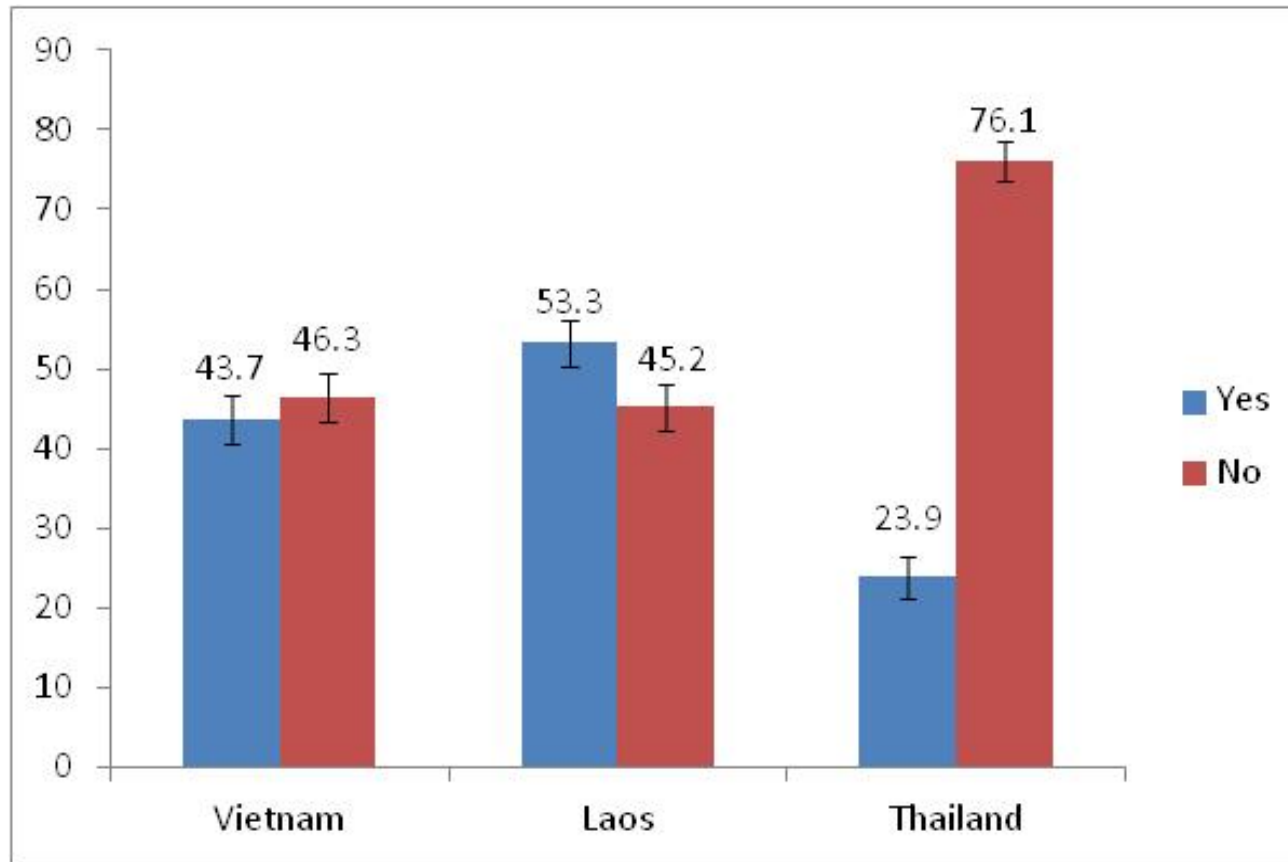
Heterogeneity of reported malaria risk captured and high risk populations can potentially be targeted

Knowledge of malaria prevention methods in study population

Where knowledge of malaria is low there is potential role for BCC at cross border points

Key conclusions

Cross-border malaria was found to be at a high level in Trapaing Kreal (Cambodia-Lao border) and requires urgent attention:

➔ Potential algorithm to optimise highest yield of malaria parasites at cross-border points (suitable for both symptomatic and asymptomatic infections)

➔ Border specific risk factors identified capable of guiding surveillance efforts and programmatic interventions

➔ Programmatic factors relevant for future upscale of cross-border surveillance activities: Weekday, Afternoon, Peak malaria season, etc

Way forward

Malaria Consortium is committed to support national programmes in establishing cross-border malaria surveillance in the region, by…

➜ Locating potential "hot" borders and conduct similar activities to identify extent of problem

➜ Linking with BCC initiatives, resistance surveillance and programmatic interventions

➜ Exploring in detail the role of cross-border activities in unofficial borders

➜ Applying lessons to other countries in the SEA region

Thank you

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Refusal population

Comparison of Nationality:

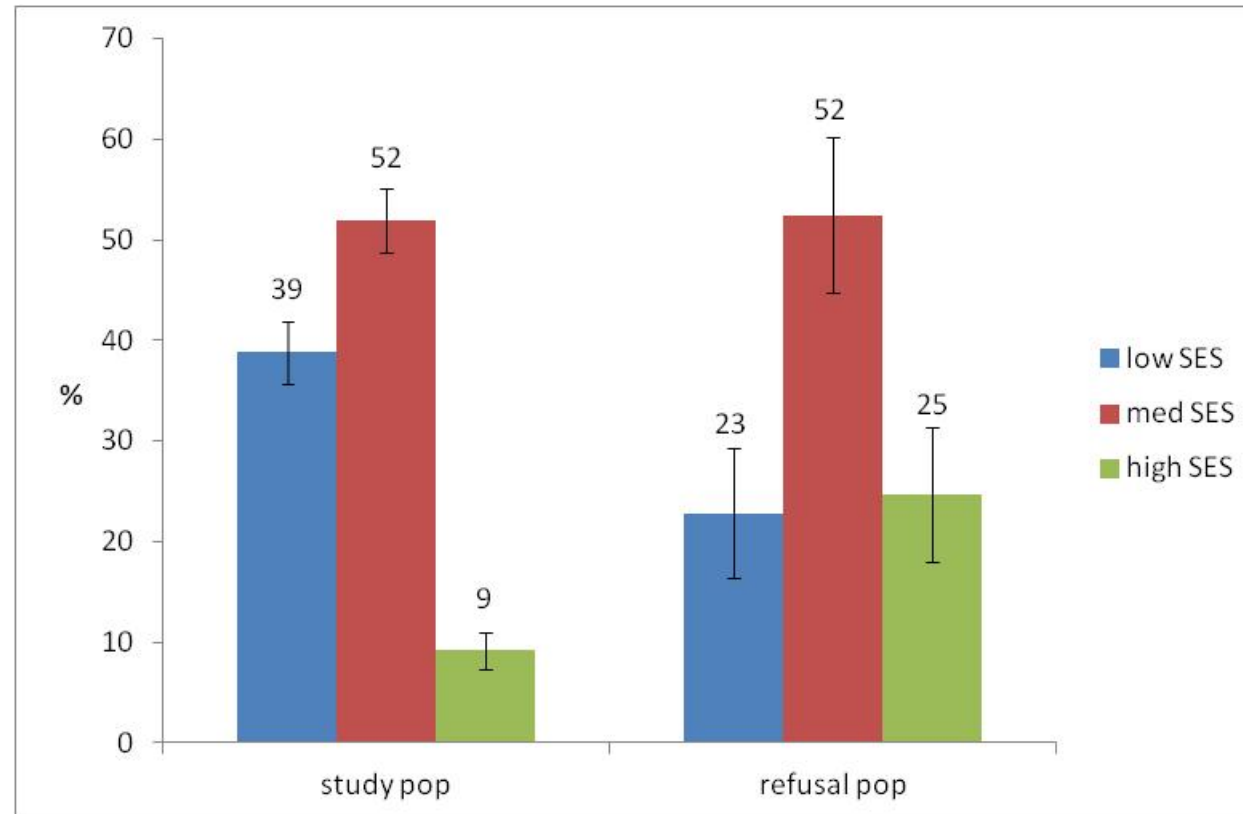# Refusal population

Comparison of Socioeconomic Status:

Refusal population

Comparison of Age:

RDT performance

Sensitivity ➜ probability of being test positive when the disease is present

Specificity ➜ probability of being test negative when the disease is not present

PPV ➜ probability of patient having disease when the test is positive

NPV ➜ probability of patient NOT having disease when the test is negative

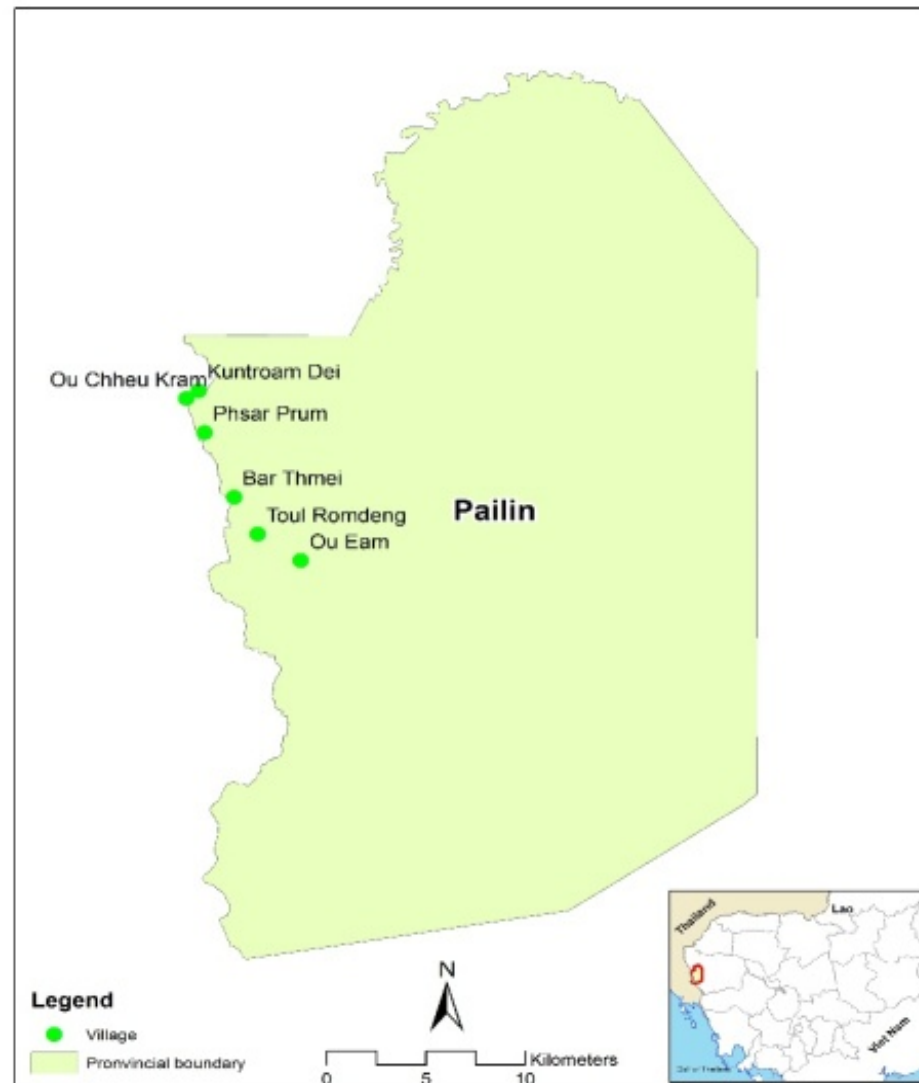|	
Sensitivity (%)	45.6
Specificity (%)	98.8
PPV (%)	70.6
NPV (%)	96.7

PCR asymptomatic cases

Border Site	# of participants	Positive cases	Positivity rate (%)	Fever (≥37.5°C)	# symptomatic positive cases	# asymptomatic positive cases
Thai	586	3	**0.5**	6	0	3
Vietnam	326	9	**2.8**	4	0	9
Laos	473	67	**14.2**	91	15	52
Total	**1385**	**79**	**5.7**	**101**	**15**	**64**

If using fever only to trigger testing, we would have missed 81% of positive cases (asymptomatic carriers)!

Study area

Unofficial sites

Provided by CNM

Unofficial borders

42 Participants - 24 (57%) Male, 18 (43%) Female

All Khmer

5 (12%) Fever

17 (40%) Temporary residents in village

Most crossed daily, and for work reasons

High knowledge of malaria and prevention methods

NO POSTIVE CASES OF MALARIA (RDT)