The Changing Pattern of Malaria in The Mekong Region

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Changing Pattern: Key Positive and Negative Factors over last decades

- Population
  - Population growth from 1950 to 2010: x2 / x3
  - Numerous Ethnic Minority Groups (>54 in Yunnan Province, >149 in Lao PDR, 46 in VN, ...) in remote / forested areas
- Forest
  - Primary Forest coverage from >60% to less than 30% during the last 50 years with Thailand the most affected but Cambodia and VN as well
- Overall development
  - Road and railway – connectivity – internal and cross country migrations – trade
  - Development projects (water management, dams, (rubber++) plantations, ...) logging, mining, farming, and construction
- Migrations
  - Urban – Rural trends :17% (1950) to 36% (2000) ...
  - Migrant workers [3/4 unrecorded] with Thailand the most attractive country during the last 3 decades
  - Refugees – displaced population (Eastern and Northern Myanmar, Thailand)
- Vectors
  - Main primary vectors (A. dirus, A. minimus)
  - Emergence of secondary vectors (…) or adaptation of primary vectors to a continuous changing environment
- Malaria control interventions: more powerful tools use / increased coverage
Active transmission is still occurring in remote forested foci, and human migration from these endemic foci to non-transmission areas can reintroduce the disease in areas now free of malaria, especially among the migrating population from the highlands and vice versa.
Forest Coverage and Malaria Trends in Thailand
Trend of malaria morbidity (confirmed & unconfirmed) trends from 1997 to 2015 (MDG)

- Recorded malaria cases/1,000 population
- Recorded cases/1,000 population trend with a slope of 3.4% yearly reduction using data from 1997 to 2007
- Treated cases/1,000 population trend with a slope of 9.7% yearly reduction using data from 2004 to 2007 (GFATM GRANTS)
- Recorded cases/1,000 population trend with a slope of 4.3% yearly reduction using data from 1997 to 2004

SOURCE: Epidemiology Department, CNM, 2009
Trend of malaria incidence rate per 1000 population, 2000-2009, Cambodia
Incidence of Malaria Treated Cases per 1,000 Population by Operational District, Cambodia 2006-2009

Malaria incidence per 1000 population of treated cases by operational district, Cambodia 2007

Malaria incidence per 1000 population of treated cases by operational district, Cambodia 2008

Malaria incidence per 1000 population of treated cases by operational district, Cambodia 2009
Can we get accurate info from cluster sampling?

Selected clusters
LAO PDR: Malaria has decreased almost by 50% during last ten year (2000 – 2009) period.

Incidence rate of confirmed malaria and mortality rate of probable and confirmed malaria in the Lao People's Democratic Republic, 2000-2009

Number of Death due to Malaria 2003-2009

Annual Case Incidence 2003-2009
Red dot: Village or health center with at least one confirmed P.falciparum case between 2006 – 2008.

Green dot: Village or health center with no confirmed P.falciparum case between 2006 – 2008.

Grey areas – No data
Identification of epidemiological strata

North
- Focal transmission: high in some villages, zero to very low in others

Central
- zero to very low transmission

South
- widespread transmission

Unpopulated area
Interpolated Pf incidence rate (10 km radius)
0
>0 < 1
1-10
10 - 100
100 - 500
500 - 1000
No estimate
Vector distribution

Anopheles dirus
- Not identified
- Identified

Source: CMPE, 2009

Anopheles minimus
- Not identified
- Identified

Source: CMPE, 2009

Anopheles maculatus
- Not identified
- Identified

Source: CMPE, 2009

Anopheles jeyporiensis
- Not identified
- Identified

Source: CMPE, 2009
Thailand: Annual parasite incidence (per 1,000) and malaria mortality rate (per 100,000), 1965 - 2009

- **API per 1,000**
- **MMR per 100,000**
Thailand

- From 4908 endemic villages in 2000 to 2967 in 2009
- From >40,000 confirmed falciparum Thai cases in 2000 to less than 10,000 in 2009
- 60% are *P. vivax* infections (2009, countrywide)
- >85% are *P. vivax* infection in provinces bordering Cambodia (2009)
- 625 deaths in 2000 to 70 in 2009
INFORMATION IS LOCALLY GENERATED ...

... AND ANALYZED

Joint International Tropical Medicine Meeting and International Malaria Colloquium, 1-3 December 2010
Centara Grand & Bangkok Convention Centre at Central World, Bangkok, Thailand
… And Locally Mapped for Active Investigation
Top Ten Provinces with highest # of confirmed malaria cases, FY2009

1. Tak 8,261
2. Yala 2,077
3. Mae Hong Son 1,567
4. Kanchanaburi 1,099
5. Narathiwat 1,019
6. Chumporn 896
7. Srisaket 687
8. Surin 651
9. Chanthaburi 646
10. Prachuap Khiri Khan 616
Proportion of foreign nationals cases by border sites, Thailand, Fiscal Year 2009

Thai-Myanmar (93.1%)
Thai-Cambodia (3.4%)
Thai-Malaysia (0.66%)
Thai-Lao PDR (0.05%)
Others (2.7%)

Source: Malaria Cluster, Department of Disease Control, MoPH
Morbidity in the Border Provinces (2005)

Camp population (cases per 1,000)

Migrant workers (cases)

Source: MOPH
Morbidity rate per 1000 Pop:

- 12.29 (1999)
- 11.82 (2000)
- 12.94 (2001)
- 9.32 (2005)
- 9.00 (2007)
- 10.75 (2008)
- 10.00 (2009)

Mortality rate per 100,000 Pop:

- 7.57 (1999)
- 5.50 (2000)
- 5.50 (2001)
- 5.05 (2002)
- 4.65 (2003)
- 3.65 (2004)
- 3.08 (2005)
- 2.91 (2006)
- 2.18 (2007)
- 1.84 (2008)
- 1.64 (2009)
Malarious Area according to Ecology & Malaria Risk Areas in Myanmar

- Coastal malaria
- Plain area malaria
- Forest fringe foot hill area malaria
- Hilly & Forest area malaria

- High Risk
- Moderate Risk
- Low Risk
- Free Risk

Joint International Tropical Medicine Meeting and International Malaria Colloquium, 1-3 December 2010
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High risk groups include:

- Pregnant Women & <5 yr Children
- National Races
- Children
- Seasonal Migrant Workers/ Farmers
- Miners
- Forest-related workers
Myanmar-Thai Border (16) Townships Malaria Morbidity Rate (/1000 pop).

Malaria Morbidity Rate (/1000 pop)

- < 15
- 15 - 30
- 31 - 45
- 46 - 60
- > 60
Myanmar-Thai Border (16) Townships
Malaria Mortality Rate (/-100,000pop).

Malaria Mortality Rate (/-100,000pop).

<5
5 - 9
10 - 14
15 - 19
20 - 24
25 - 29
>30

International Malaria Colloquium, 1-3 December 2010
Convention Centre at Central World, Bangkok, Thailand
Incidence rate (1/100,000) of reported confirmed malaria in China from 1996 to 2008.

>30 Million cases in 1955 to less than 20,000 confirmed cases in 2008 towards zero in 2020
Number of counties in each of the four categories.

<table>
<thead>
<tr>
<th>County Type</th>
<th>Definition</th>
<th>No. of Counties</th>
<th>Target population[^1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>Presence of confirmed local case(s) in the last 3 years, with at least one year having an annual incidence &gt;=1/10,000</td>
<td>110</td>
<td>57,111,204</td>
</tr>
<tr>
<td>Type 2</td>
<td>Presence of confirmed local case(s) in the last 3 years, annual incidence &lt;1/10,000</td>
<td>554</td>
<td>356,989,175</td>
</tr>
<tr>
<td>Type 3</td>
<td>No local case for at least 3 years, only imported cases</td>
<td>1,557</td>
<td>707,759,805</td>
</tr>
<tr>
<td>Type 4</td>
<td>No history of any locally transmitted cases, only imported cases</td>
<td>638</td>
<td>177,329,815</td>
</tr>
</tbody>
</table>

[^1]: Based on China’s 2007 Census data.
Stratification: from counties to villages … Surveillance through web-based systems
Malaria stratification in Viet Nam

- **Without malaria transmission**
- **Area at risk of malaria resurgence**
- **Low malaria endemic (<5/1000 cases/y)**
- **Moderate malaria endemic (5-10/1000 per y)**
- **High malaria endemic (>10/1000/y)**
Confirmed malaria cases per 1000 in 2007 in the GMS

- SHRINKING THE MALARIA MAP
- VILLAGE-BASED SURVEILLANCE AT ITS BEST
- REGIONAL ACTION
Thank you