Dengue

Global & Community Transmission

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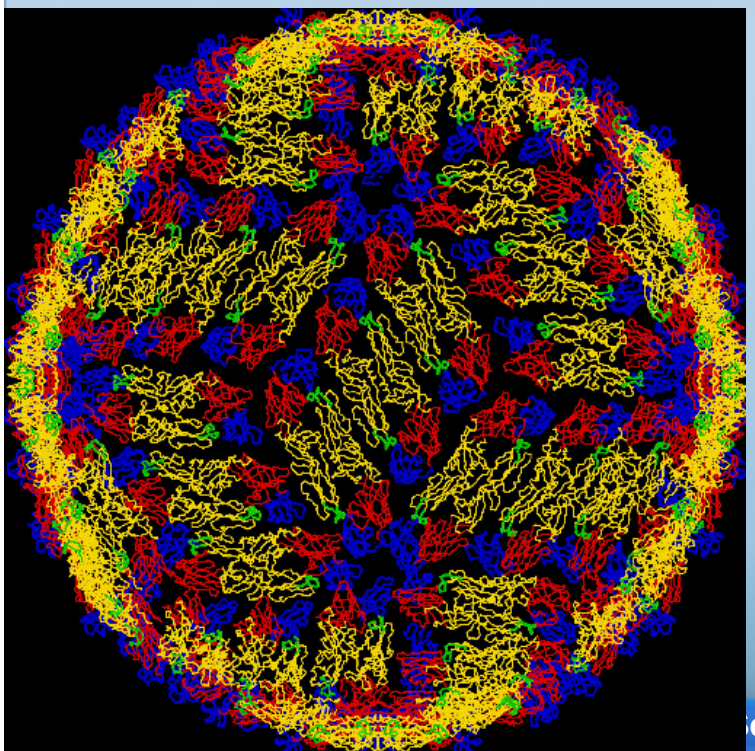
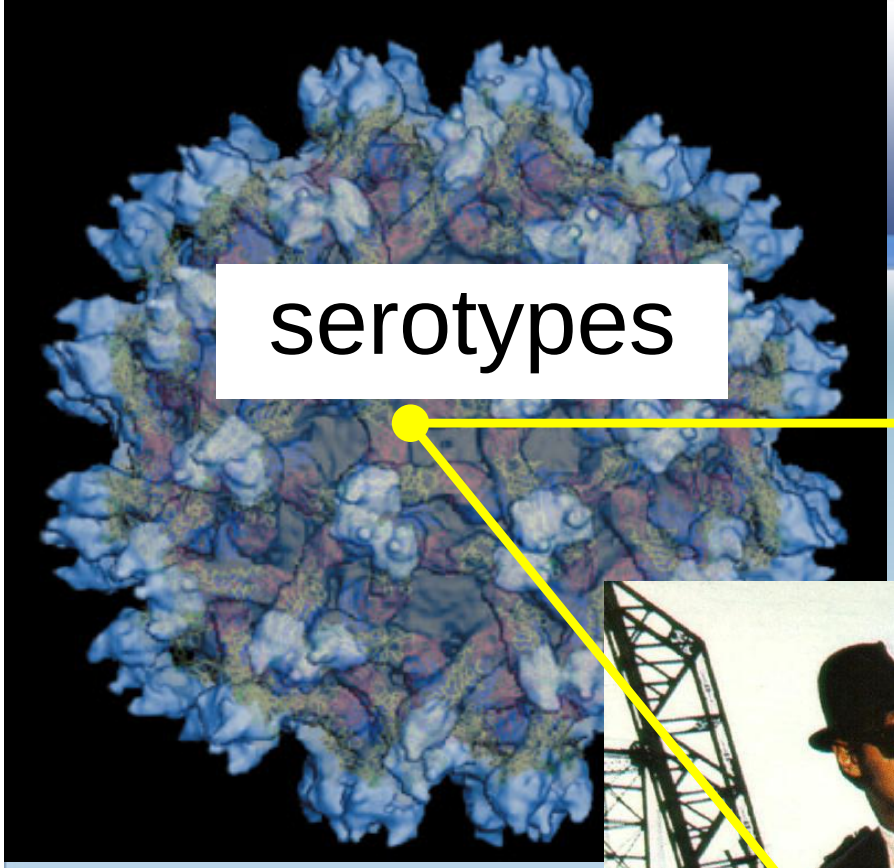
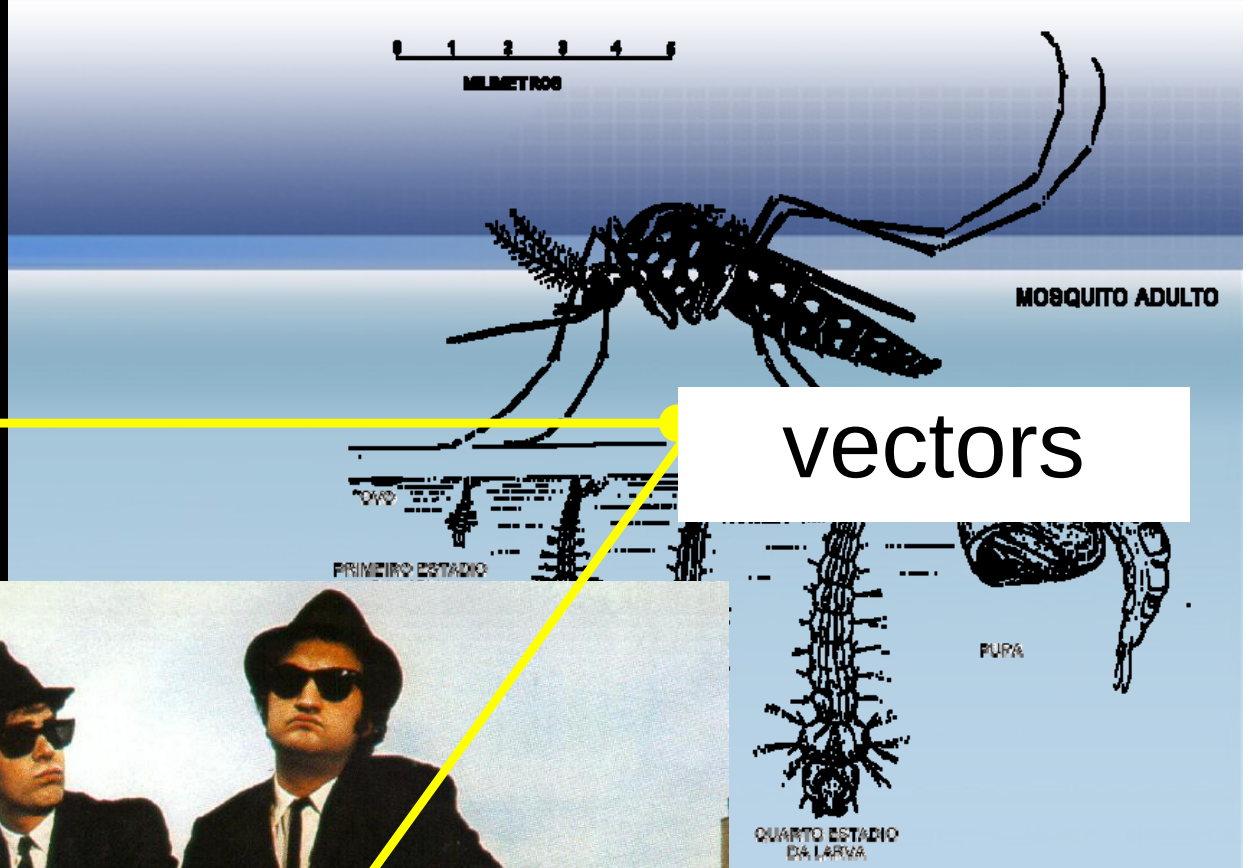


Outline

- Basic background
- Epidemiology
  - Global
    - Many areas where dengue has been absent or mild in recent years are now epidemic.
  - Regional
    - Brazil increase of 120%, Costa Rica 382%, El Salvador 189%
    - Bahamas first cases since 2003.
    - Mauritius 2009 first outbreak in > 30 years
    - SE Asia 2010 < 2009, with exceptions
  - Community
    - Key West, Florida, USA
    - Croatia
    - France



serotypes



vectors

host behavior

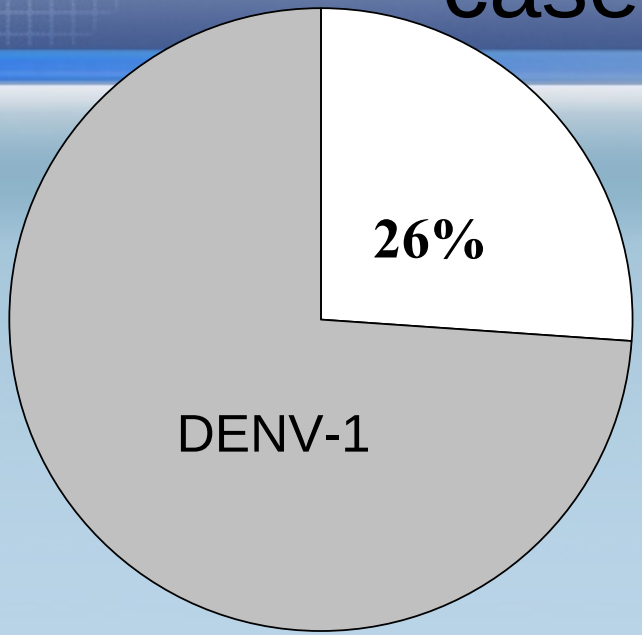
Dengue epidemiology

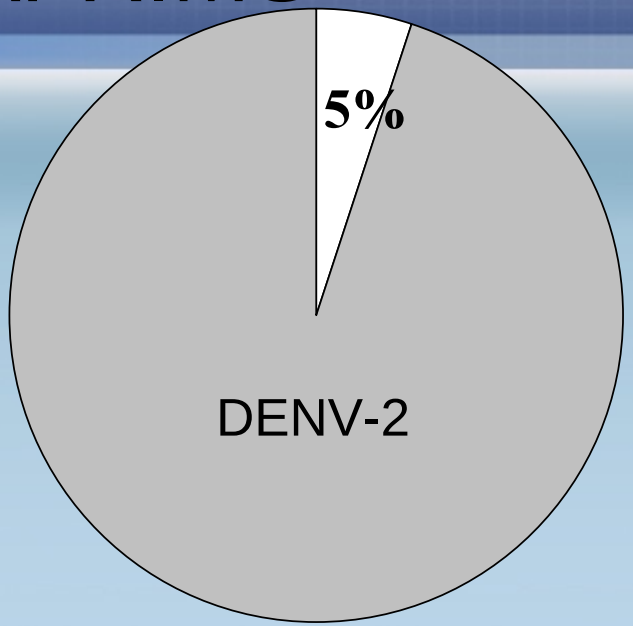
Viruses

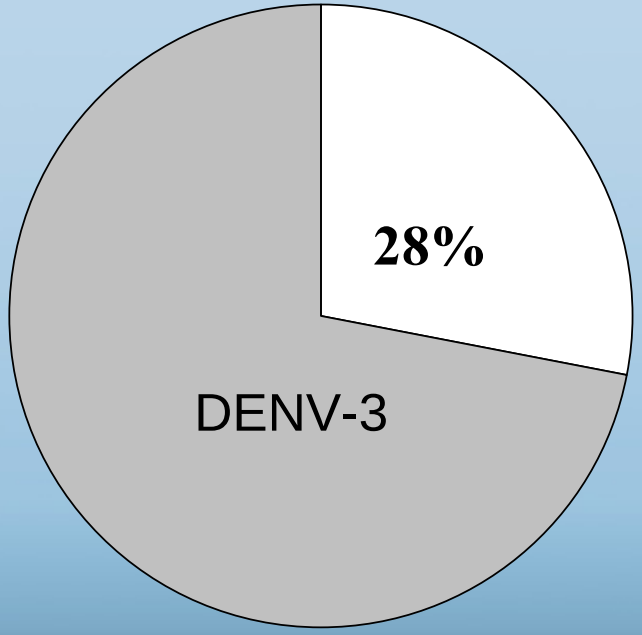
SS RNA viruses

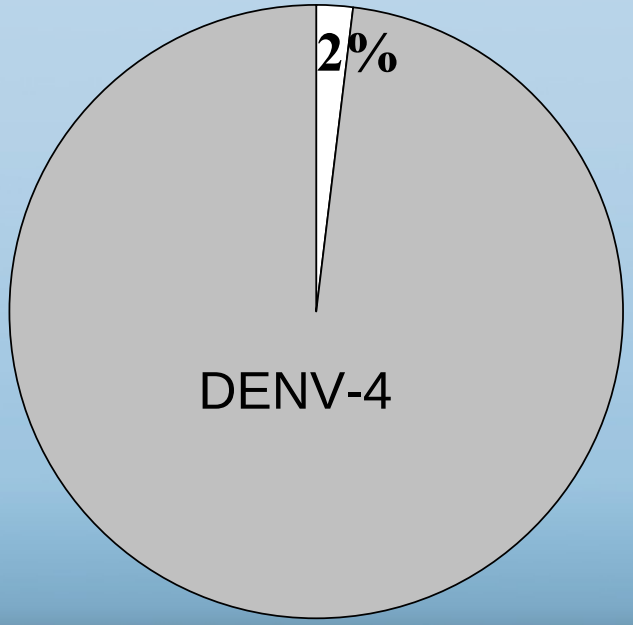
- Dengue serogroup
  - Dengue 1-4
  - Closely related, cause similar disease in humans
  - But antigenically distinct
- Analogous to JE serogroup
  - JE, Murray Valley, SLE, WNV
  - Closely related, cause similar disease in humans
  - But antigenically distinct

% primary infections in symptomatic cases at AFRIMS





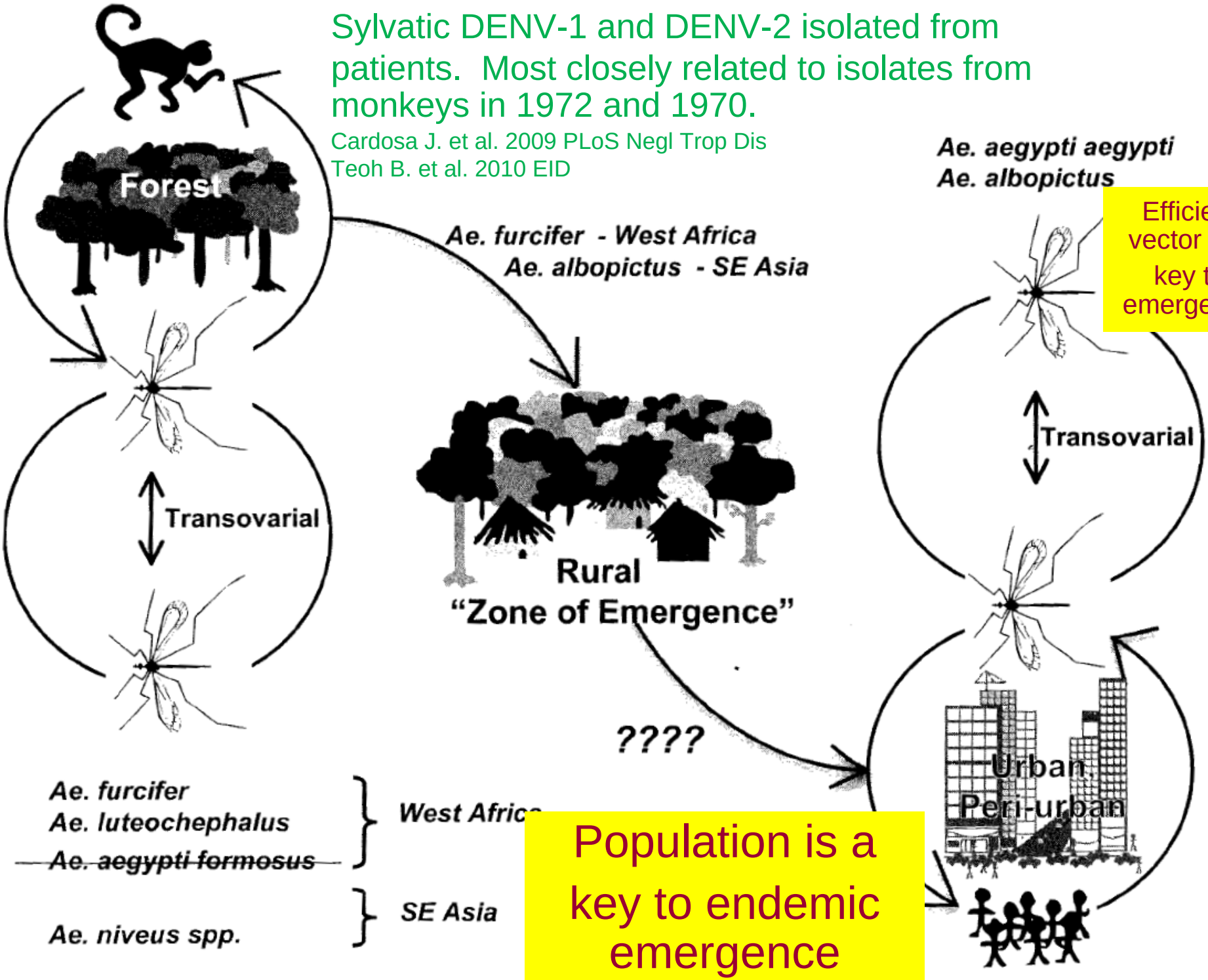




2005 and 2008 Malaysia.

Sylvatic DENV-1 and DENV-2 isolated from patients. Most closely related to isolates from monkeys in 1972 and 1970.

Cardosa J. et al. 2009 PLoS Negl Trop Dis
Teoh B. et al. 2010 EID



Efficient vector is a key to emergence

Population is a key to endemic emergence

Epidemiology

Recent review by PDVI

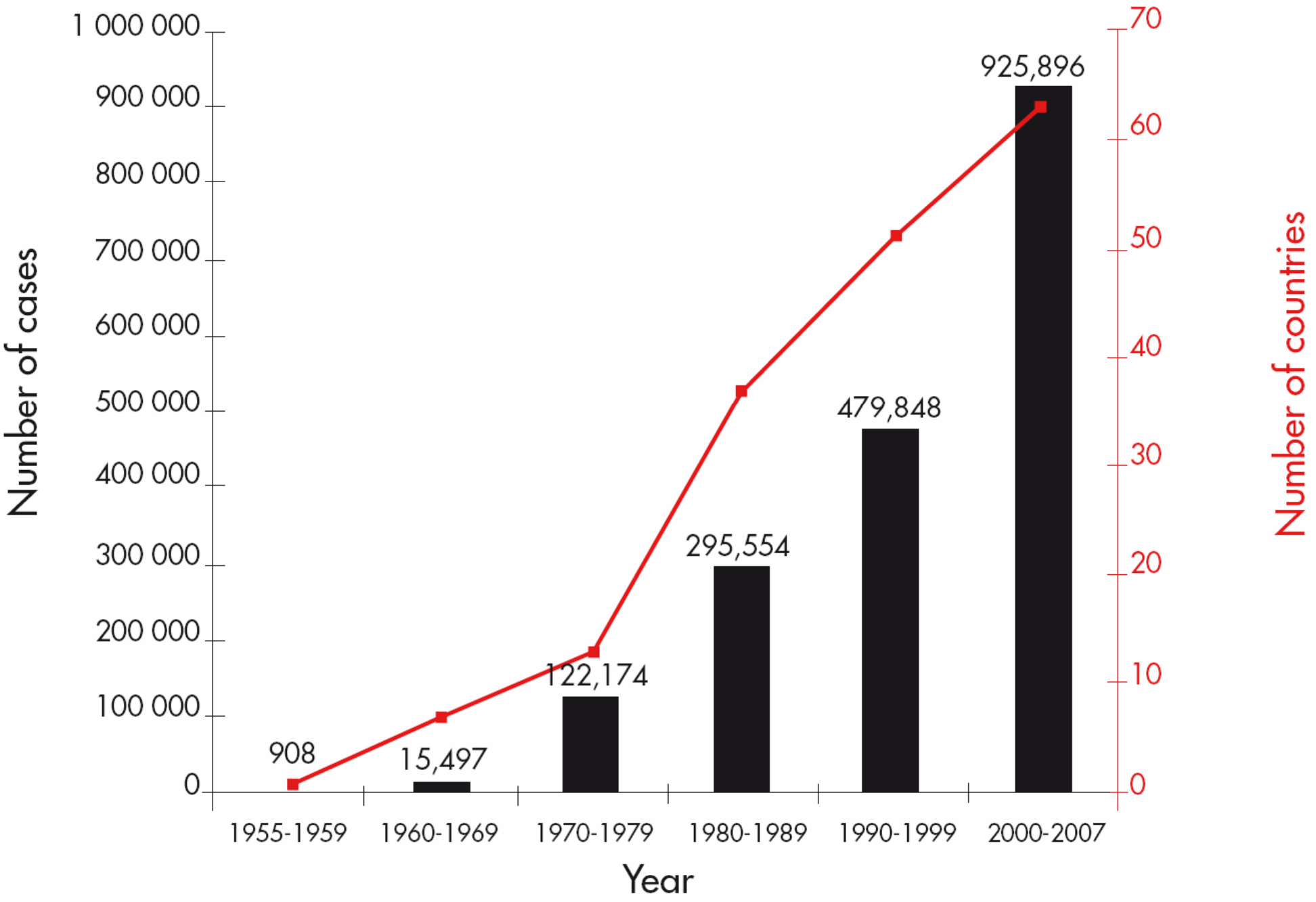
3.5 billion live in areas at risk for dengue (55%)

34 million DF cases

2 million DHF cases

21,000 deaths

Figure 1.2 Average annual number of dengue fever (DF) and dengue haemorrhagic fever (DHF) cases reported to WHO, and of countries reporting dengue, 1955–2007



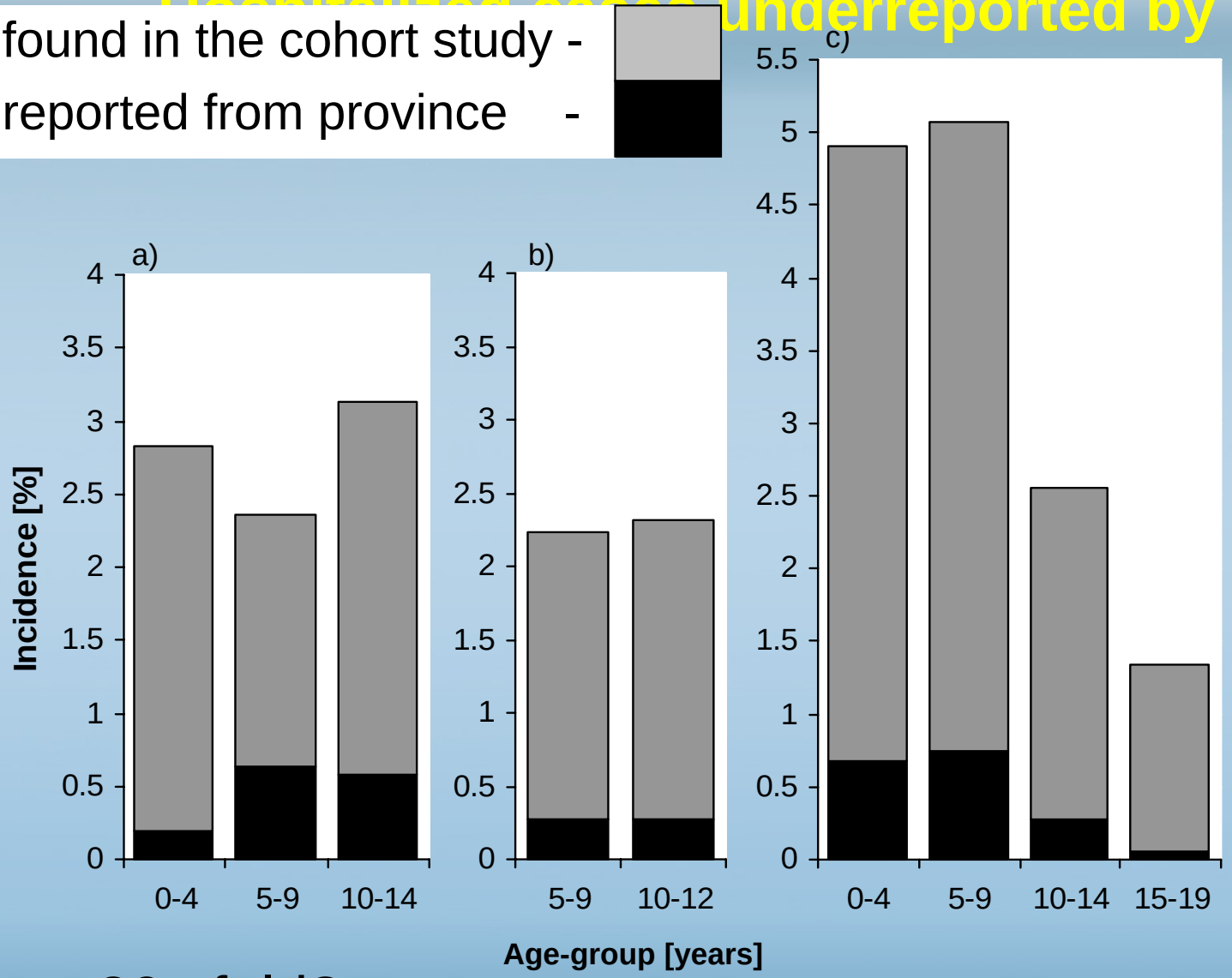
Underreporting

Total dengue cases underreported by 9x

Hospitalized cases underreported by 2x

Mean found in the cohort study -

Mean reported from province -

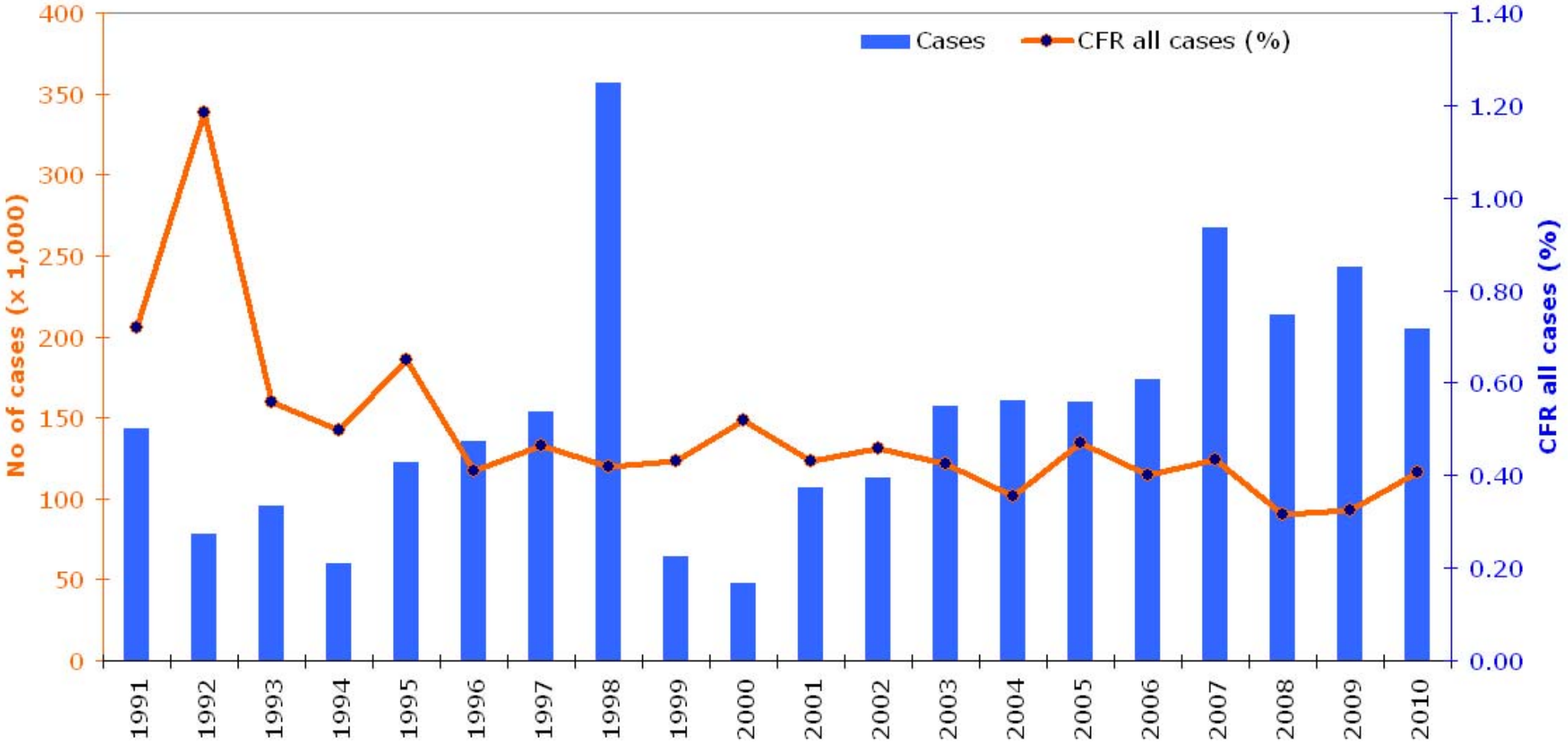


Thailand and Cambodia

Nicaragua: 20x fold?

WHO Western Pacific Region

Number of reported DF/DHF cases and Case Fatality Rates in the Western Pacific Region, 1991-2010 (as of 11.10.2010)

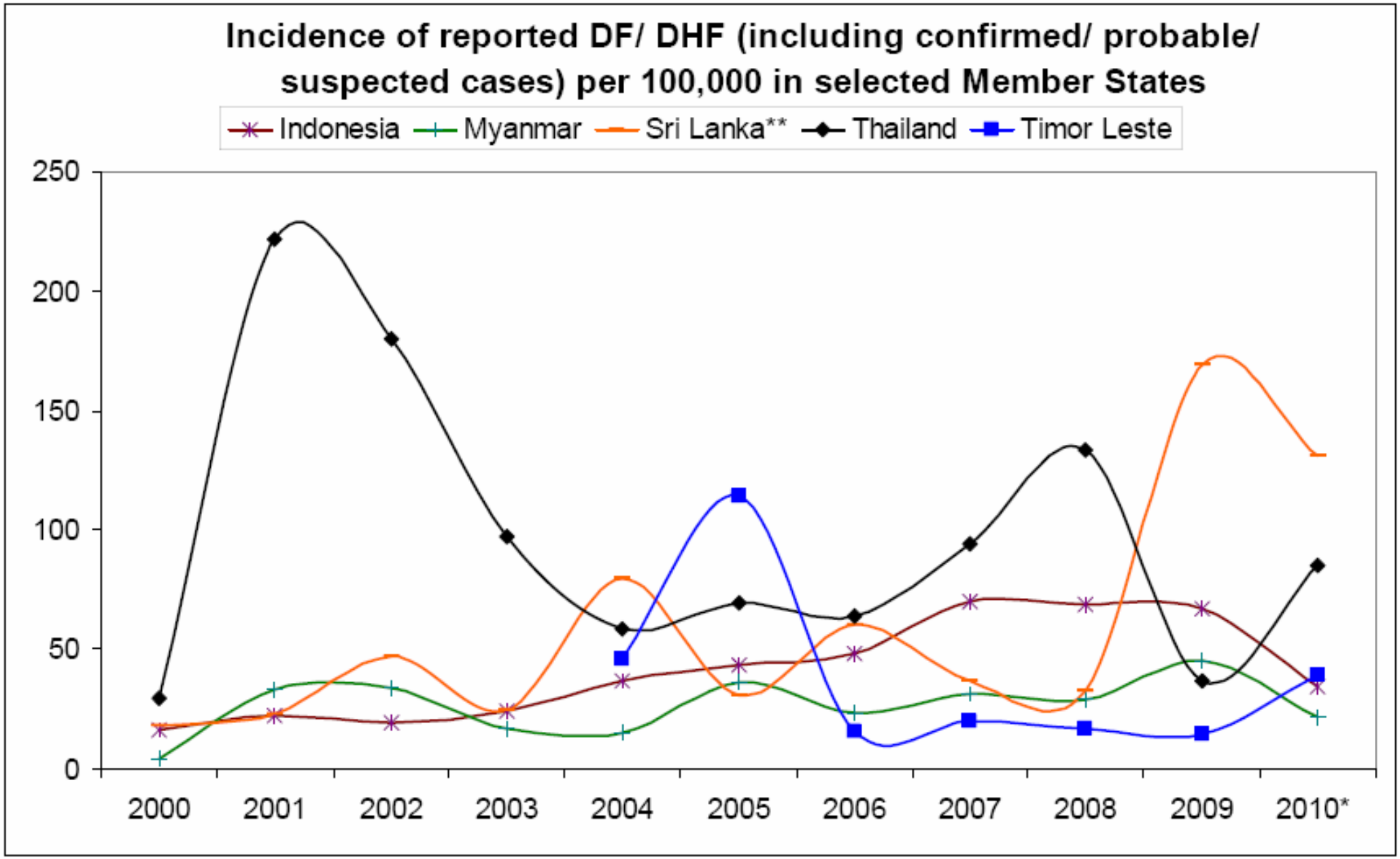


Last update: 11 October 2010. (*)

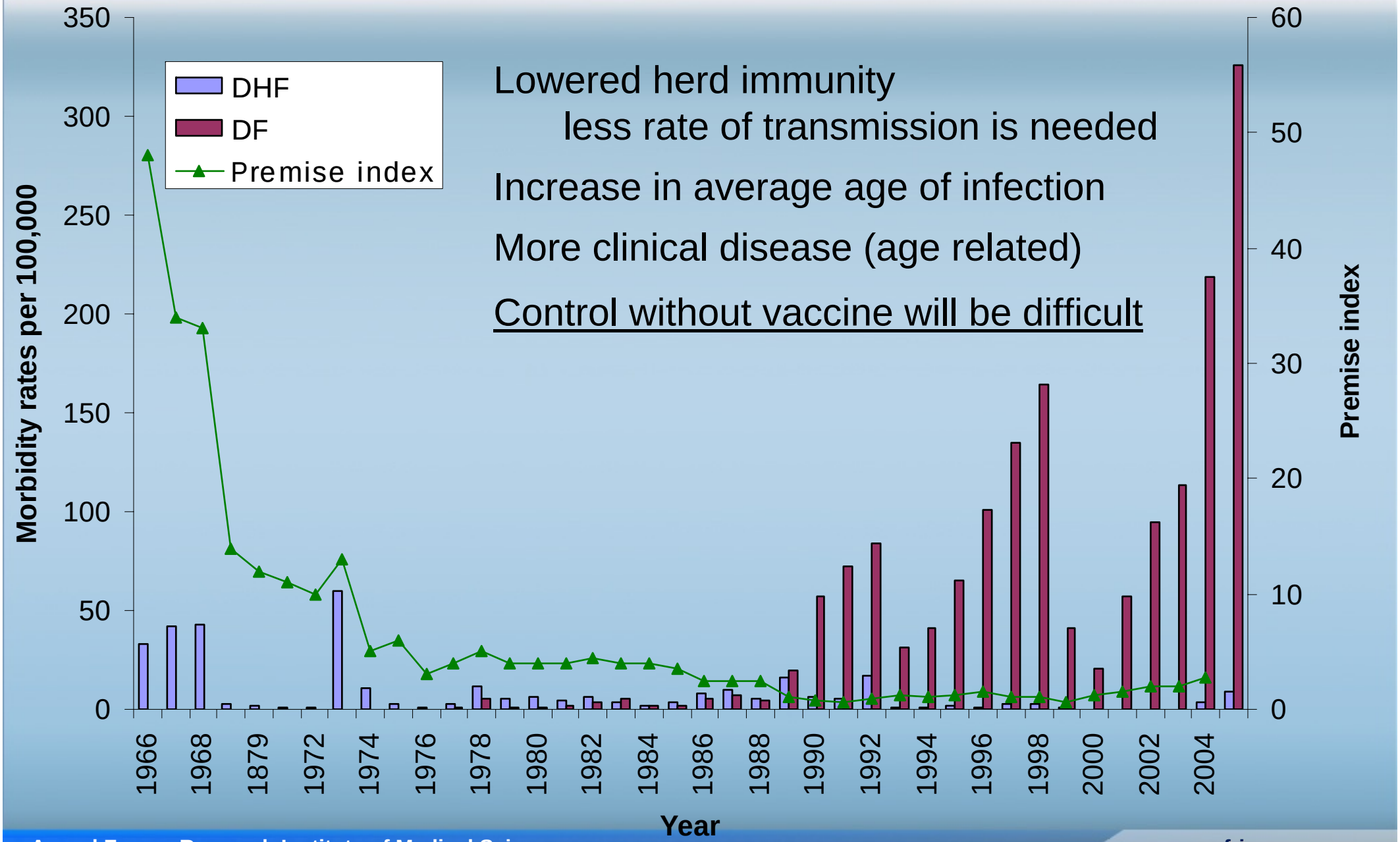
Note: (*) Data in 2010 is incomplete in some countries due to delay in reporting at national and regional level.

Figure1: Incidence of reported dengue (including confirmed/ probable/ suspected cases) per 100,000 in selected Member States

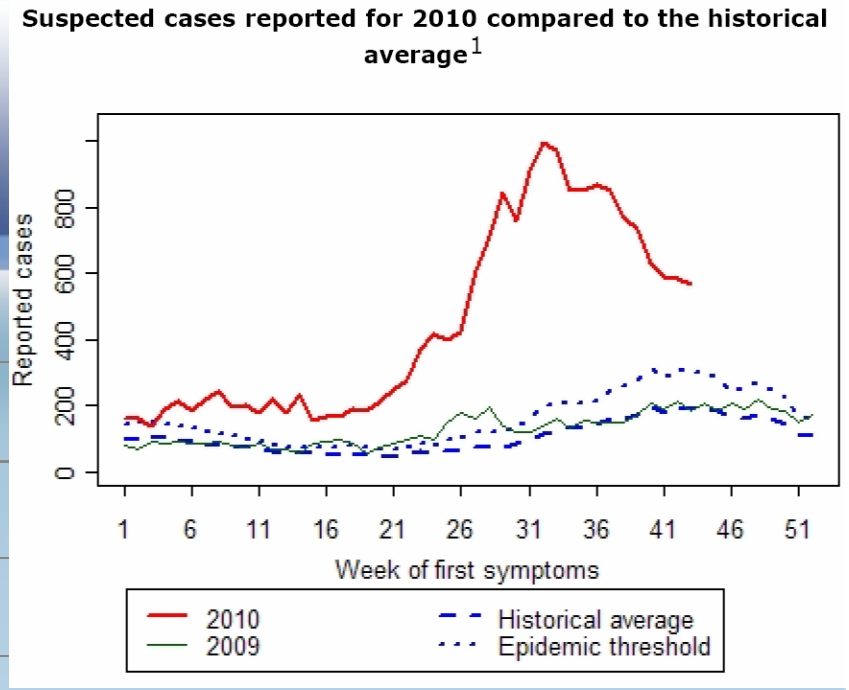
SEARO



Incidence of DF and DHF, Singapore, 1977 - 2005



Puerto Rico - 2010 reported cases compared to historical average and 1998



TABLE

Imported cases of dengue fever per year, Germany, 2001–2010[a]

Year	Number of recorded cases
2001	60
2002	213
2003	131
2004	121
2005	144
2006	175
2007	264
2008	273
2009	298
2010	387

Source: Robert Koch Institute, SurvStat (http://www3.rki.de/SurvStat).

[a] As of 4 October 2010.

Aedes aegypti historically in southern Europe - currently *Aedes albopictus*.

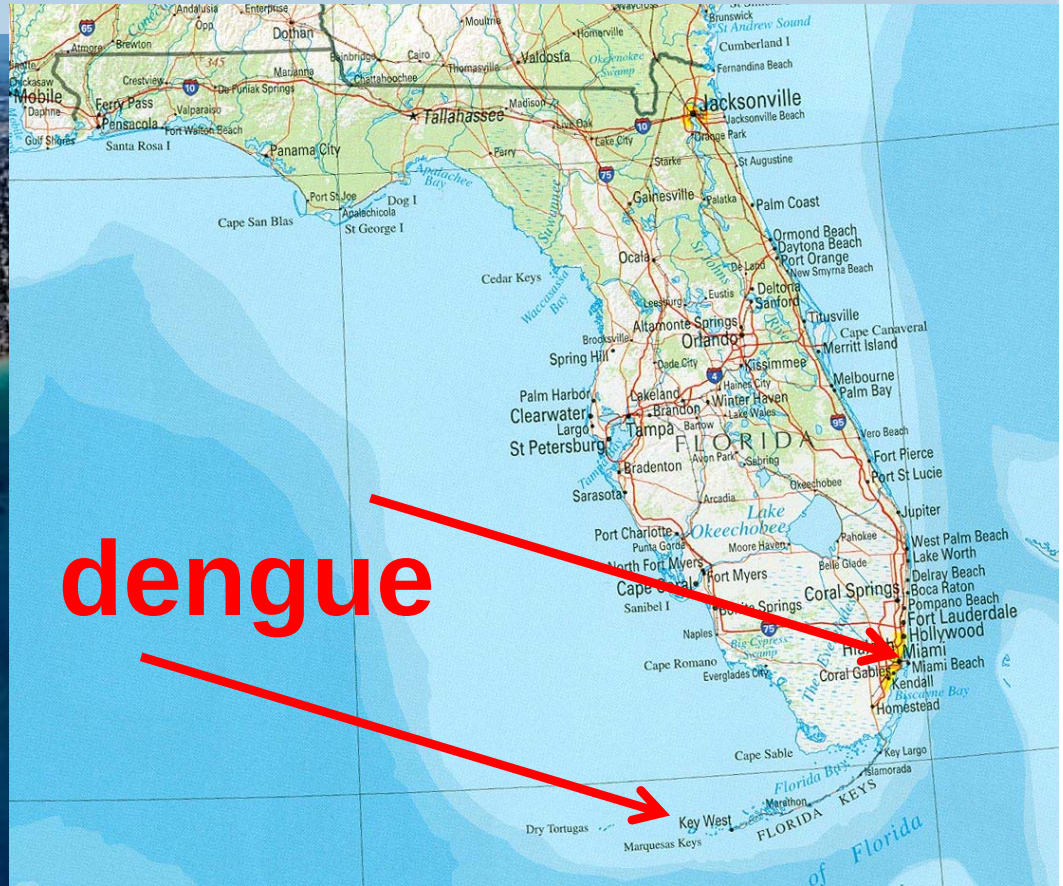
Break-Bone Fever Draws Roche Drug as Dengue Virus Hits Riviera

Florida Keys

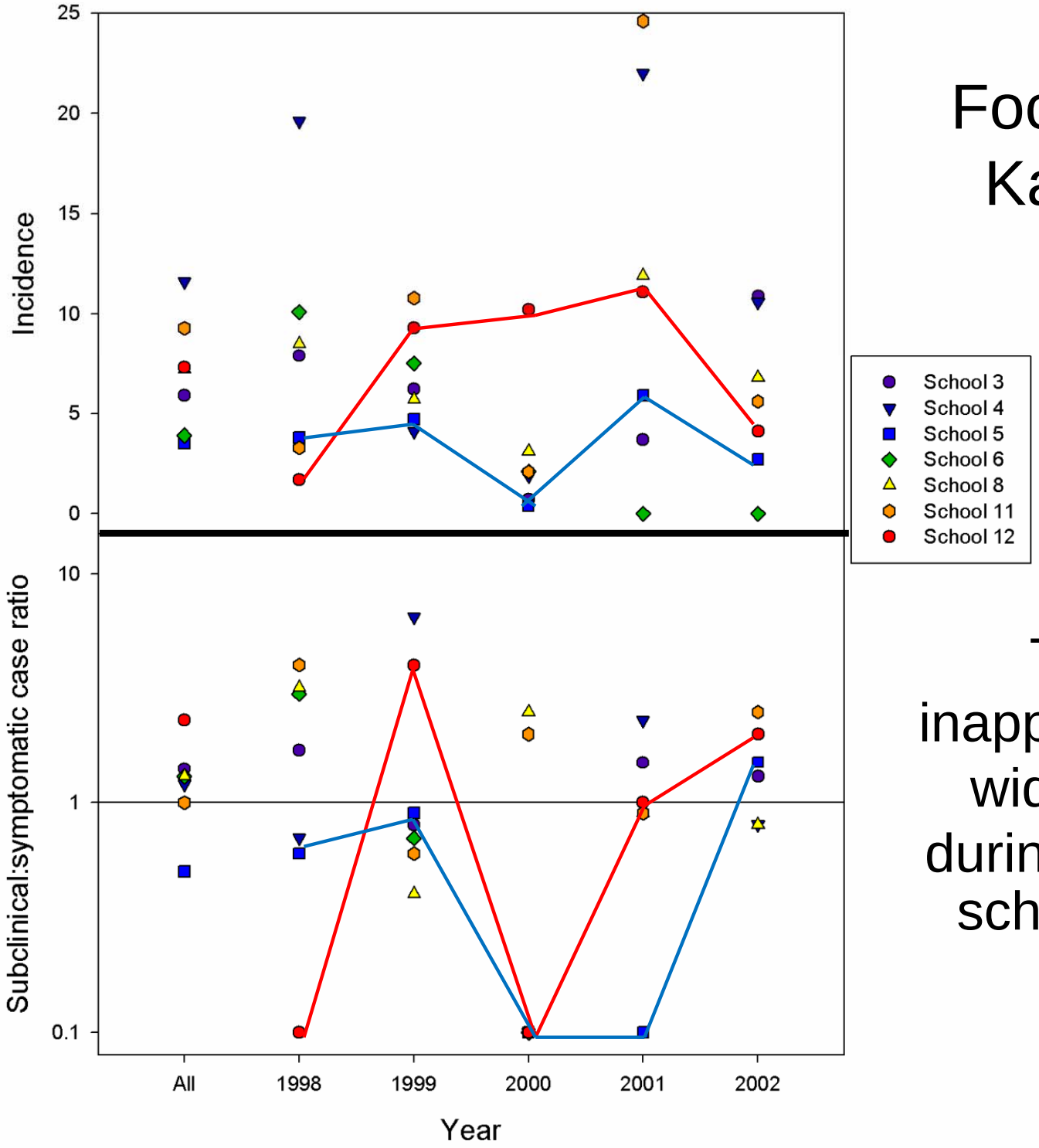
July 2009 – present : >75 symptomatic cases

Two mosquito pools positive for DEN1

- 2 human samples and 2 mosquito pools were sequenced
- DENV-1 genetically related to 2007 Mexican DENV-1



Focality of dengue - Kamphaeng Phet

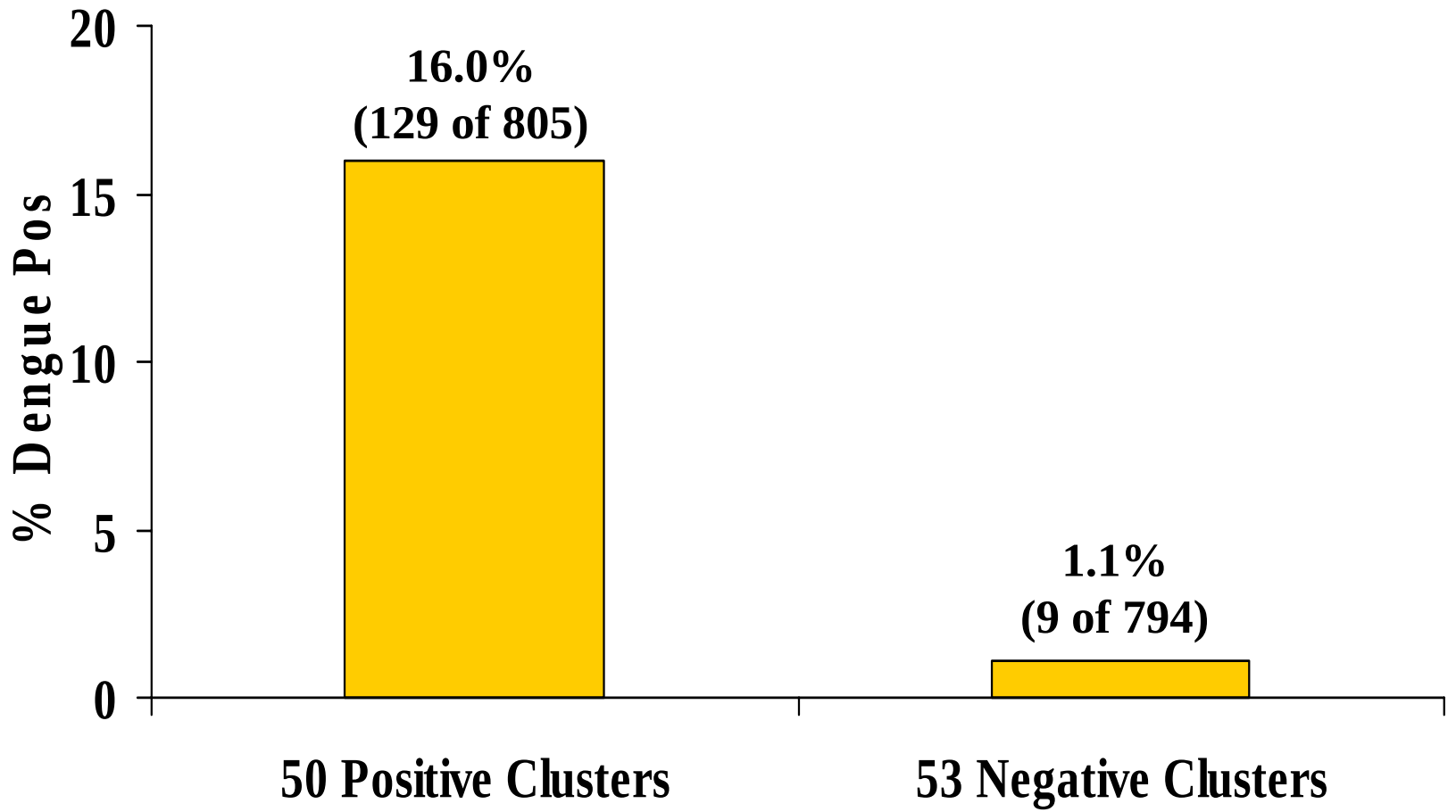


The proportion of inapparent infection varies widely among schools during the year and within schools over the years.

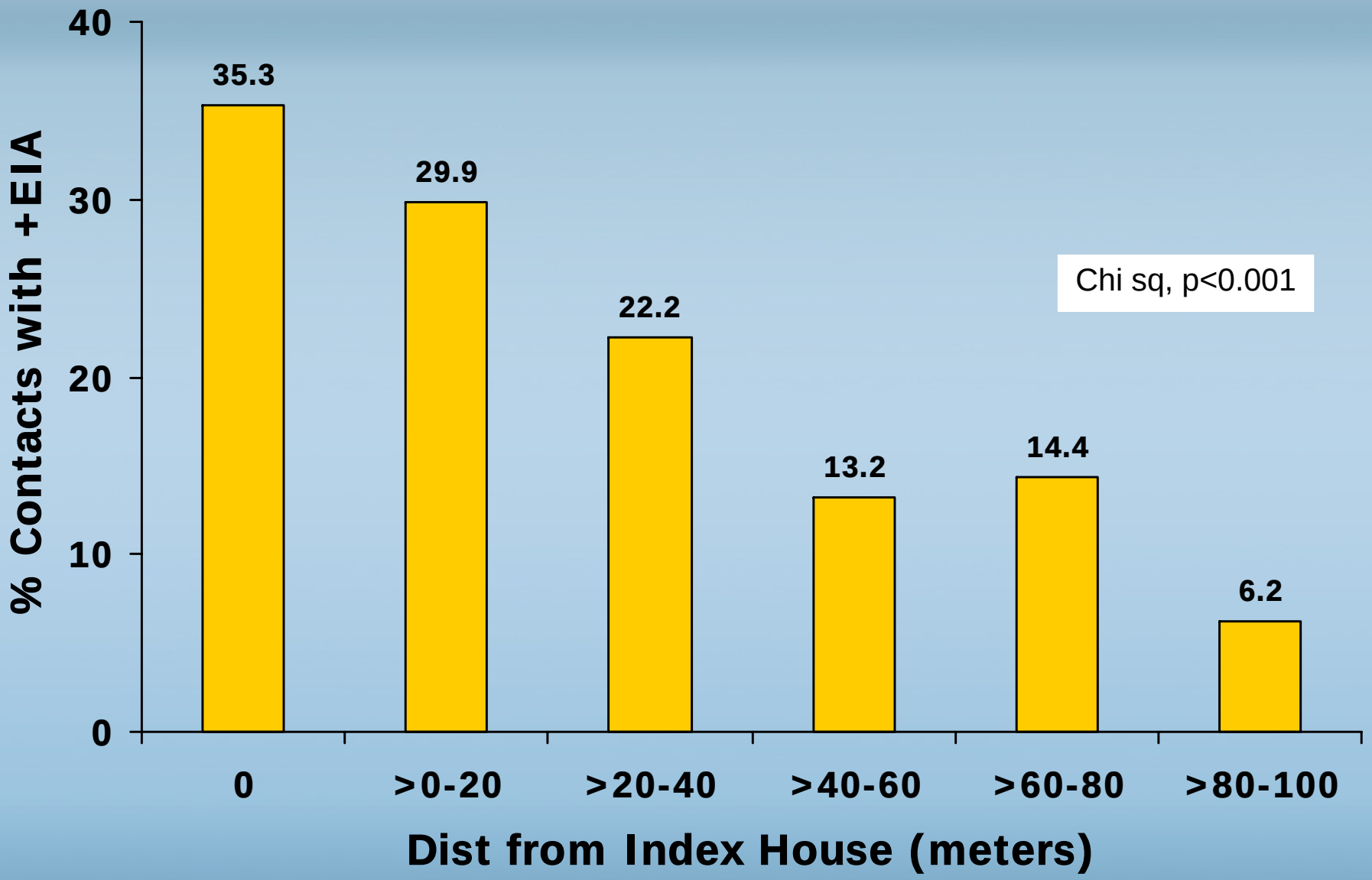
Inapparent to symptomatic ratio

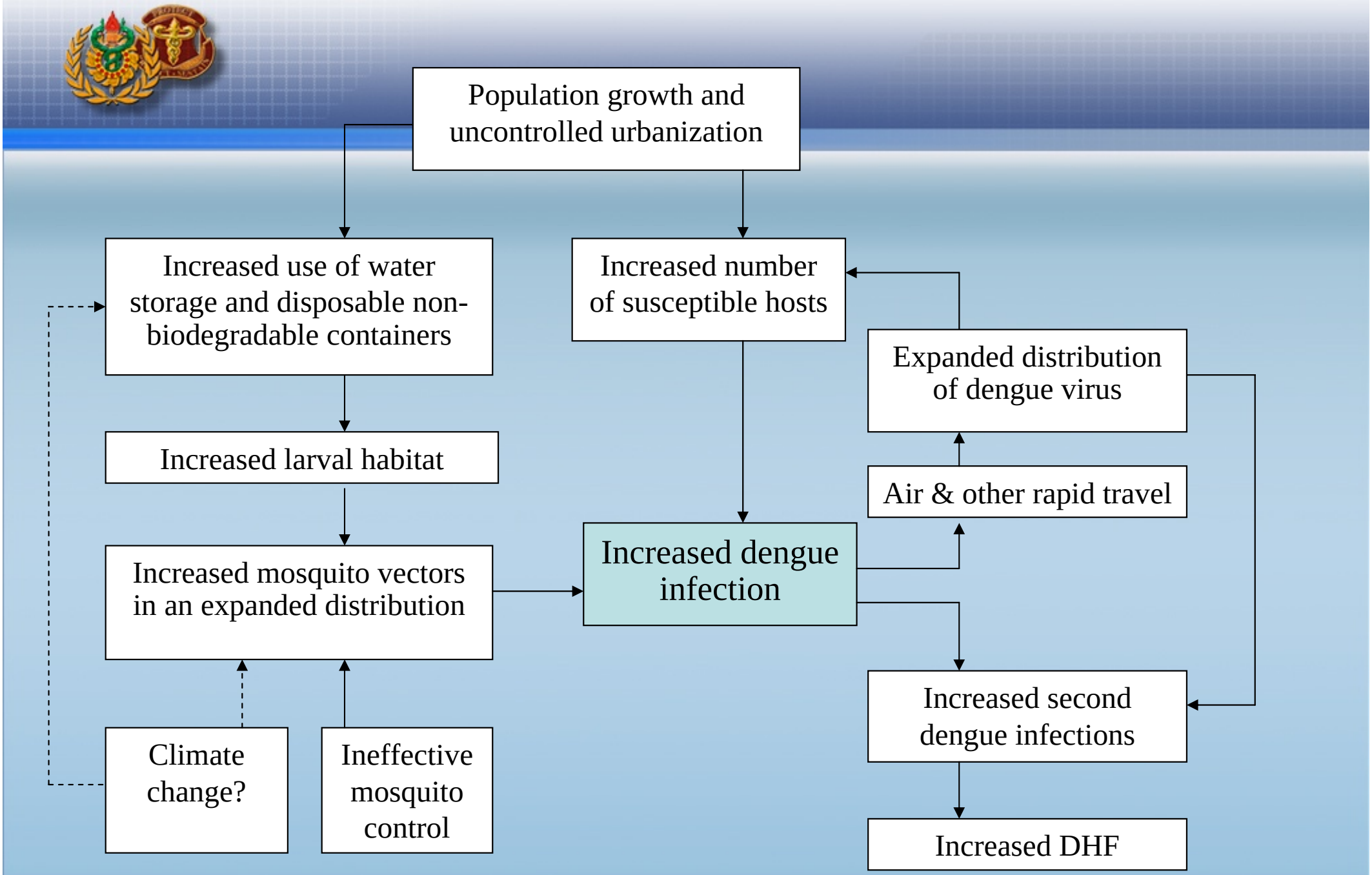
- A lower proportion of inapparent infection
  - a higher incidence of infection at a given school that year
  - lower incidence at a given school the year before
  - a higher # of serotypes in circulation for a given year

Dengue Positive Cases
Positive vs. Negative Clusters



Rate of Dengue EIA Positive Contacts by Distance from Index House




Population growth and uncontrolled urbanization
Increased use of water storage and disposable non-biodegradable containers
Increased number of susceptible hosts
Expanded distribution of dengue virus
Increased larval habitat
Air & other rapid travel
Increased mosquito vectors in an expanded distribution
Increased dengue infection
Increased second dengue infections
Climate change?
Ineffective mosquito control
Increased DHF

Thank you