Arboviral diseases are THE emerging problem of the 21st century: Zika

Dynamics of arboviral disease epidemiology: the past five years

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Arboviral diseases are THE emerging problem of the 21st century: Yellow fever

390 million infections annually; Bhatt et al. Nature 2013

Arboviral diseases are THE emerging problem of the 21st century: chikungunya

“Wake up call”: Epidemic arboviral diseases
What do they have in common?
**Aedes**

- *Aedes aegypti*
- *Aedes albopictus*

**Relative Vectorial Capacity**

- **1980-2009**
- **2010-2019**


**Population growth drives dengue in Singapore**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relative Risk (Relative contribution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population growth</td>
<td>42.7 (86%)</td>
</tr>
<tr>
<td>Mean temperature</td>
<td>1.8</td>
</tr>
<tr>
<td>Climate variables combined</td>
<td>7.1 (14%)</td>
</tr>
</tbody>
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**Population density facilitates transmission**

**Urban growth in Western Africa**

- **1990:** 2,500 cities
- **2020:** 6,000 cities

**Massive urbanization without the appropriate infrastructure**
Other arboviral diseases

West Nile Virus Distribution Pre-1999

Current Approximate West Nile Virus Distribution

Japanese Encephalitis

- Culex is the primary vector
- Aedes
- Anopheles
Reasons for the geographic expansion of arboviral diseases

- Modern transportation (Globalization)
- Climate change
- Virus evolution
- Lack of effective vector control
- Demographic changes (Population growth and population densities)
  - Environmental change
  - Socioeconomic factors
  - Unprecedented urban growth

What is the next arbovirus outbreak?

Severity

- Yellow fever
- Rift Valley
- Japanese encephalitis
- VEE
- Ross River
- Sindbis
- Wesselsbron
- Sepik
- Edge Hill
- Tembusu
- Me Tri

Probability of occurring

Thank you for your attention