Malaria Elimination in the Asia Pacific by 2030

Professor Sir Richard Feachem
Director
The Global Health Group
University of California, San Francisco

Development Policy Centre
Crawford School of Public Policy
Australian National University

November 25, 2014
British officer in the Indian Medical Service

Poet, scientist, mathematician, novelist, painter and musician

1897, India: Ross discovered the role of mosquitoes in transmission of malaria in humans while dissecting the stomach tissue of an anopheline mosquito that fed on a patient with malaria

1902: Awarded the second Nobel Prize for Medicine for his work on malaria
Definitions

• **Malaria Control**: reducing disease burden to a level where it is no longer a major public health problem

• **Elimination**: interrupting local mosquito-borne malaria transmission in a defined geographical area, i.e. zero incidence of locally acquired cases

• **Eradication**: permanent reduction to zero of the worldwide incidence of infection
The Malaria parasite needs both humans and mosquitoes to propagate itself. This complex life cycle has hindered efforts to engineer a vaccine that can crush the parasite. Current vaccine research strategies focus on three stages of the parasite’s life cycle (a, b, and c), two in the human and one in the mosquito.

**How Malaria Spreads**

**Inside Mosquito**

- **Sporozoite**
- **Oocyst**
- **Fertilization**
- **Male gamete**
- **Female gamete**

**Inside Human**

- **Host’s liver**
- **Liver cell**
- **Merozoites**
- **Host’s red blood cells**

**The Disease**

The rupture of infected blood cells causes malaria’s fever, chills and progressive anemia. Death may occur from severe anemia as well as clogging of blood vessels in the brain, lungs and other organs by parasitized red blood cells. In pregnancy, malaria-laden placentas rob babies of growth before they are even born.
Female *Anopheles freeborni* mosquito having a blood meal.
Malaria Transmission By Country

1900

- No malaria transmission
- Malaria transmission

Wallace Line
Buxton Line
The Endgame

2050

No malaria
The Eradication Strategy

1. Aggressive control in the heartland, to achieve very low transmission and zero mortality where possible;

2. Progressive elimination from the endemic margins to shrink the malaria map; and

3. Research to bring forward a vaccine and better drugs, diagnostics, and other tools
Asia Pacific Malaria Elimination Network (APMEN)

- Launched 2009
- 30 partner institutions
- Country-led, country-driven
- Information-sharing, capacity building, evidence gathering and advocacy
- Focus on *P. vivax*
- Australian core funding
- Annual meetings: Brisbane, Kandy, Kota Kinabalu, Seoul, Bali, Manila, Hoi An
APMEN Malaria Elimination Goals

National

Sri Lanka (2014)
Republic of Korea (2017)
China (2020)
Cambodia (2025) elimination (2020)
Nepal (2026)

Sub-National

Bhutan (2018)
Peninsular and Vanuatu (2025)
Philippines (2030)
Vietnam (2030)

Peninsular Malaysia (2020)
Solomon Islands (2020)
Indonesia 26 out of 34 Provinces (2020)
Thailand (2020) malaria-free (2020)
### Malaria in Indonesia, 2012

<table>
<thead>
<tr>
<th>Endemicity</th>
<th>District/City</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free</td>
<td>128</td>
<td>133 M</td>
</tr>
<tr>
<td>Low &lt; 1‰</td>
<td>204</td>
<td>28 M</td>
</tr>
<tr>
<td>Moderate 1-5‰</td>
<td>85</td>
<td>73 M</td>
</tr>
<tr>
<td>High &gt; 5‰</td>
<td>84</td>
<td>16 M</td>
</tr>
</tbody>
</table>

70% of malaria cases <7% of total population
Five provinces selected:

- Papaya
- Laguna
- Cavite

Malaria in the Philippines, 2005-2011

Legend:
- ≥ 1,000 CASES/YEAR
- 100 - 999 CASES/YEAR
- 1 - 99 CASES/YEAR
- 0 CASE/YEAR

2005

2011

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From evidence to action
Goal 2015:
Eliminate everywhere except border counties in Yunnan and Tibet.

Goal 2020:
Eliminate malaria in all China.
Malaria in Sri Lanka, 1999-2013

- 1911: First Anti Malaria Centre set up at Kurunegala
- 1913: Incrimination of Anopheles culicifacies as primary vector
- 1921: Appointment of first malariologist
- 1934/35: Devastating malaria epidemic
- 1936: Eradication nearly achieved
- 1963: Resurgence of malaria leading to a countrywide epidemic
- 1967/68: DDT resistance in An. culicifacies first detected
- 1969: Widespread malathion resistance in An. culicifacies first detected
- 1975: Introduction of malathion
- 1984: Chloroquine-resistant Pf first detected
- 1999: RBM launched
- 2003: GFATM project launched
- 2007: ACT introduced
- 2009: Elimination programme launched
- 2012: Last indigenous case reported

Total Cases (Millions)
The Changing Face of Malaria: Sri Lanka

Proportion of total annual confirmed infections

- % P. vivax
- % Adults (> 15 years)
- % Male
- % Imported

Year:
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013

Values:
- 1999: 76%
- 2000: 88%
- 2001: 95%
- 2002: 95%
- 2003: 93%
- 2004: 93%
- 2005: 90%
- 2006: 77%
- 2007: 60%
- 2008: 94%
- 2009: 84%
- 2010: 71%
- 2011: 55%
- 2012: 55%
- 2013: 84%
Let History NOT Repeat Itself
Sri Lanka: Imported Cases by Nationality, 2013

Graph Courtesy of Sri Lanka Anti-Malaria Campaign, 2014
Pacific Malaria Initiative

Total microscopy confirmed Malaria cases in Isabel Province 2000-2011 (June)
East Asia Summit Statement 14 November 2014, Nay Pyi Taw

19. We reiterated our commitment to the Declaration of the 7th East Asia Summit on Regional Responses to Malaria Control and Addressing Resistance to Anti-malaria Medicines. We welcomed the Asia Pacific Leaders Malaria Alliance (APLMA) Task Force Progress Report 2014 and agreed to the goal of an Asia Pacific free of Malaria by 2030. We tasked the APLMA co-chairs to submit to the 10th EAS in Malaysia a plan for achieving this goal and to implement the recommendations of the APLMA Task Forces.
Monkey Business

The Challenges Now for Elimination

1. Political Commitment
   - ALMA??
   - APLMA??
   - Dengue! Ebola!

2. Finance
   - “No malaria, cut the budget!”
   - Global Fund
   - Measles logic

3. Management
   - Generally weak
   - Sine Qua Non

4. Reengineering
   - Easiest because technical
   - Most likely to happen
At least 20 countries

- dependent on the big four
  - Political Commitment
  - Management
  - Reengineering

Elimination Between Now and 2020

- Algeria
- Argentina
- Azerbaijan
- Belize
- Botswana
- Cape Verde
- Costa Rica
- El Salvador
- Iran
- Kyrgyzstan
- Mayotte
- Paraguay
- Rep. of Korea
- Saudi Arabia
- Sri Lanka
- Swaziland
- Tajikistan
- Turkey
- Uzbekistan
Elimination After 2020

- 80 countries
- Dependent on the big four

Science / Discovery
The Need to Commit
The Need to Commit

2040

No malaria
Malaria elimination

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From evidence to action
“Whatever you can do, or dream you can do, begin it. **Boldness** has genius, power and magic in it.”

Johann Wolfgang von Goethe (1749-1842)
*Faust*, 1835
“Until one is committed, there is hesitancy, the chance to draw back, always ineffectiveness. The moment one definitely commits oneself, providence moves too. A whole stream of events issues from the decision, raising in one’s favor all manner of unforeseen incidents, meetings, and material assistance, which no man could have dreamt would have come his way.”

W. H. Murray, OBE (1913-1996)  
*The Scottish Himalayan Expedition*, 1951