

Shrinking the Malaria Map: 1900 to 2025

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Malaria

MAL

ARIA

Bad

Air



Sir Ronald Ross



- 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



Theodore Roosevelt on Malaria in Cuba

“The army is disabled by malarial-fever to such an extent that its efficiency is destroyed.”

1898



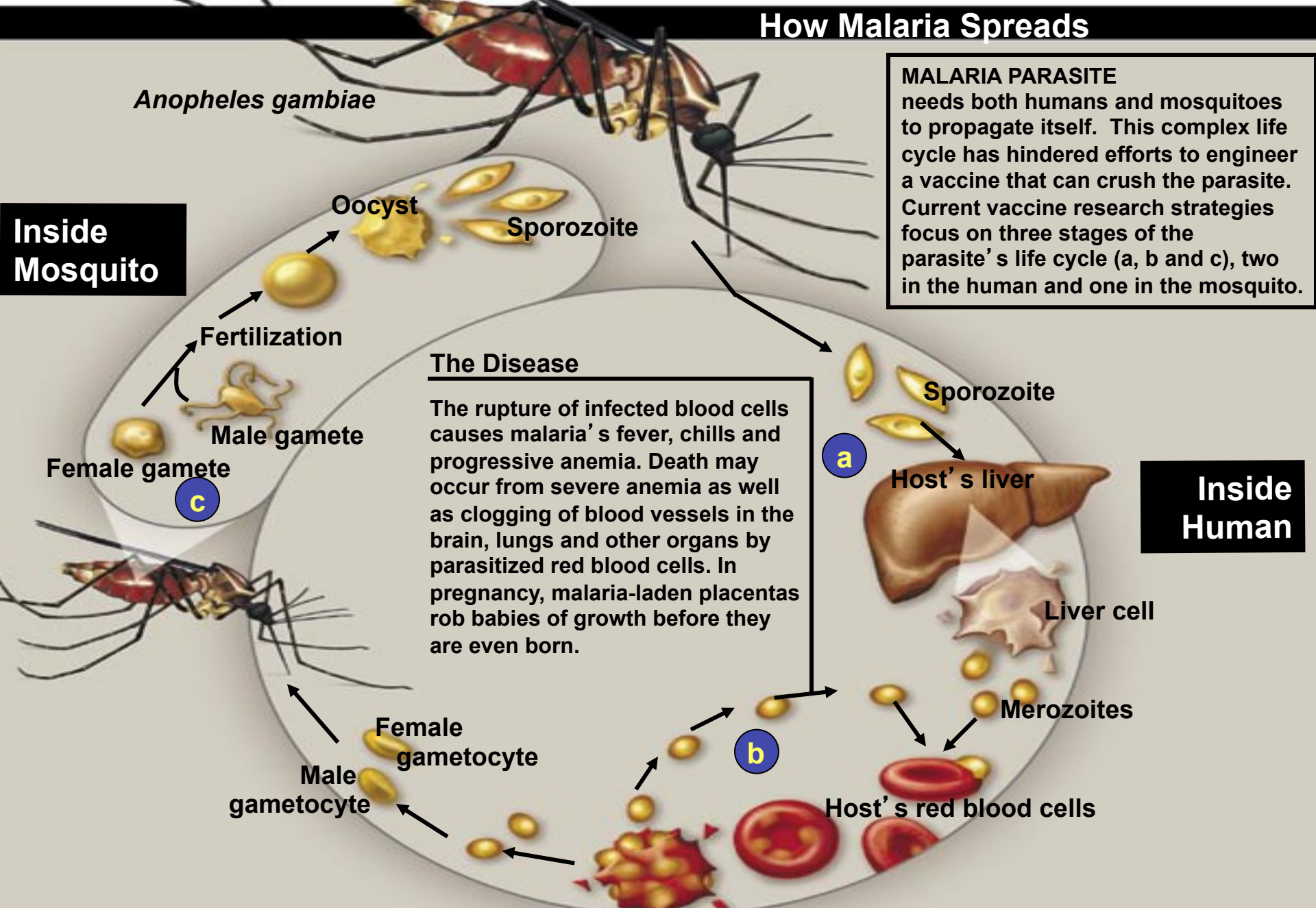
Courtesy of Colonel Dennis Shanks

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

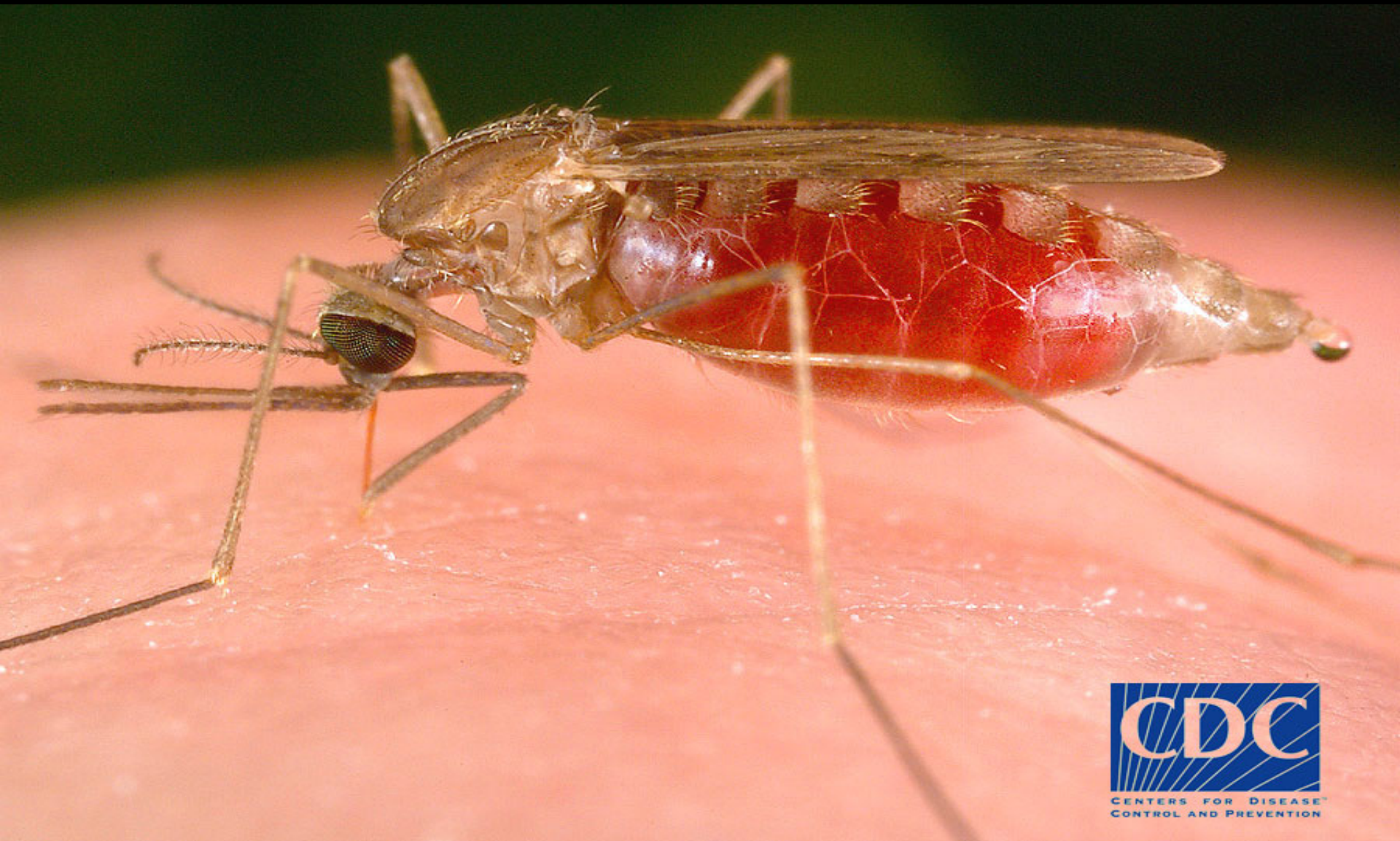


How Malaria Spreads



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.

Female *Anopheles freeborni* mosquito having a blood meal

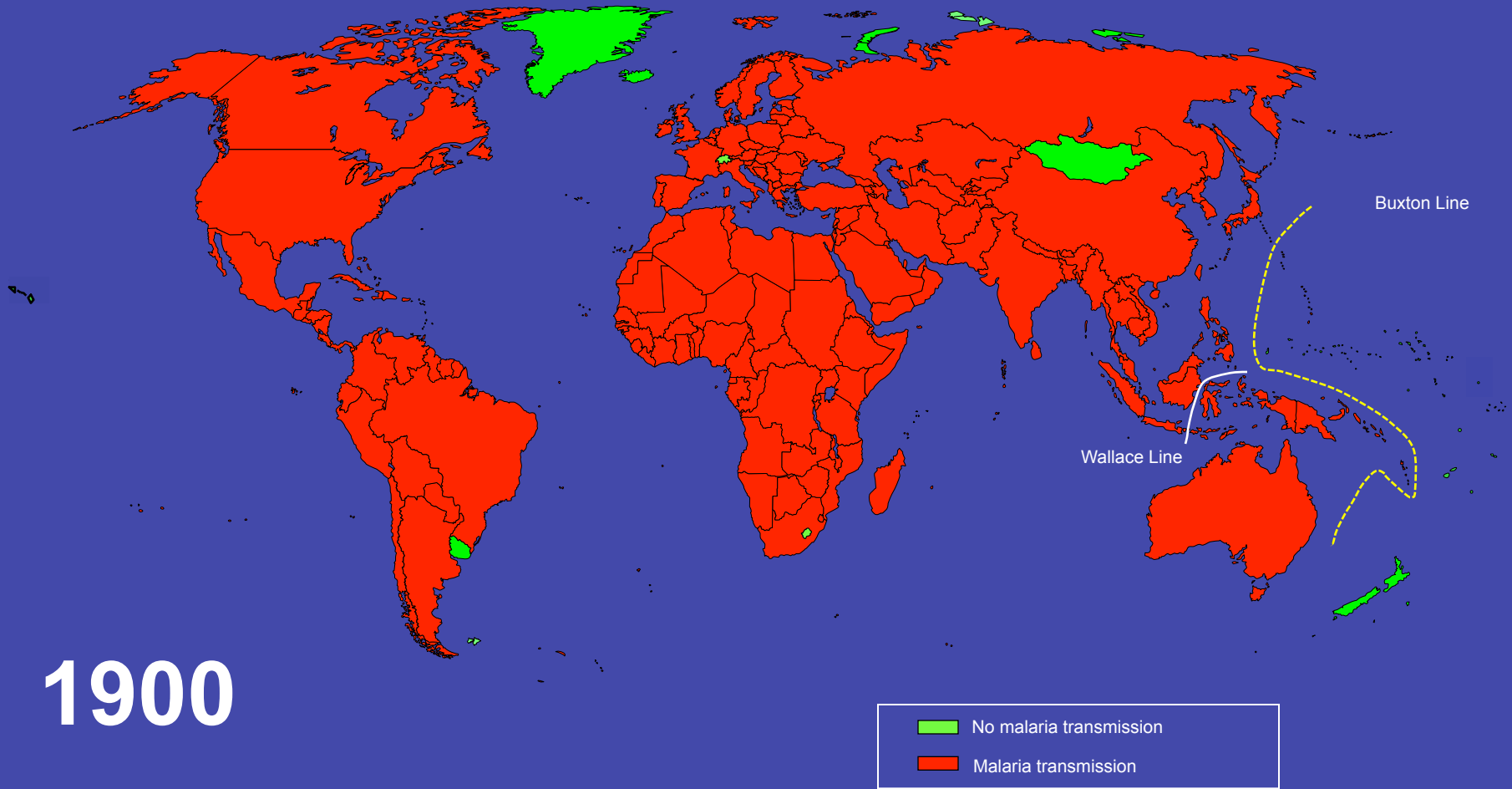


The Eradication Strategy

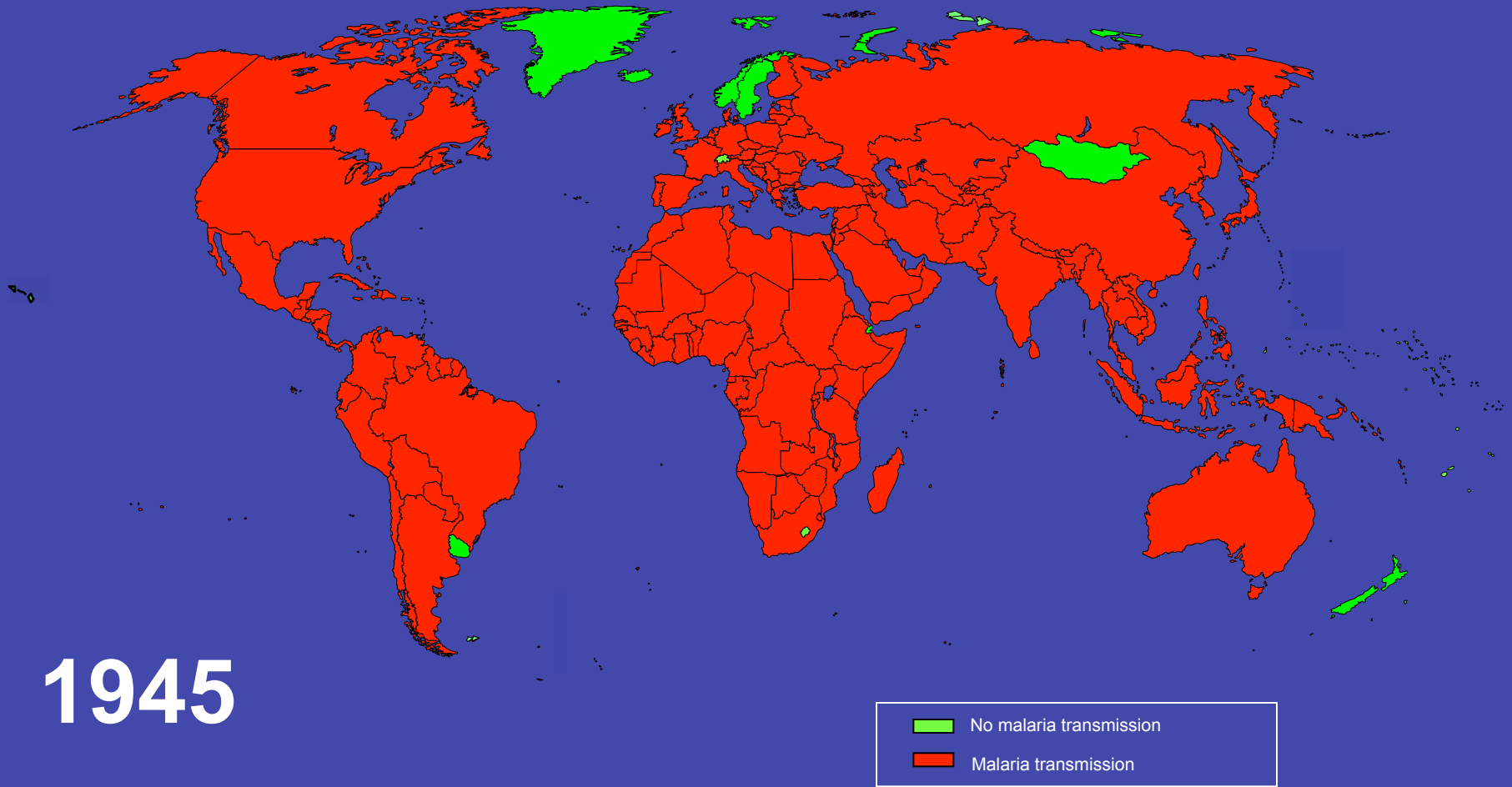
1. Aggressive control in the heartland, to achieve very low transmission and zero mortality where possible;
2. Progressive elimination from the endemic margins to shrink the malaria map; and
3. Research to bring forward a vaccine and better drugs, diagnostics, and other tools



Malaria Transmission By Country

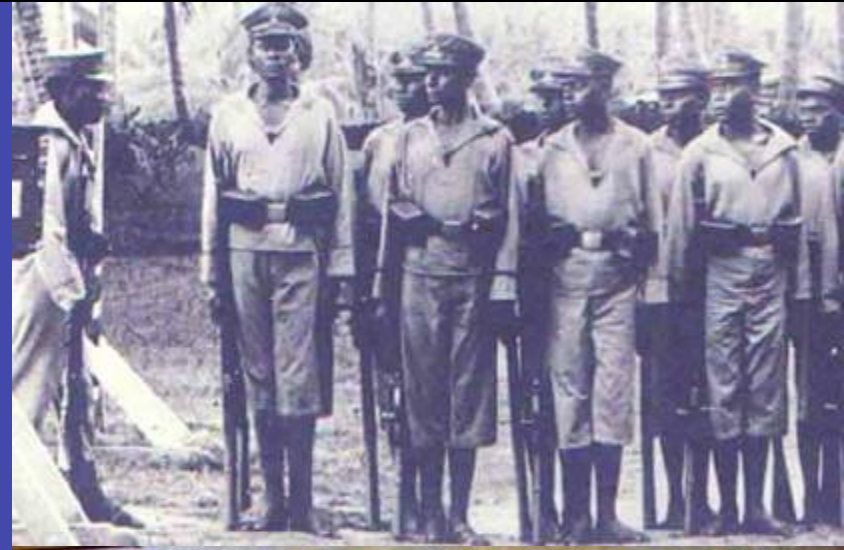


Malaria Transmission By Country



Australian Capture of German New Guinea 1914

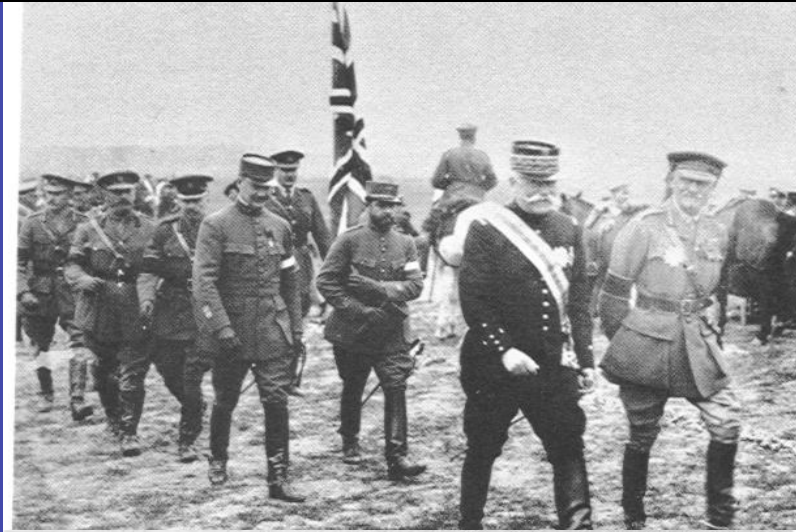
- Australian Naval / Military Expeditionary Force seized German Colony of New Guinea from Aug 1914
- By Jan 1915, 60% of Army and 15% of Navy were infected filling the hospitals, causing many deaths and abandonment of Angorum on the Sepik River



Courtesy of Colonel Dennis Shanks

Salonika, Greece 1916-1918

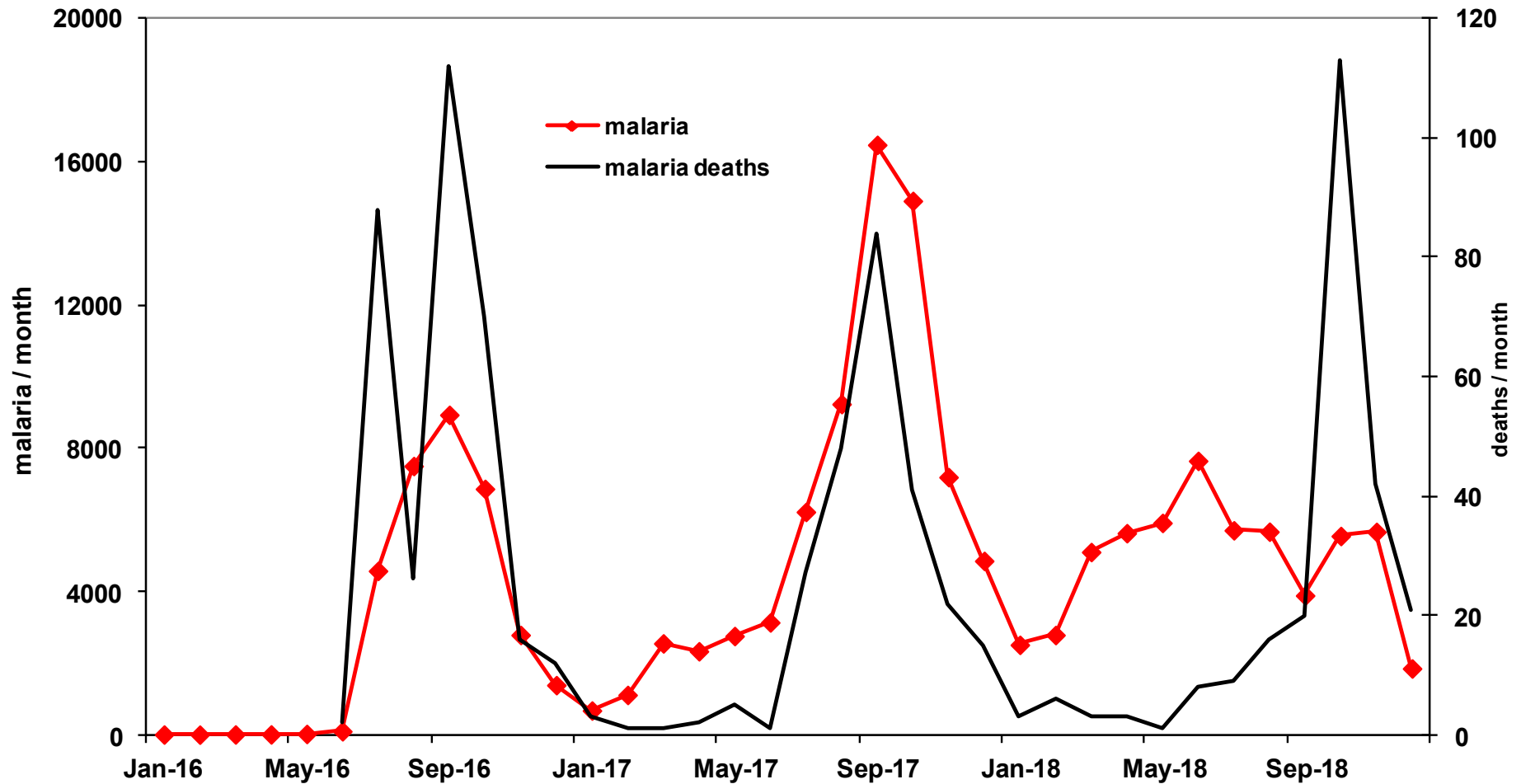
- Trench warfare of Anglo-French Army against German-Bulgarian
- 34,762 British invalided home as chronic malarial cases; up to 20% of army in hospital at any time
- Entire Army Corps incapable of operations



Courtesy of Colonel Dennis Shanks

Summer Malaria Epidemics in Soldiers

Malaria in British Soldiers in Salonika, Greece 1916-18



Australian / British / Indian Army Invades Palestine Fighting the Turks 1918

- General Allenby's Allied Army attacks Turks in Palestine in Sept 1918
- Last major cavalry operation as 3 Mounted Divisions break the line going north into Jordan, Syria: Battle of Megiddo
- During capture of Amman and Damascus, outbreaks of malaria overwhelm military operations and halt advance



Courtesy of Colonel Dennis Shanks

Malaria in Bataan, Philippines 1942

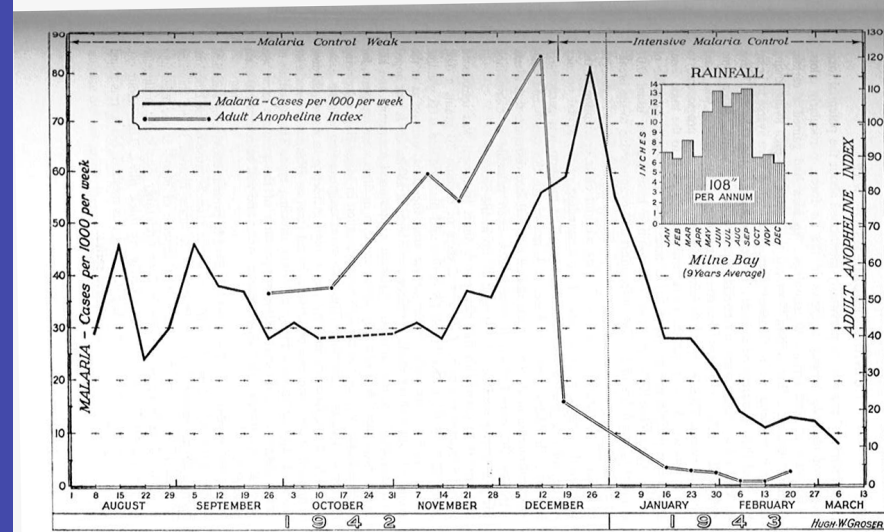
- Although defeat was inevitable, Bataan fell more rapidly because the force was debilitated by malaria
- 500-700 malaria casualties / day taken out of the fight



Courtesy of Colonel Dennis Shanks

Milne Bay, New Guinea 1942-43

- Joint Australian / US force destroyed Japanese Imperial Marine Landing Brigade in Sept 1942
- By November, malaria rates in excess of 1000 / 1000 per year shut down military operations until malaria was controlled



Courtesy of Colonel Dennis Shanks

Dr. Seuss on Malaria

THIS IS Ann..

*Her full name is Anopheles Mosquito
and she's dying to meet you!*



Her trade is dishing out
MALARIA. She's at home in
Africa, the Caribbean, India, the
South and Southwest Pacific
and other hot spots.



... *she drinks blood!*

Ann moves around at
night (a real party gal)
and she's got a thirst.
No whiskey, gin, beer
or rum coke for Ann...
she drinks G. I. blood. She jabs
that beak of hers in like
a drill and sucks
up the juice... then
the poor G. I. is going
to feel awful in about
eight or fourteen days...
because he is going to
have *ma/aria*

Dr. Seuss



Turn the page



Shrinking the Malaria Map

*has been occurring since 1900
and continues today*



STATE AND LOCAL HEALTH AGENCIES FOR THE PROTECTION OF FIGHTING
MEN AND WAR WORKERS.

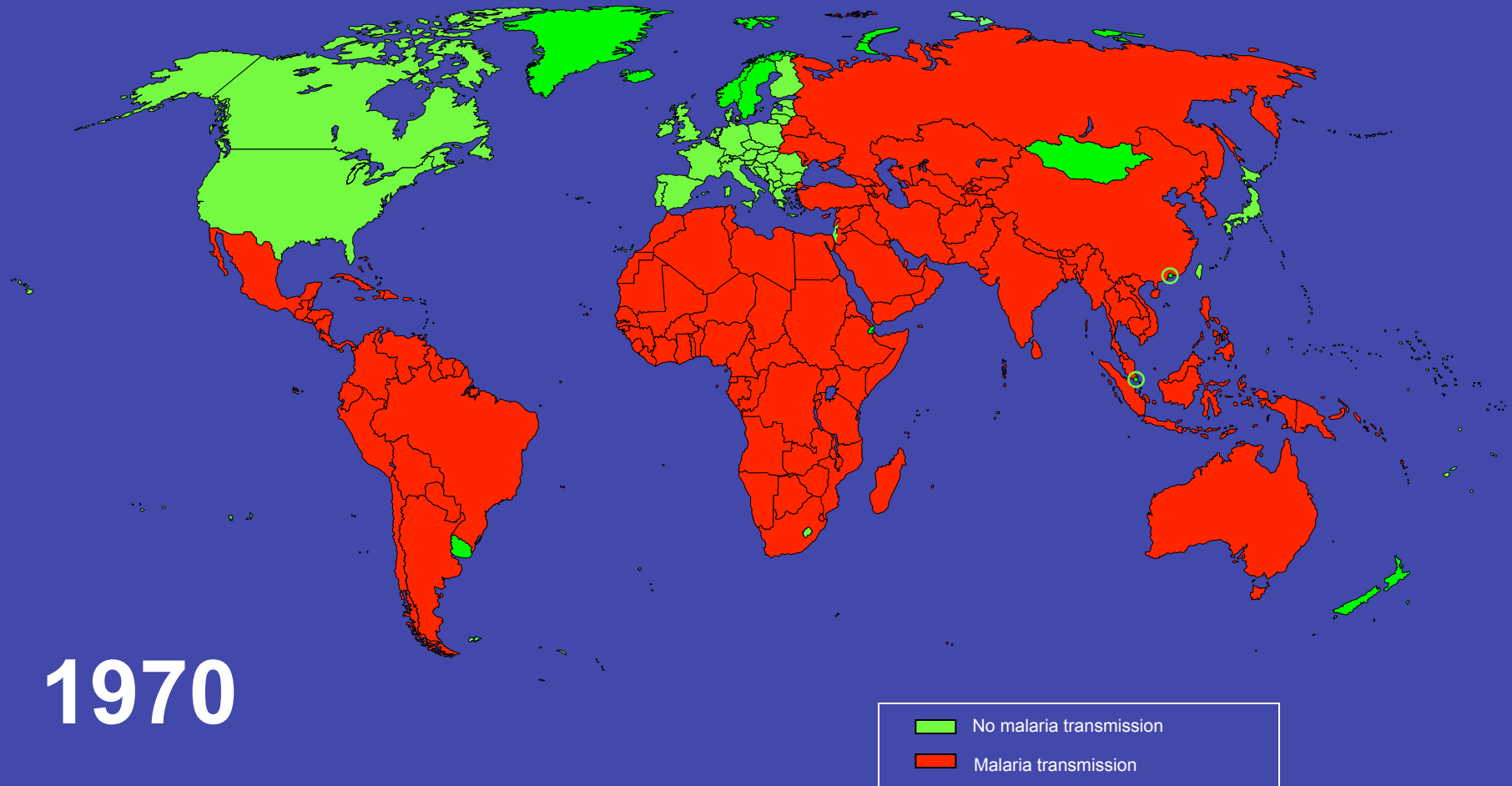
This cartoon, from the Malaria Control in War Areas report for 1942–1943 (p. 5), depicts the mosquito as an enemy airplane carrying a disease "bomb." Here the emphasis is on the separation of the mosquito from barracks, ships, and industry.



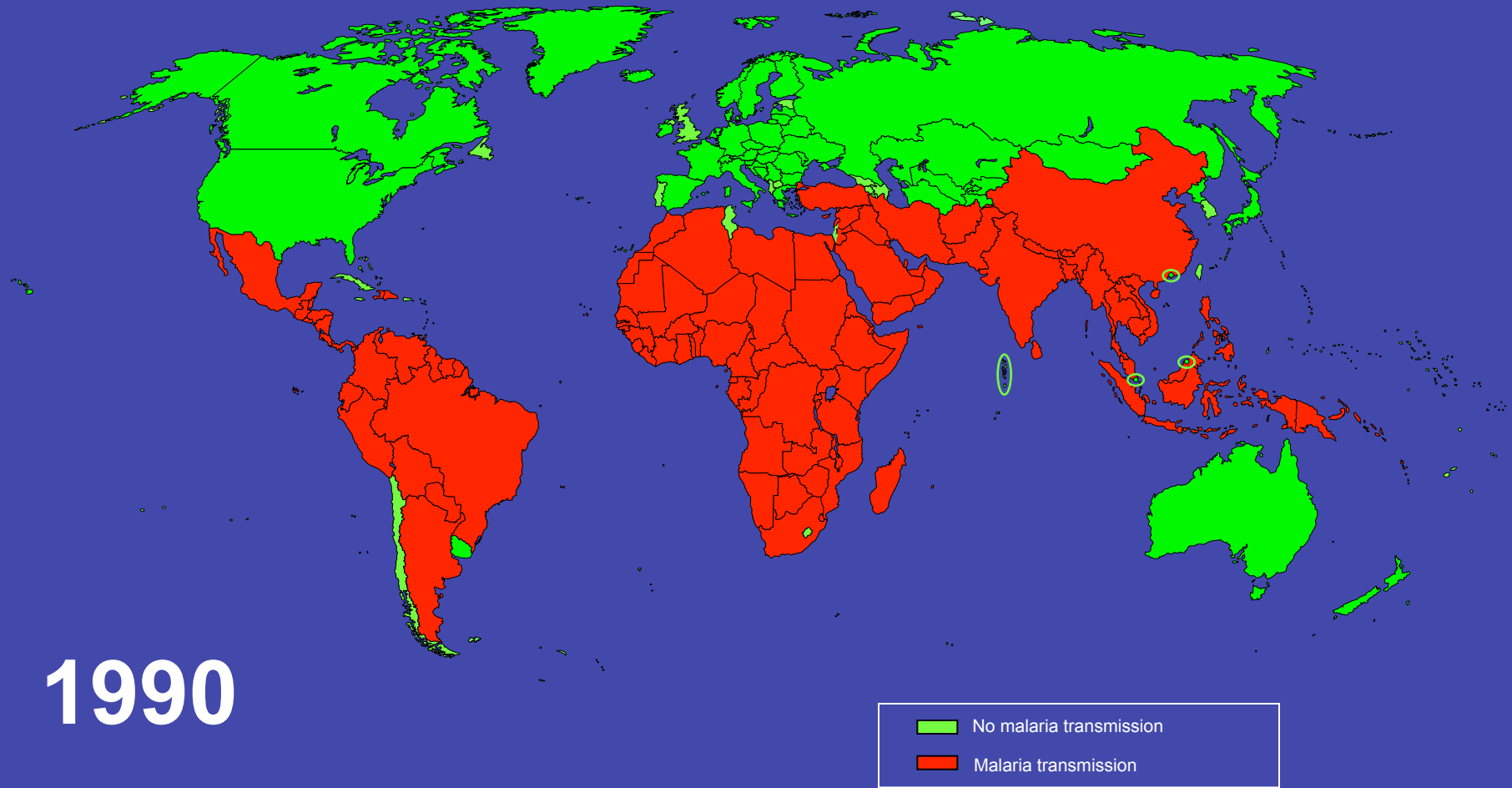
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From evidence to action

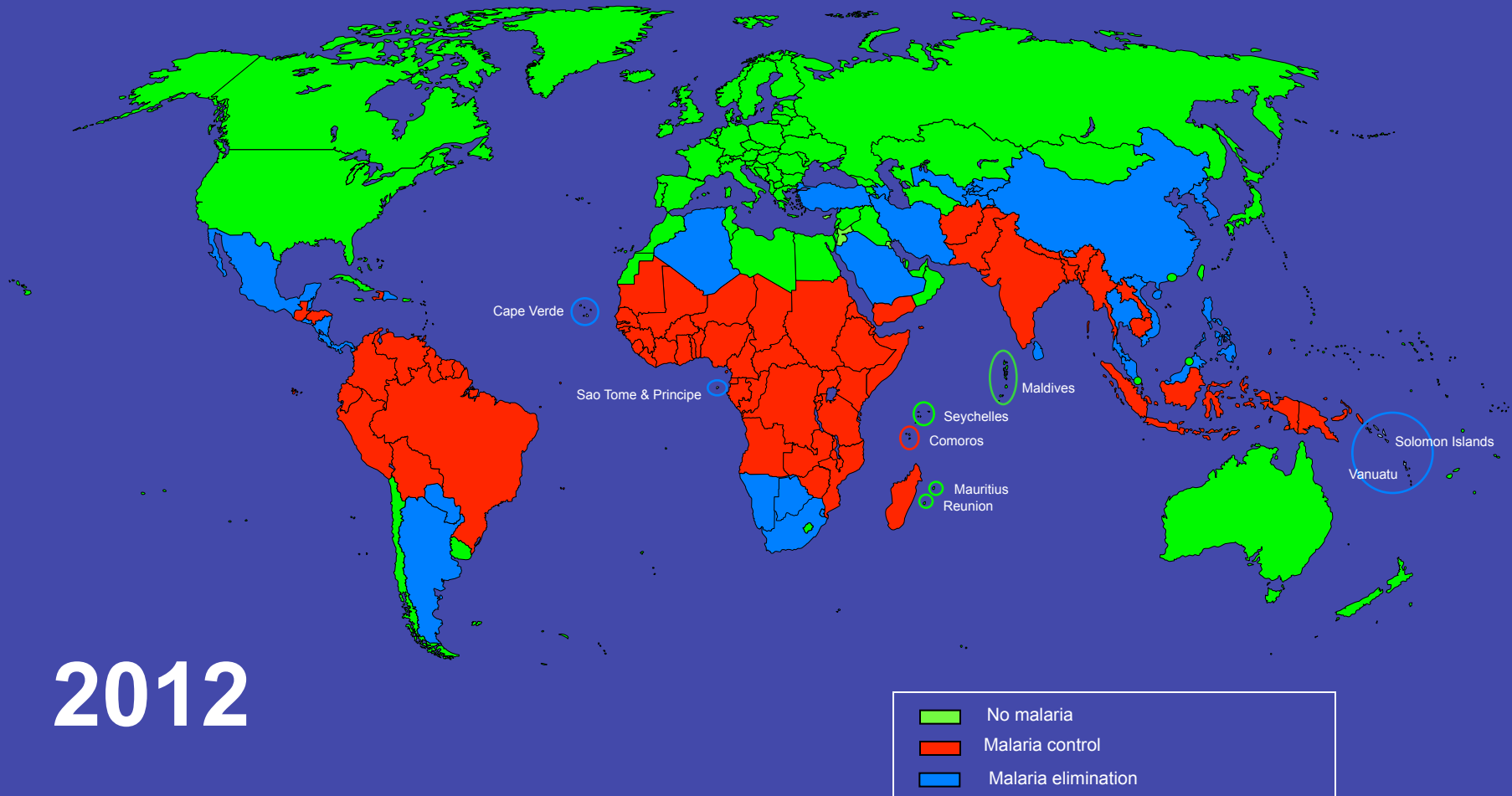
Malaria Transmission By Country



Malaria Transmission By Country

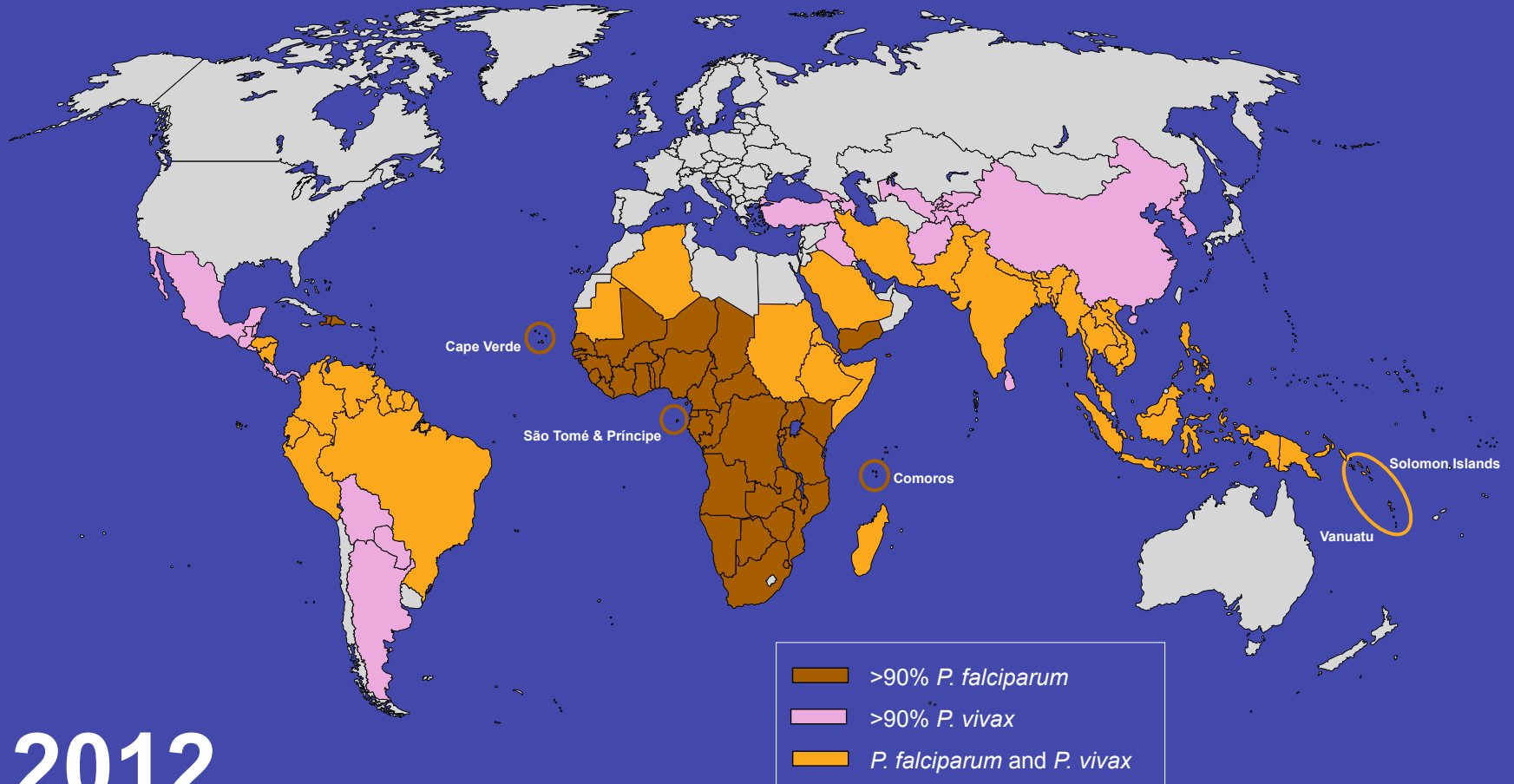


Progress Towards Elimination by Country



2012

Human Malaria Parasite by Country



Asia Pacific Malaria Elimination Network

- Country-led, country-driven
- 13 countries with a goal of national or sub-national elimination...and growing
- Information sharing, capacity building, research, and advocacy
- Focus on *P. vivax*
- AusAID grant

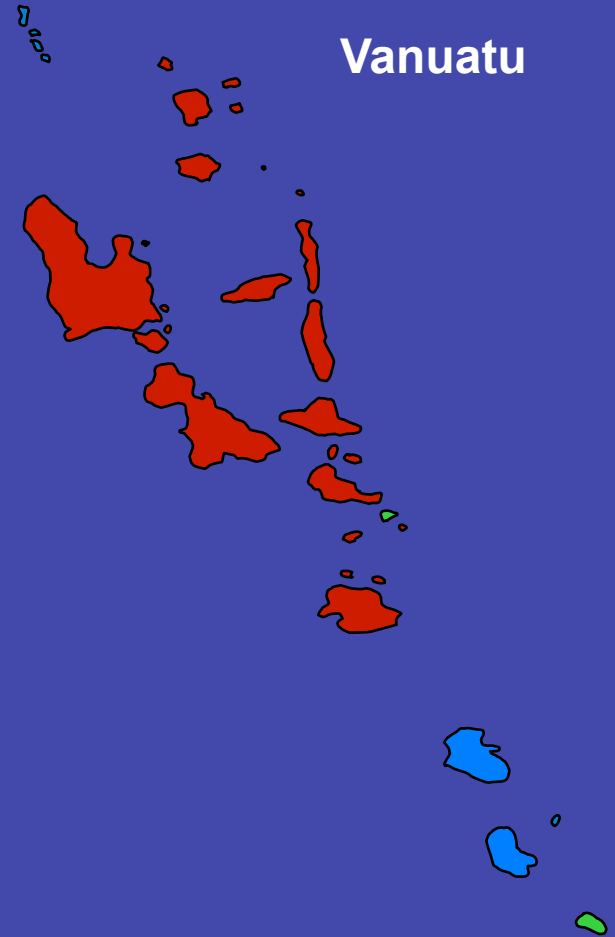


www.apmen.org

Pacific Malaria Initiative

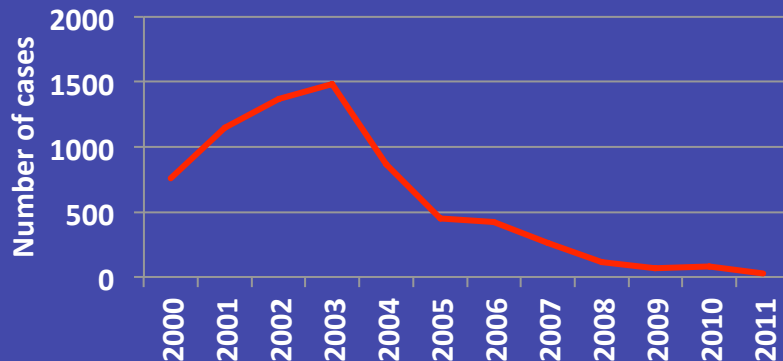


Solomon Islands

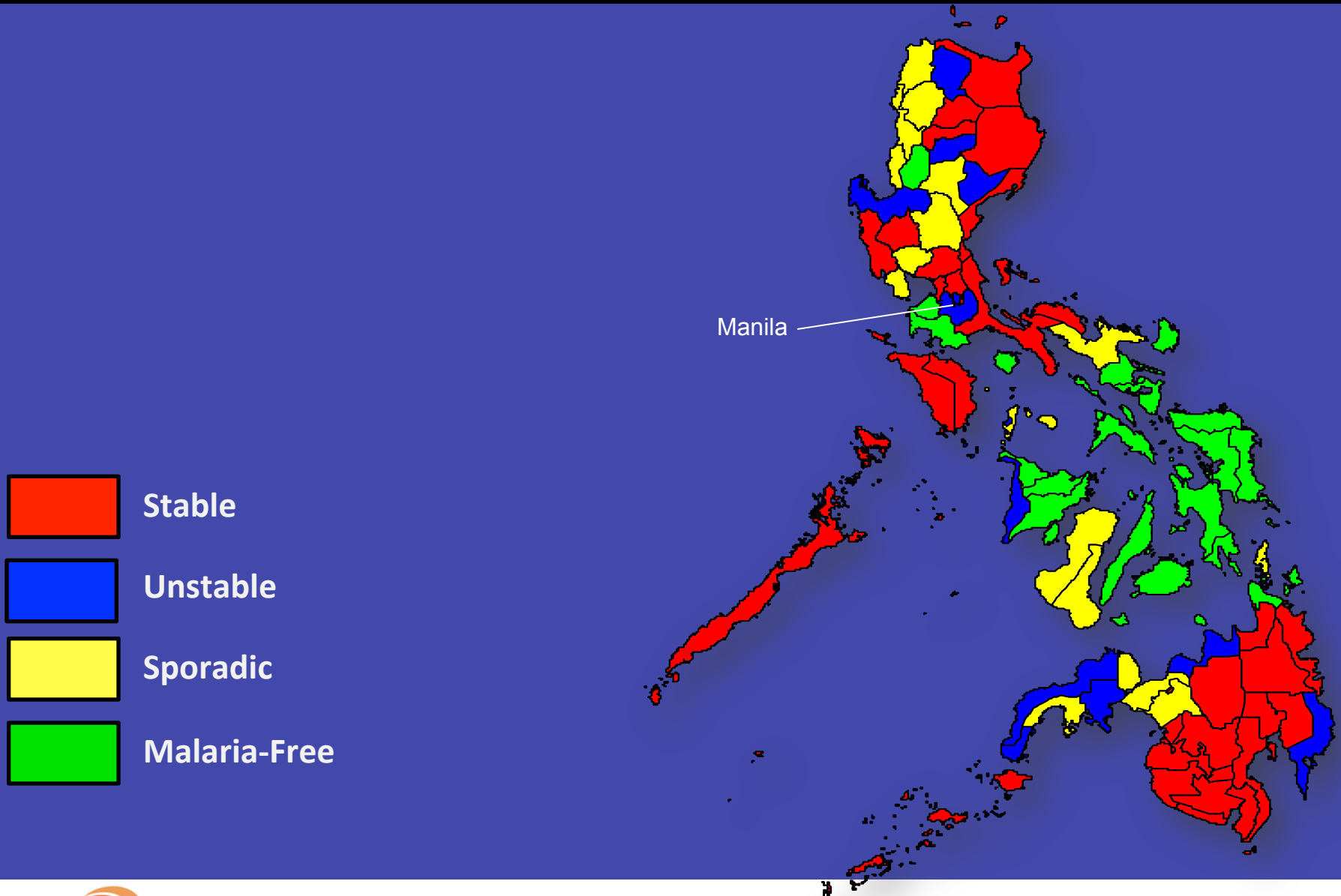


Vanuatu

Total microscopy confirmed Malaria cases in Isabel Province 2000-2011 (June)



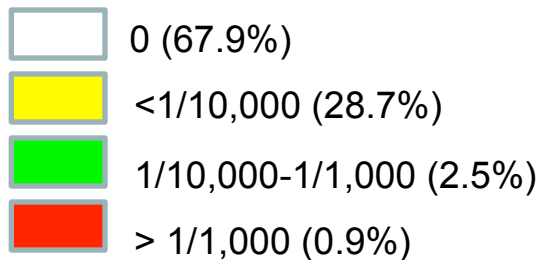
Malaria in the Philippines, 2010



Malaria in China, 2010

2,787 counties with 1.2 billion population in areas of malaria basic elimination.

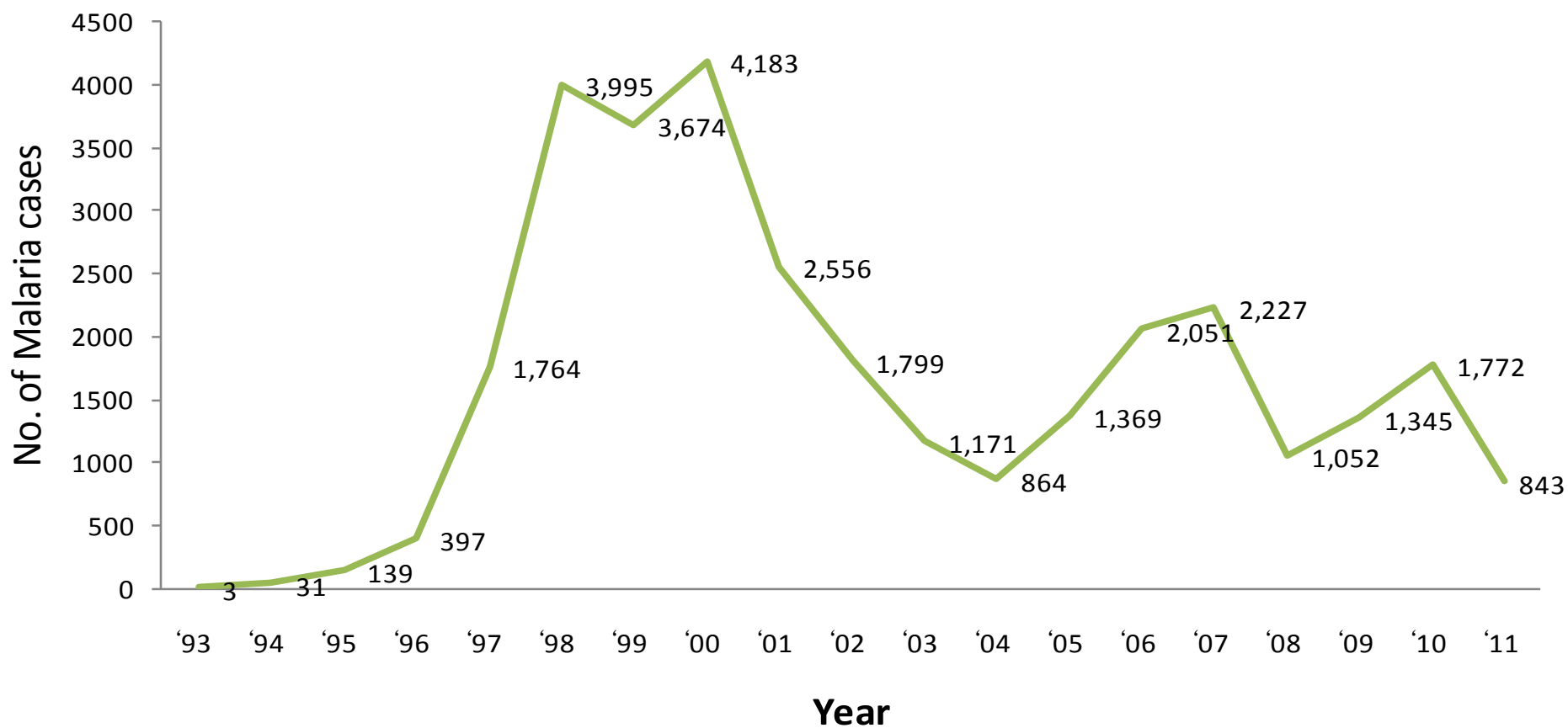
Malaria Incidence by County



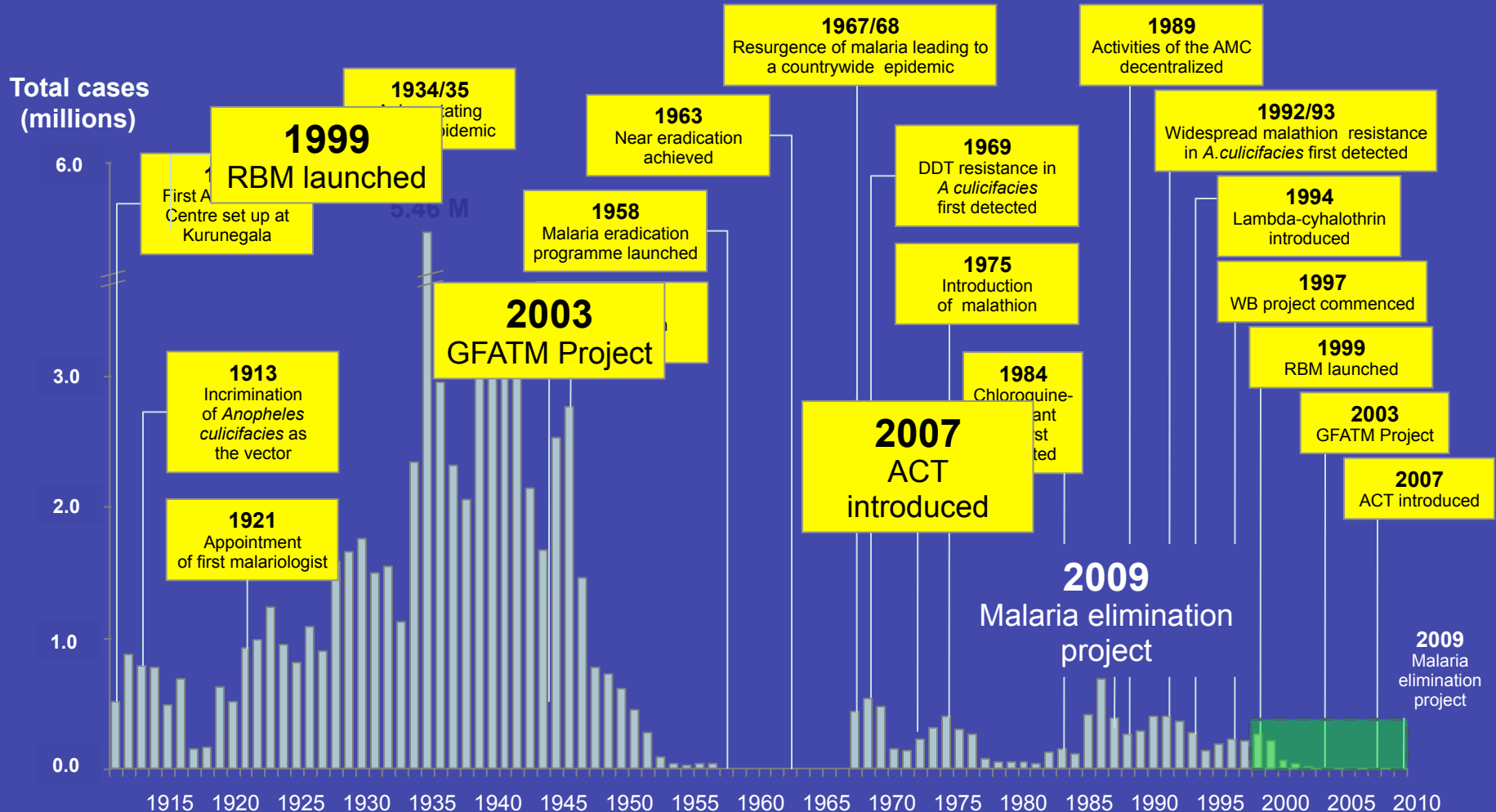
14491 cases (*P.f.*: 7%)
Died: 12 cases

Malaria in South Korea, 1993-2011

	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11
Domestic	1	25	107	356	1,724	3,932	3,621	4,142	2,488	1,763	1,107	826	1,324	2,021	2,192	1,023	1,319	1,721	785
Imported	2	6	32	41	40	63	53	41	68	36	64	38	45	30	35	29	26	51	58
Total	3	31	139	397	1,764	3,995	3,674	4,183	2,556	1,799	1,171	864	1,369	2,051	2,227	1,052	1,345	1,772	843

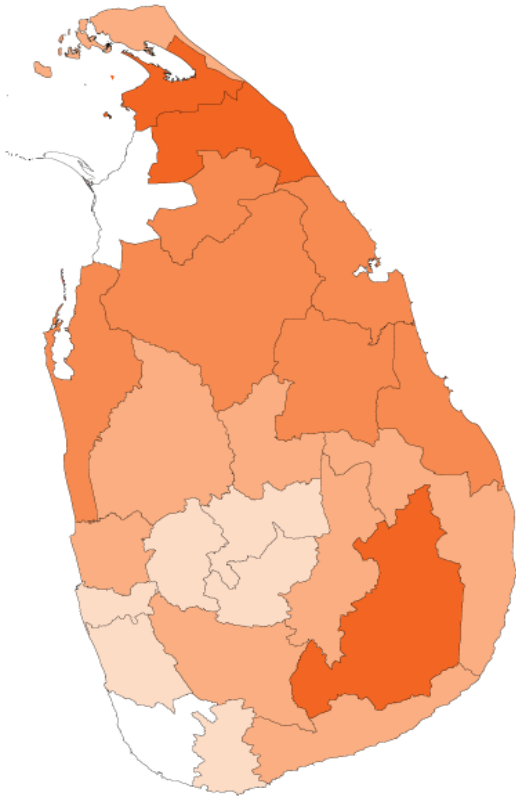


Malaria in Sri Lanka, 1911-2010

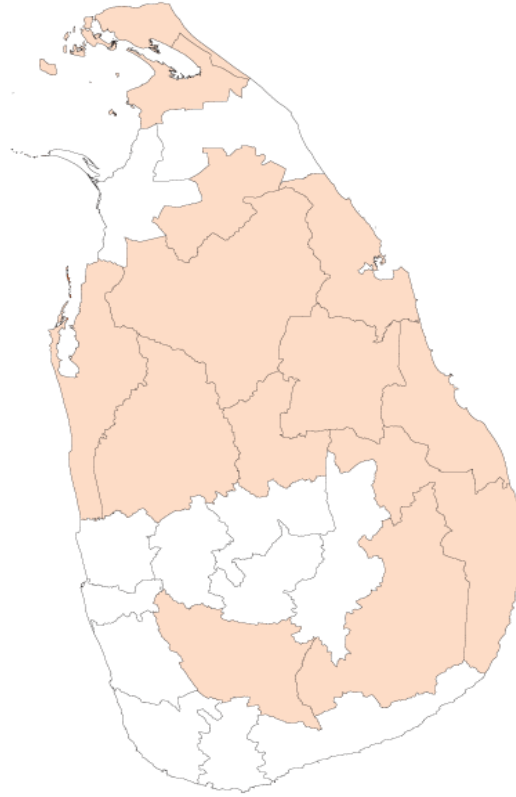


Sri Lanka

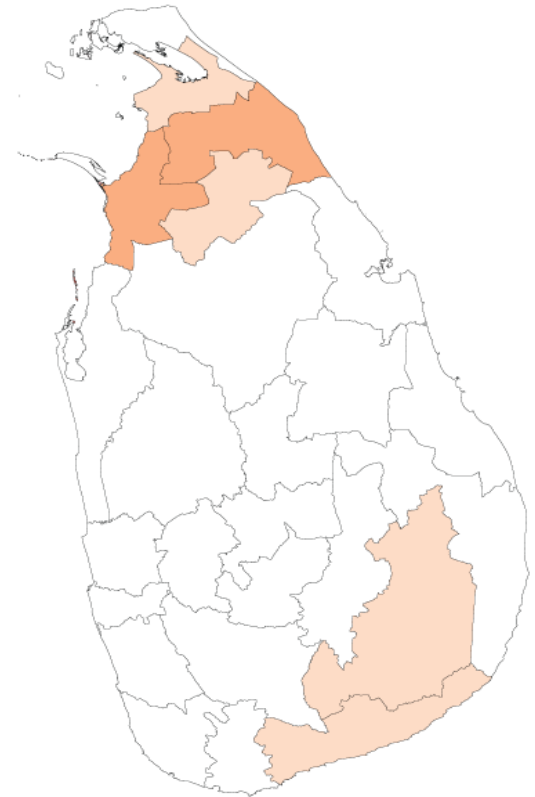
2000



2005



2010



Legend



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<1.0 API



<10 API



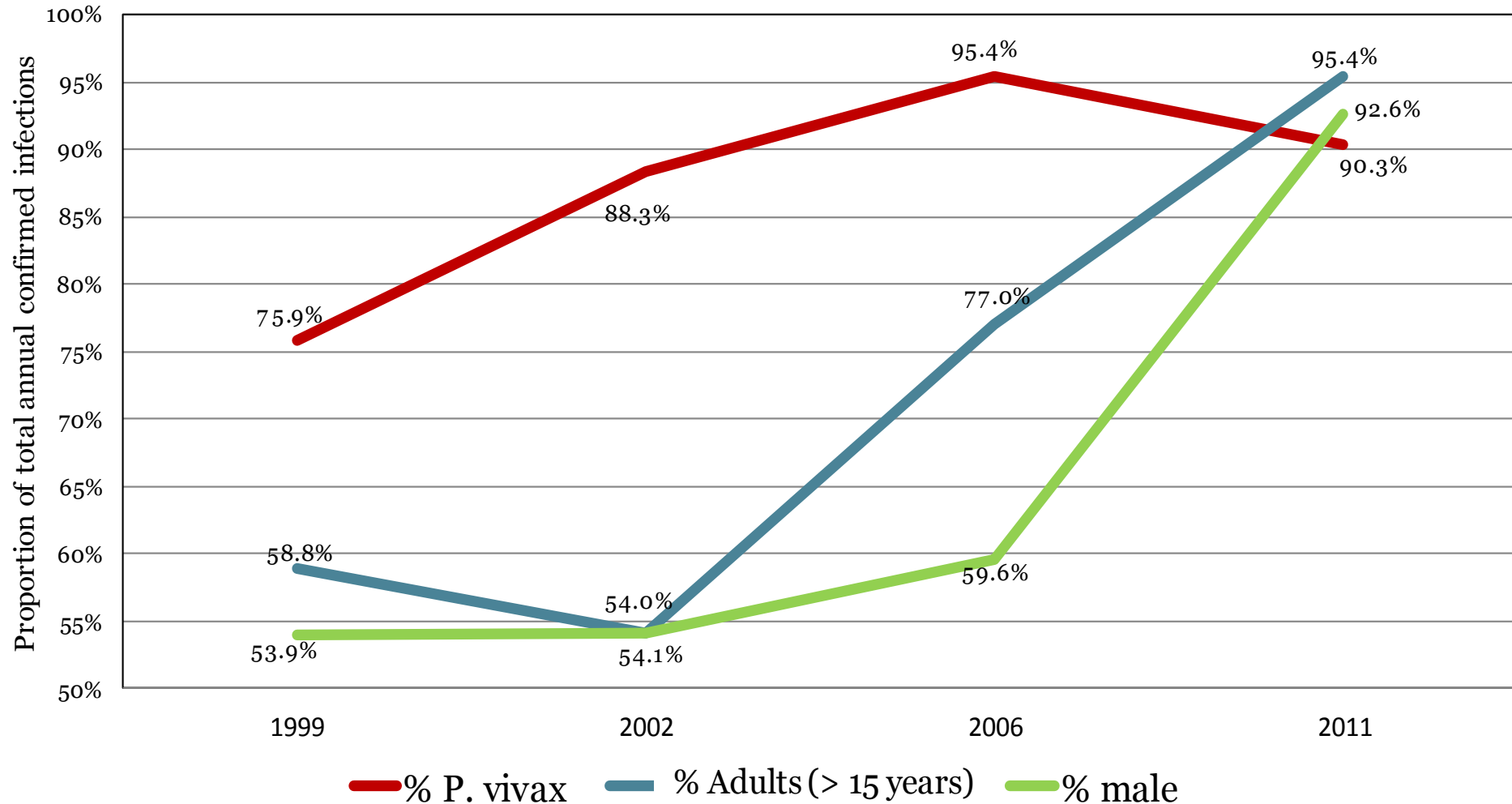
<100 API



>100 API



The Changing Face of Malaria : Sri Lanka



Sri Lanka had a total of 175 cases of malaria in 2011, 124 indigenous and 51 imported. Of the indigenous cases, 95% were in adults, 94% were in males, and 96% were caused by *P. vivax*.

Malaria 2012: Saving Lives in the Asia-Pacific

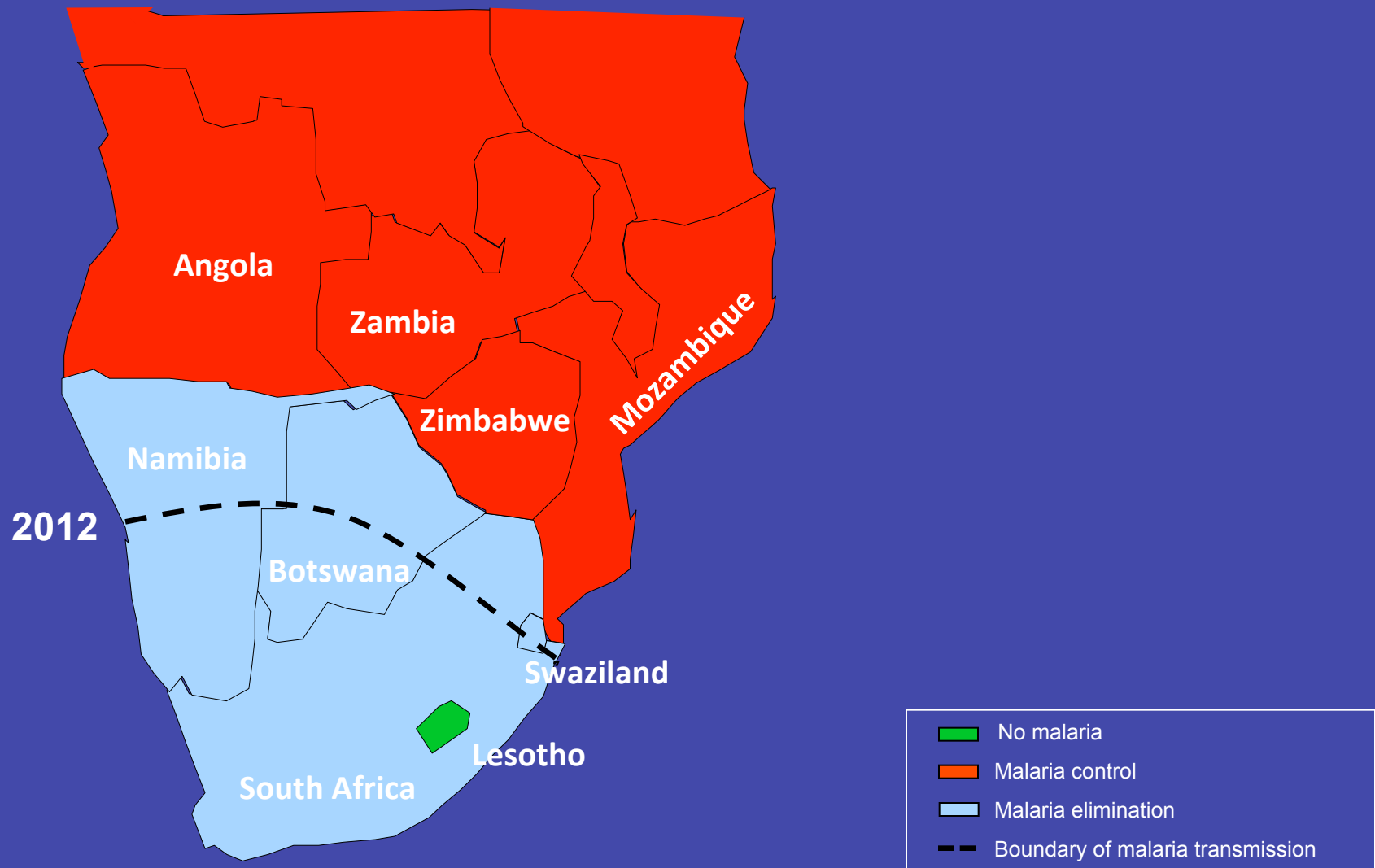


31 October - 2 November · InterContinental Hotel, Sydney Australia

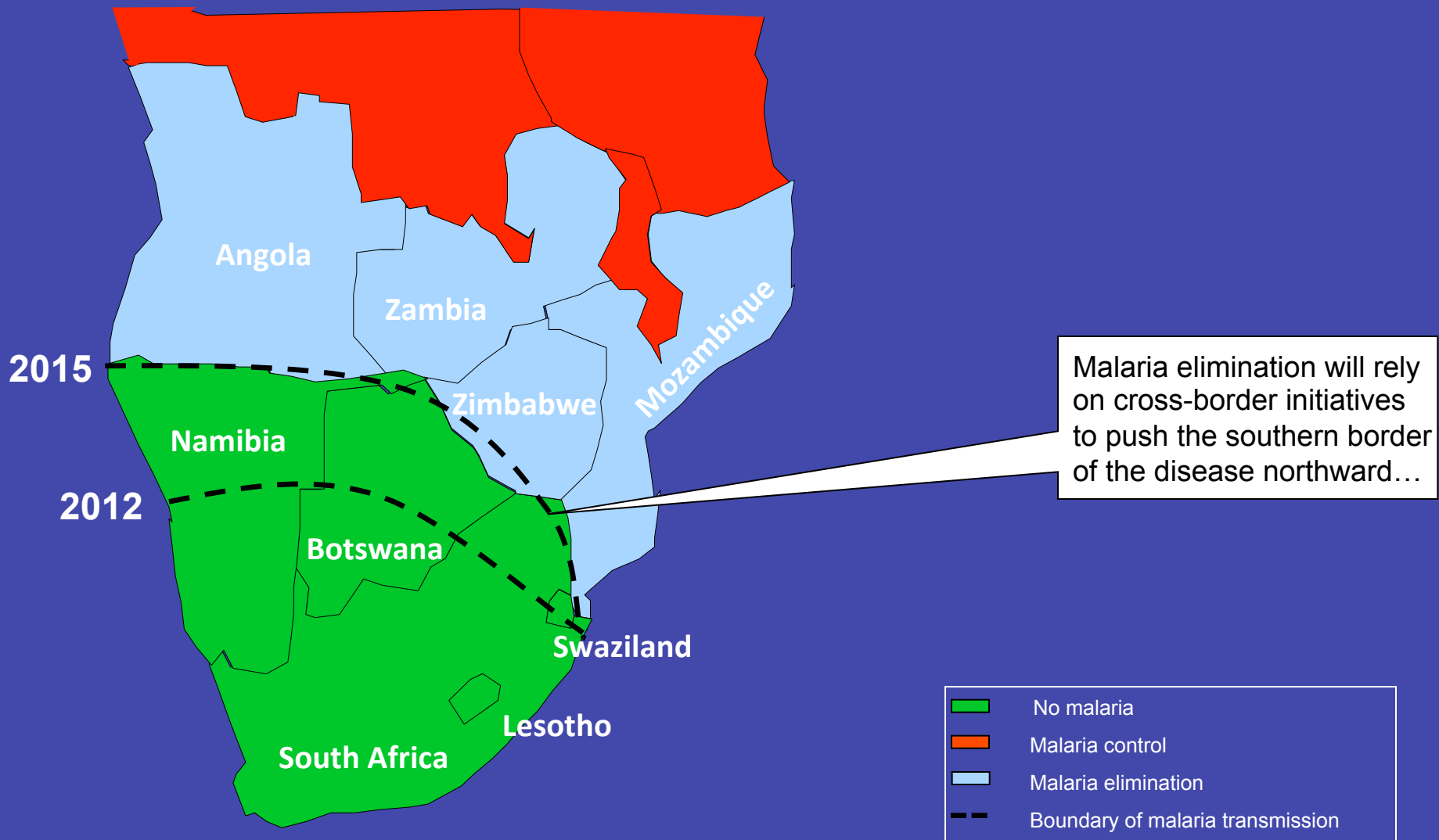


Malaria 2012 is hosted by the Australian Government through the Australian Agency for International Development (AusAID).

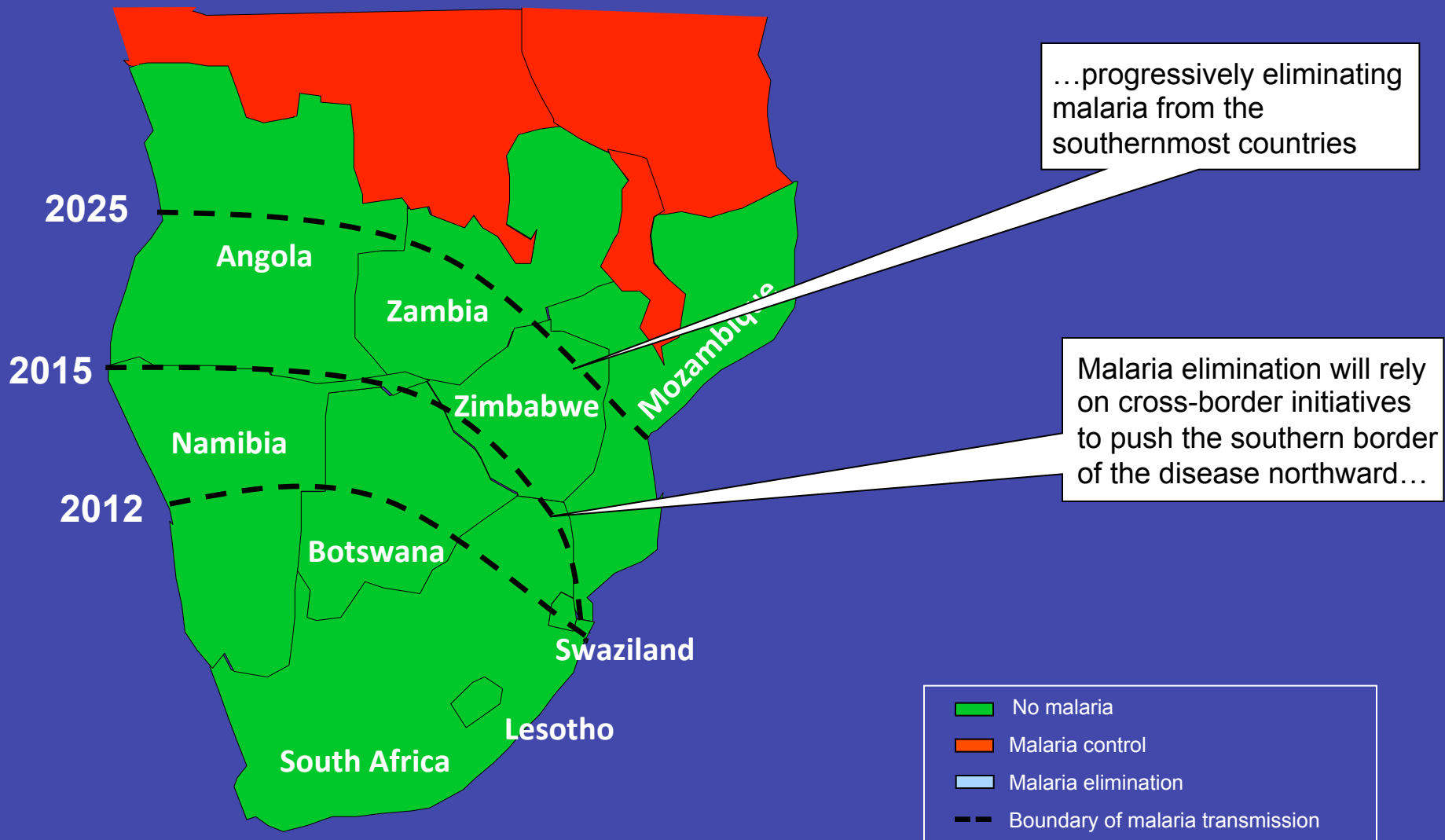
Southern Africa Elimination Strategy



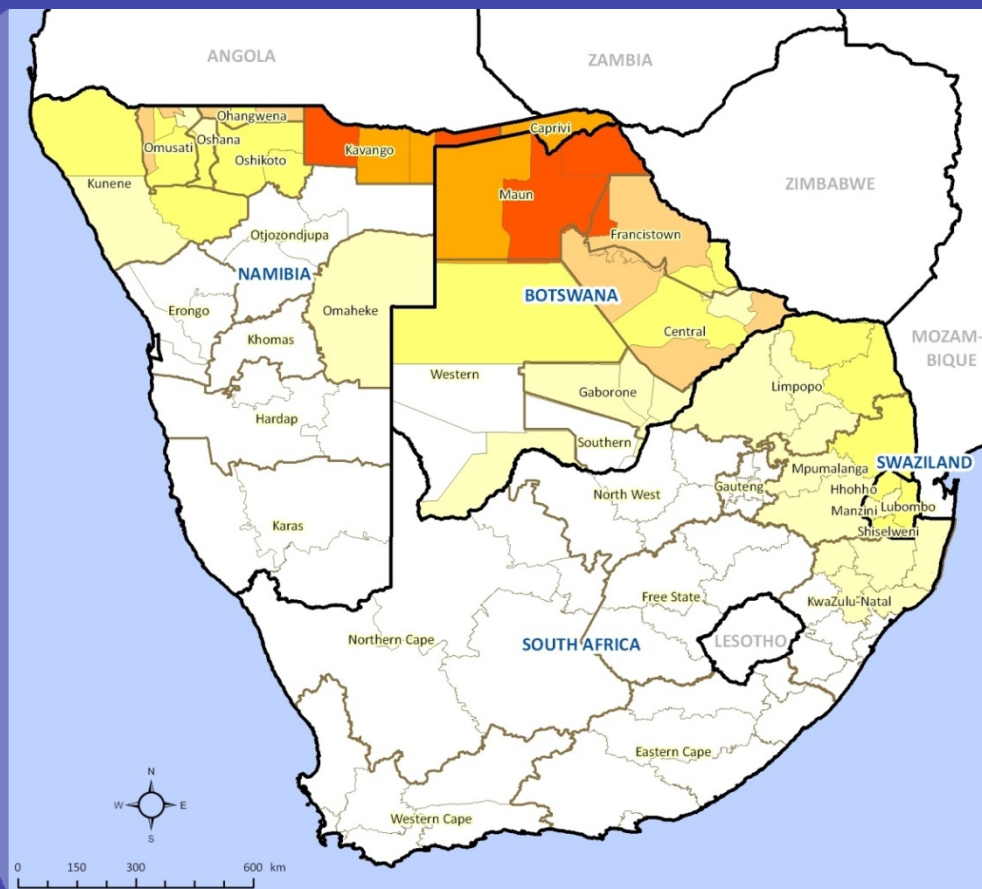
Southern Africa Elimination Strategy



Southern Africa Elimination Strategy

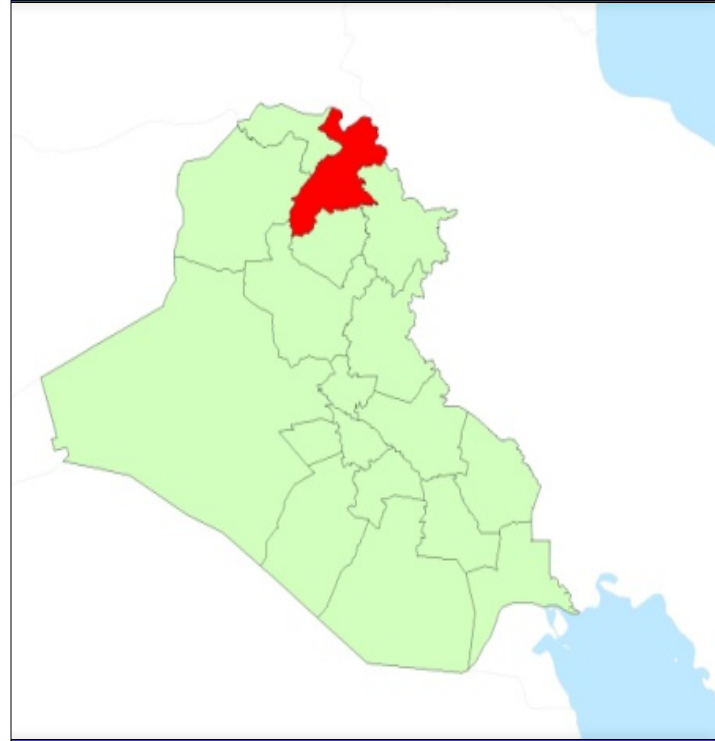
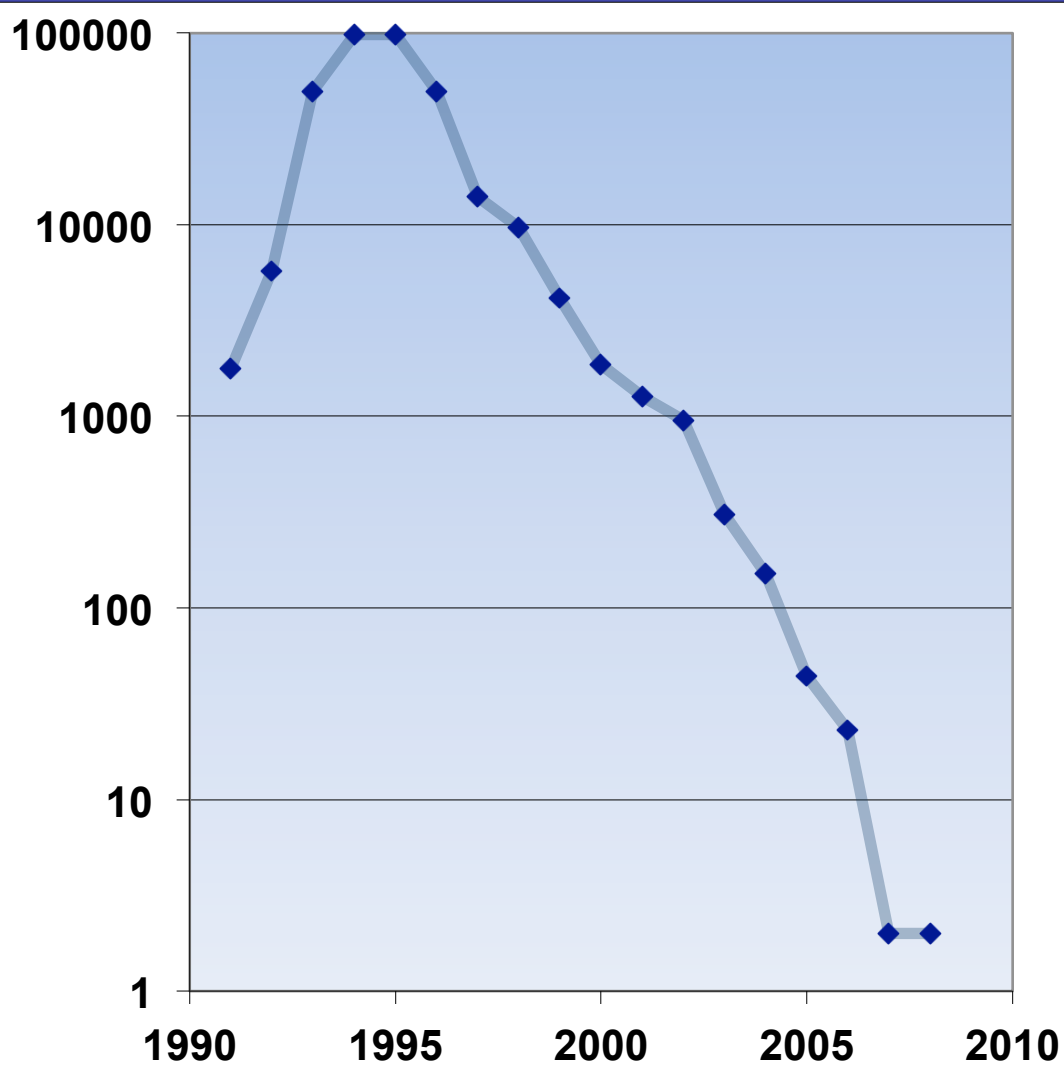


Elimination 4 Countries: Botswana, Namibia, South Africa, Swaziland



Note: Includes all cases, both confirmed and clinically diagnosed, both imported and local
Source: WHO World Malaria Report 2009; South African Department of Health; Swaziland Ministry of Health; Statistics SA

Malaria in Iraq

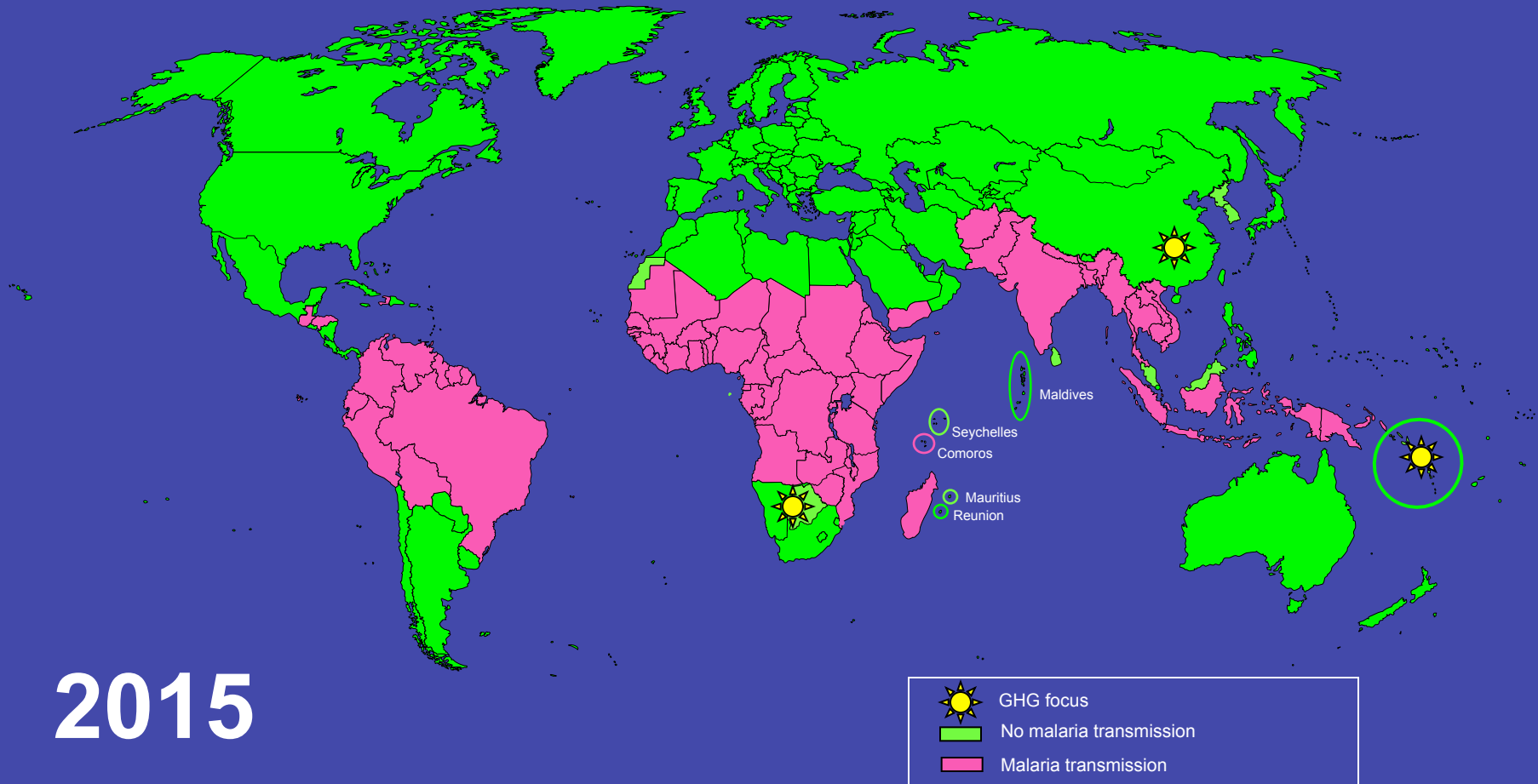


Last local foci in Iraq
Last local case in **Sulaimania 2008**

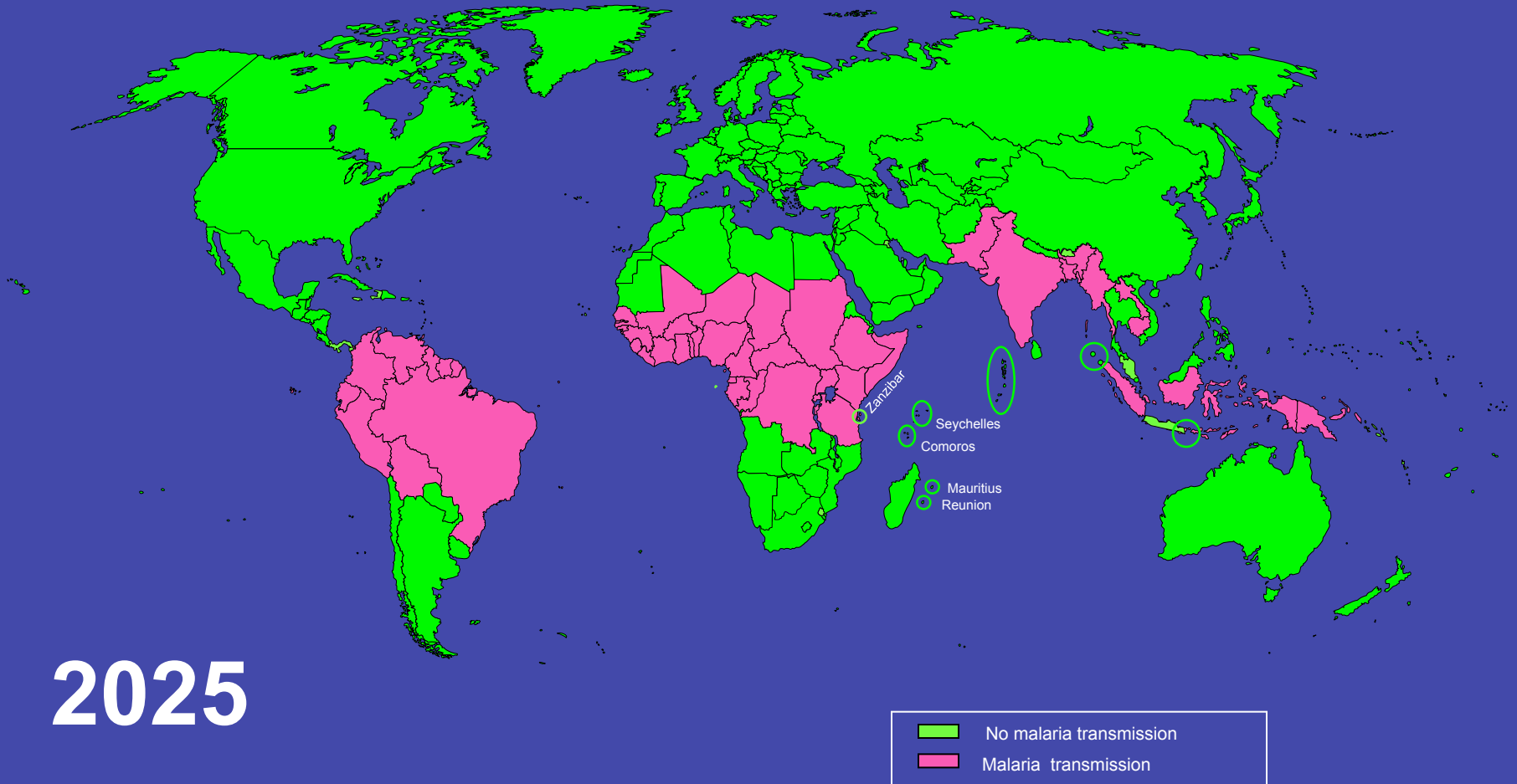
Malaria in Iran



Malaria Transmission By Country



Malaria Transmission By Country



2025

Sir Ronald Ross

“The proper policy is not the protection policy, nor the mosquito reduction policy, nor the quinine policy, but an opportunistic policy that uses any weapon it can.”

Major Sir Ronald Ross
The Prevention of Malaria, 1911



Strategies for Malaria Control and Elimination

Against the mosquito

- Nets
- Indoor residual spraying
- Larviciding / draining / water management
 - But only when few, fixed and findable

Against the parasite

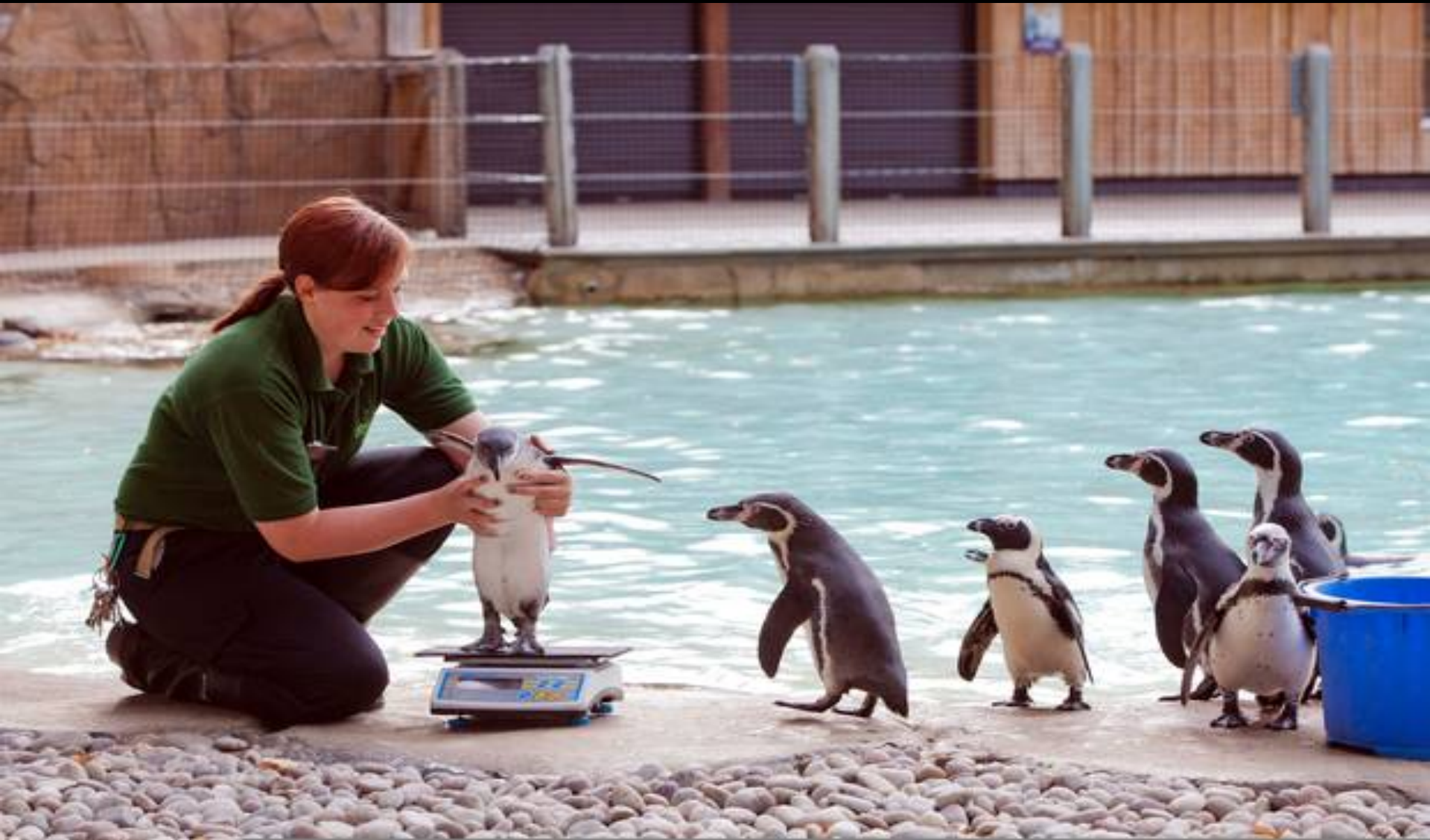
- Diagnosis
- Treatment

For elimination

- Surveillance and response
- Crossborder measures
- Targeting: hotspots and hot-pops



Penguins at London Zoo queue up for Primaquine



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From evidence to action

