Country and Regional Experience: Impact and challenges of arbovirus control

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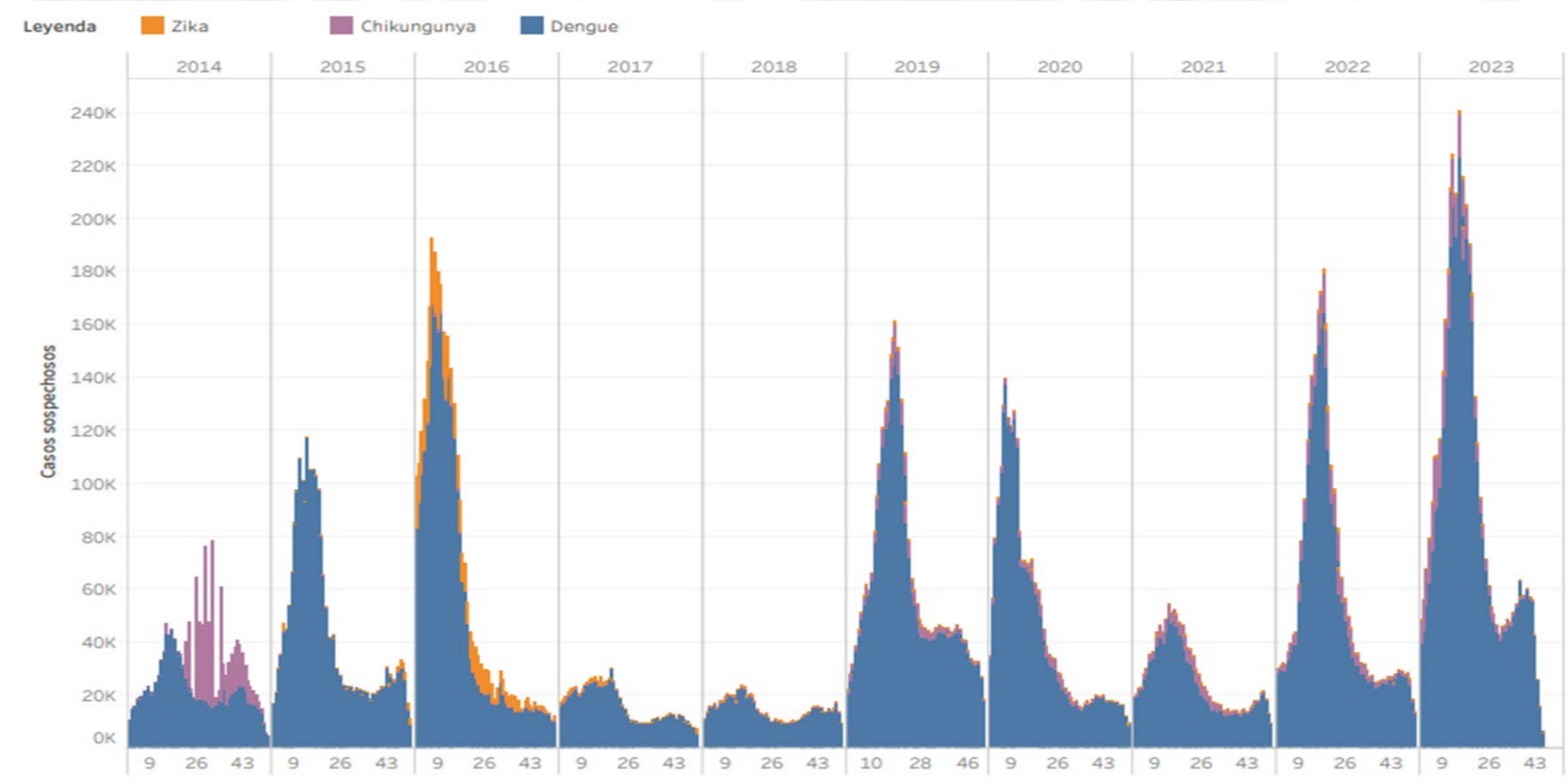
PAHO Pan American Health Organization World Health Organization REGIONAL OFFICE FOR THE Americas

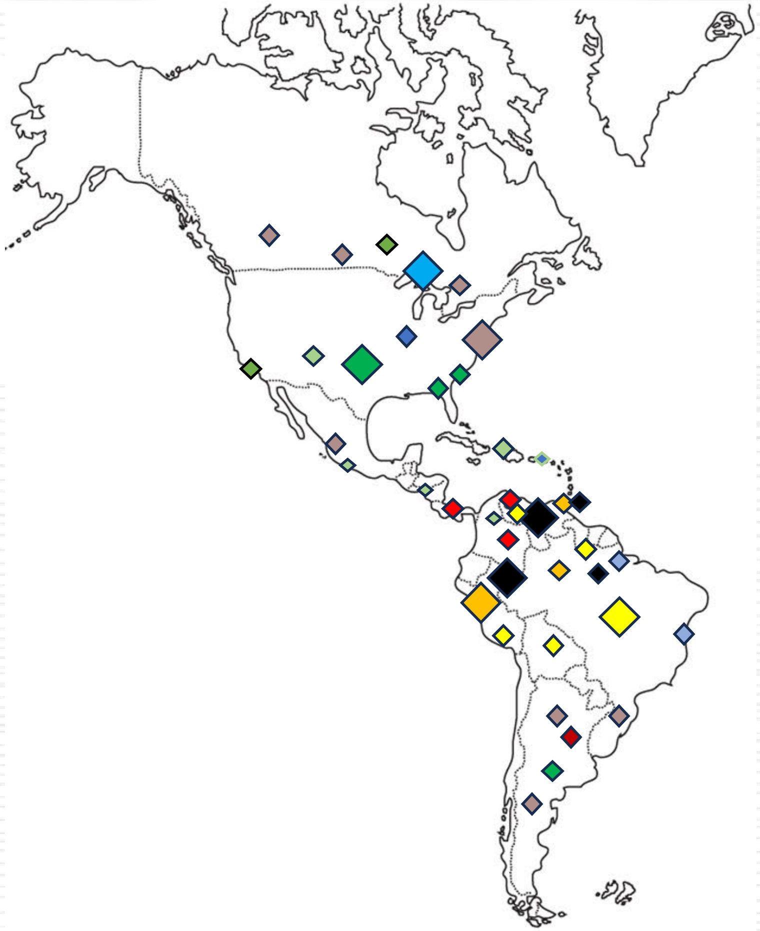
Cases of dengue, chikungunya and Zika by EW in the Americas, 2014 – 2023 (EW45)



- **Dengue**: Between 2010-2019, 10 times more case than those reported between 1980-1989. 2023 the greatest number of cases recorded since 1980.
- **Chikungunya**: Since its introduction (2014-2023), 3,840,534 cases reported, 64% between 2014-2016. ~2% of cases reported in the Caribbean
- **Zika:** out of the 968,947 cases reported since its introduction, 67% ocurred in 2016. Brazil reported 52% of the cases.

Contribution Chikungunya 2014 – 2023: 3,840,534 (14.4%)
Contribution de Zika 2014-2023: 968.947 (3.6%)

Emerging arboviral diseases in the Americas



- ◆ Yellow Fever virus
- ◆ Venezuelan Equine Encephalitis virus
- ◆ **Oropouche virus**
- ◆ St. Louis Encephalitis virus
- ◆ Powassan virus
- ◆ **Mayaro virus**
- ◆ West Nile virus
- ◆ Ilheus virus
- ◆ Eastern Equine Encephalitis virus
- ◆ Western Equine Encephalitis virus

◇ Outbreaks

◇ Frequent cases/virus isolation

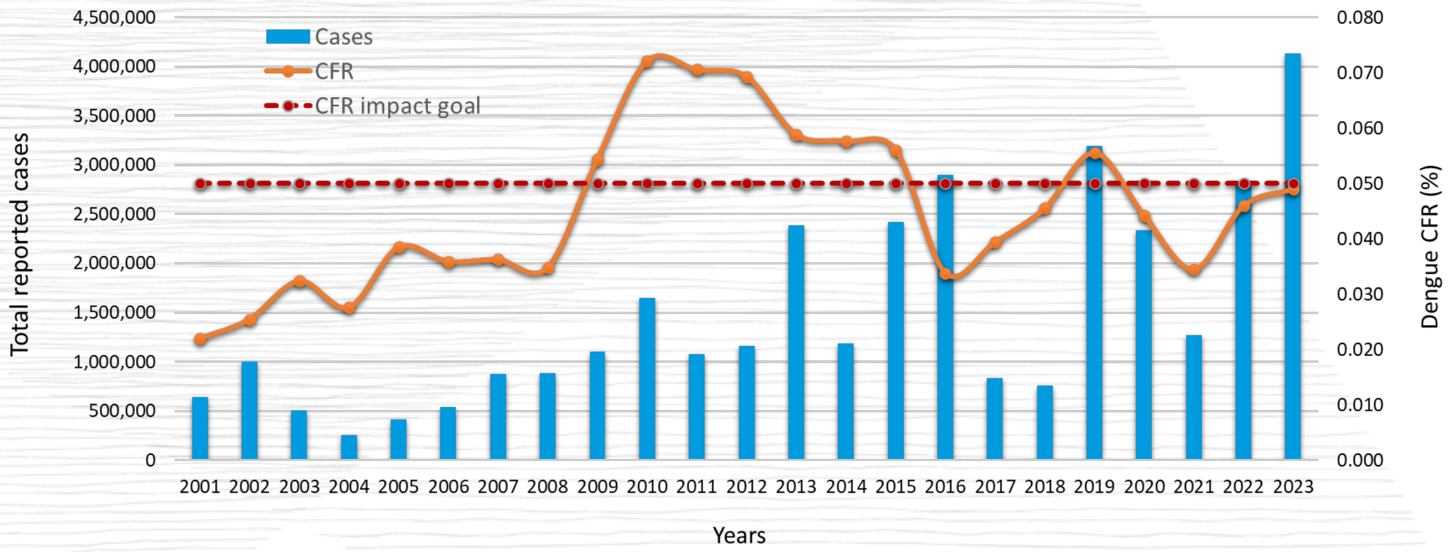
Lessons learned: Laboratory Networking

- Development and standardization of laboratory diagnosis algorithms for arboviruses
- Support in the distribution of reagents for serological and molecular tests
- Strengthening of laboratory confirmation and identification of serotypes in the countries of the Americas
- Expansion and strengthening of RELDA and development of the Arbovirus Genomic Surveillance Network (VIGENDA)

Arbovirus Laboratory Network of the Americas (RELDA)

Lessons learned: Patient Care/ Organization of health services

- While case burden has consistently increased, proportion of severe cases and case fatality rate can be decreased with an improvement of patient care at the primary healthcare level (early predictors of severe disease)
- Re-organization of health services during epidemics is key to prevent deaths, focused on appropriate triage the and establishment dengue units
- Virtual course on dengue clinical diagnosis and management

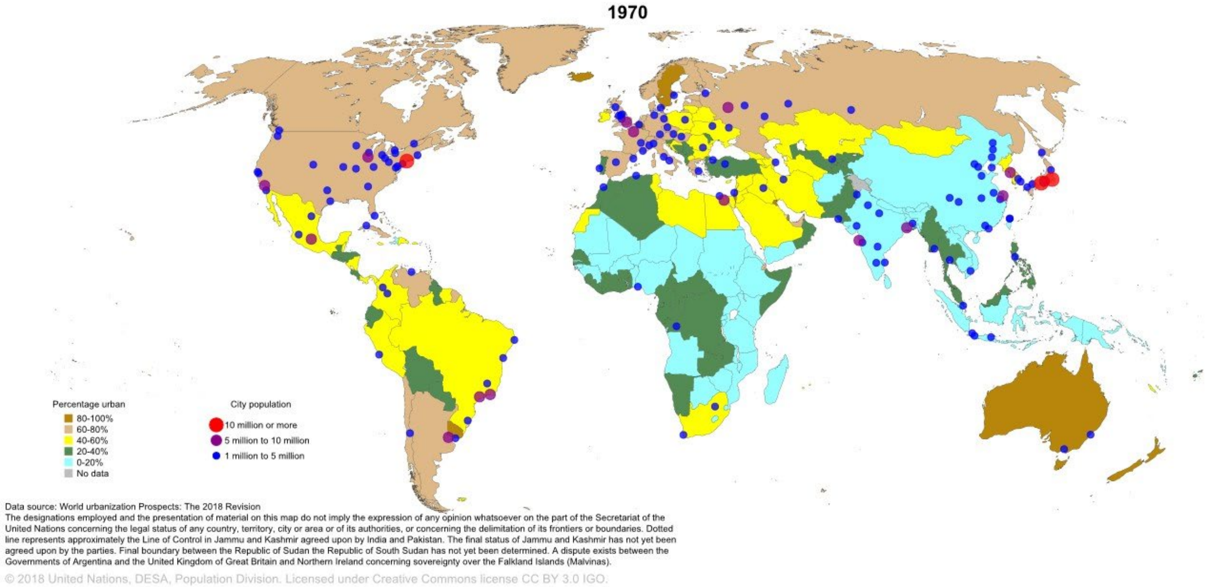


Lessons learned: Vector Control

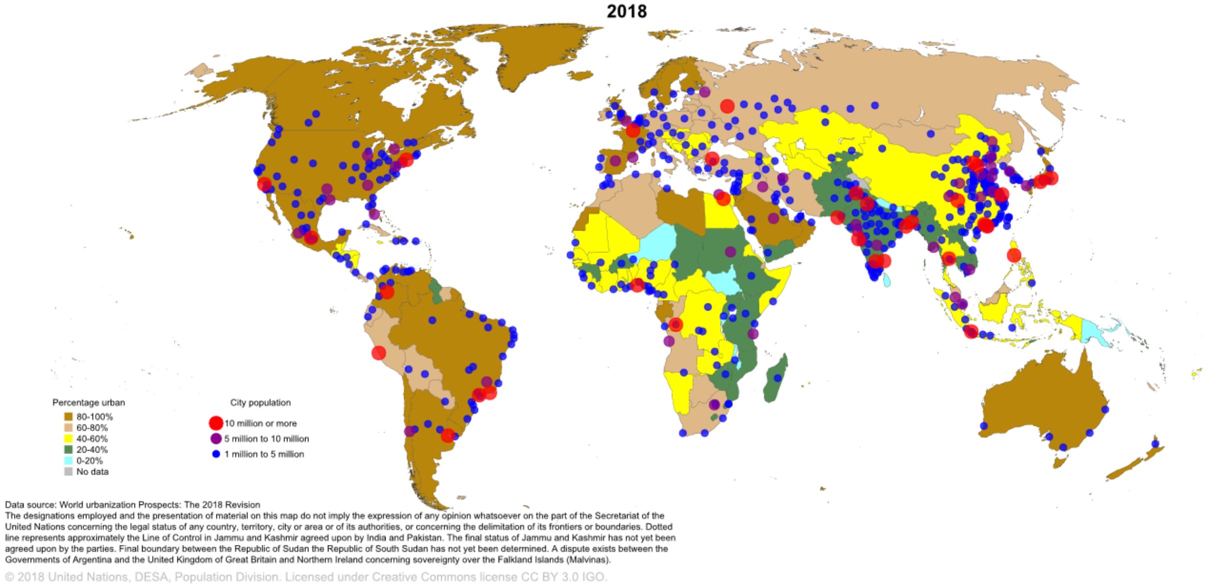
- Improve and modernize entomological surveillance methods as well as their information systems.
- Promote the implementation of Integrated Vector Management.
- Rationally incorporate new technologies and approaches.
- Strengthen capacities for monitoring and managing insecticide resistance.

Population growth and increase in large cities

Cities in 1970



Cities in 2018



Source: World Urbanization Prospects 2018. Department of Economic and Social Affairs. United Nations.
World Urbanization Prospects - Population Division - United Nations

Latin America and the Caribbean went from having 168 million inhabitants in 1950 to 662 million in 2022, and **80% of these people currently live in large cities (ECLAC 2023).**

Climate change

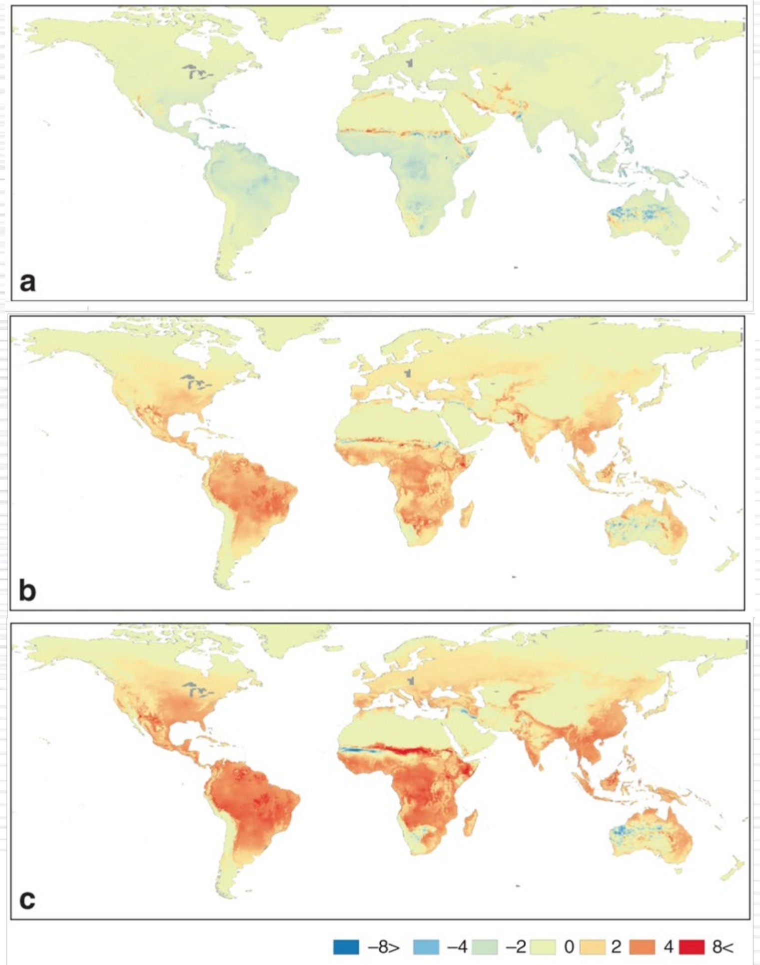
- Expansion of the geographic area with conditions for vector reproduction.
- Modification of habits and behavior of the vector.
- Better conditions for accelerated vector reproduction.

Climate change and Vector Suitability

- It is suggested that the world became ~1.5% more suitable per decade for the development of *Ae. aegypti* during 1950–2000.
- This trend is projected to accelerate to 3.2–4.4% per decade by 2050.
- Expansion of vector in North America are projected to accelerate by ~2 to 6 km/year by 2050.

Source: Takuya Iwamura et. al. 2020. https://doi.org/10.1038/s41467-020-16010-4

Changes of life-cycle completions of *Ae. Aegypti* between 1950s, 2000s, and 2050s

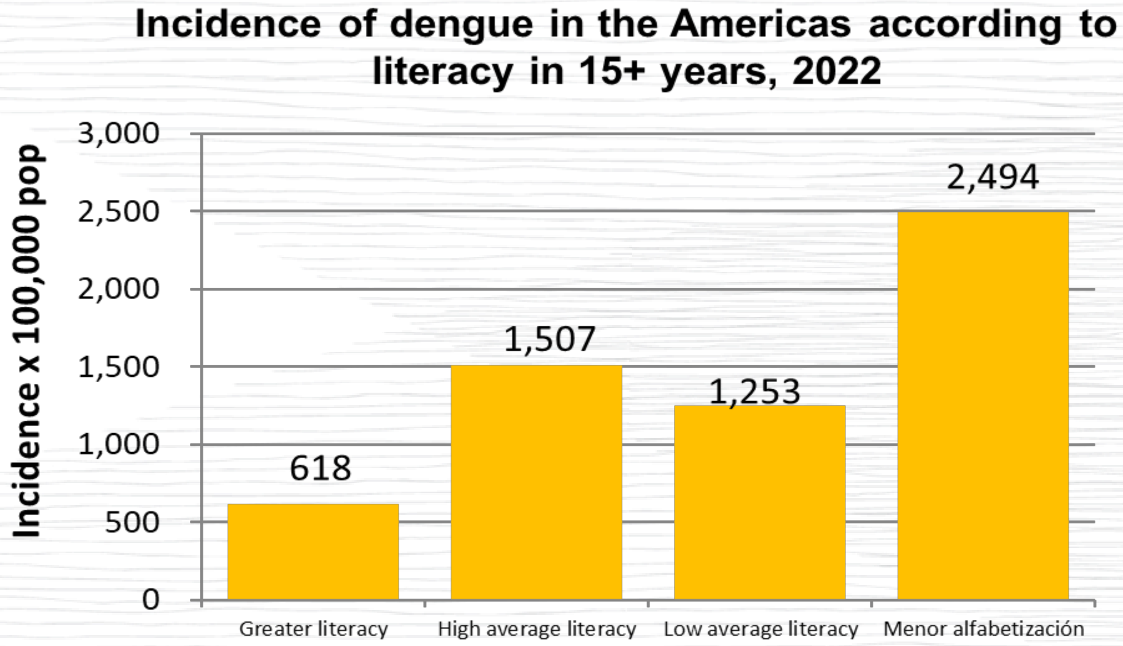


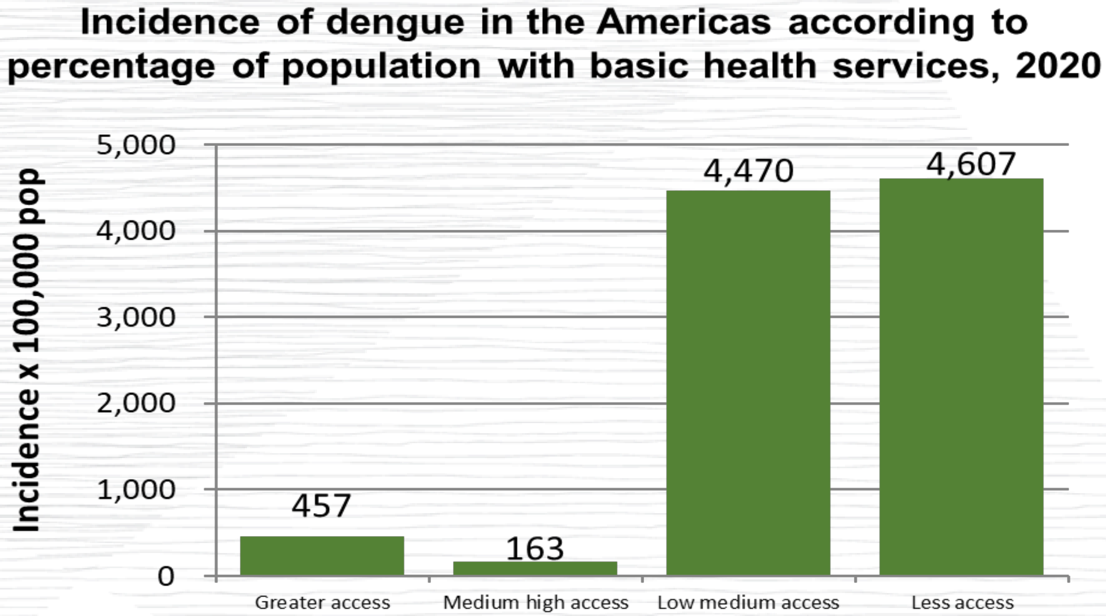
1950s

2000s

2050s

Inequalities analysis

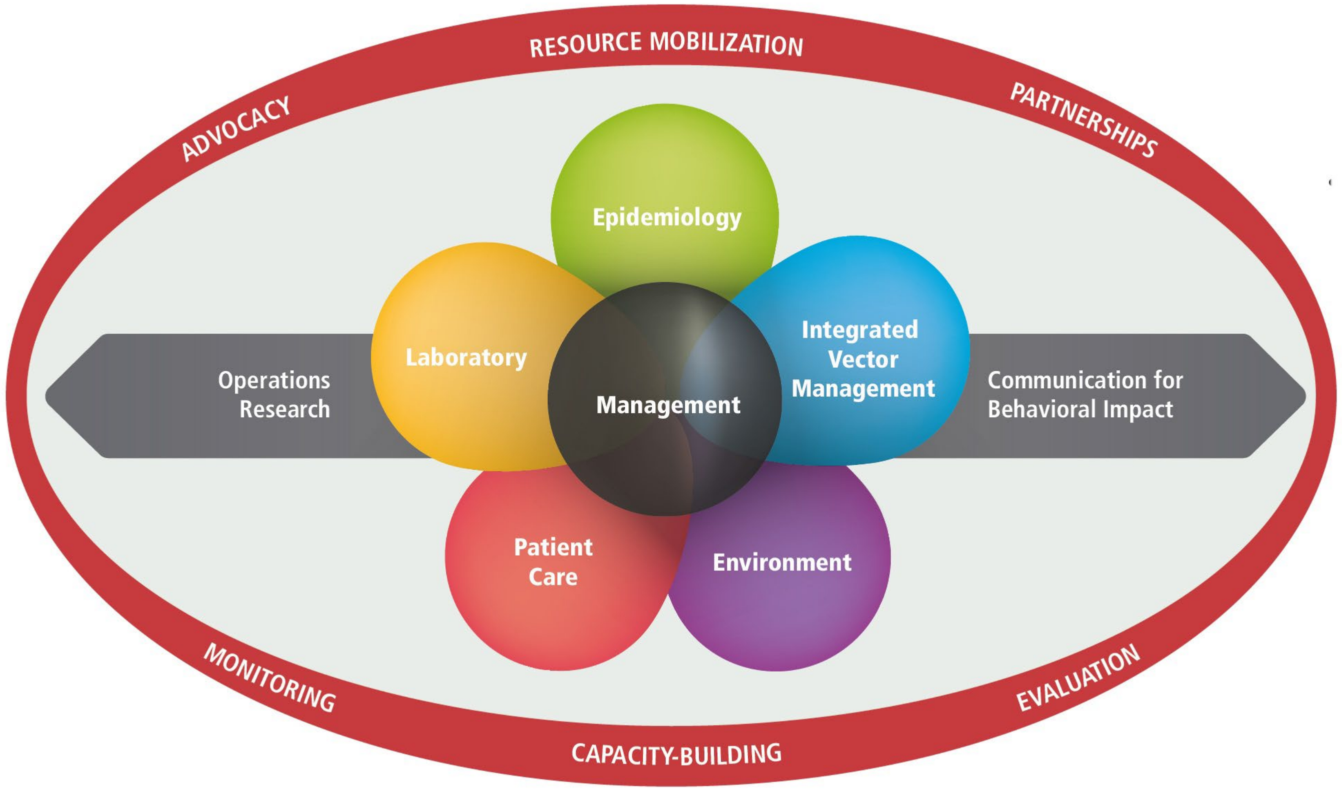


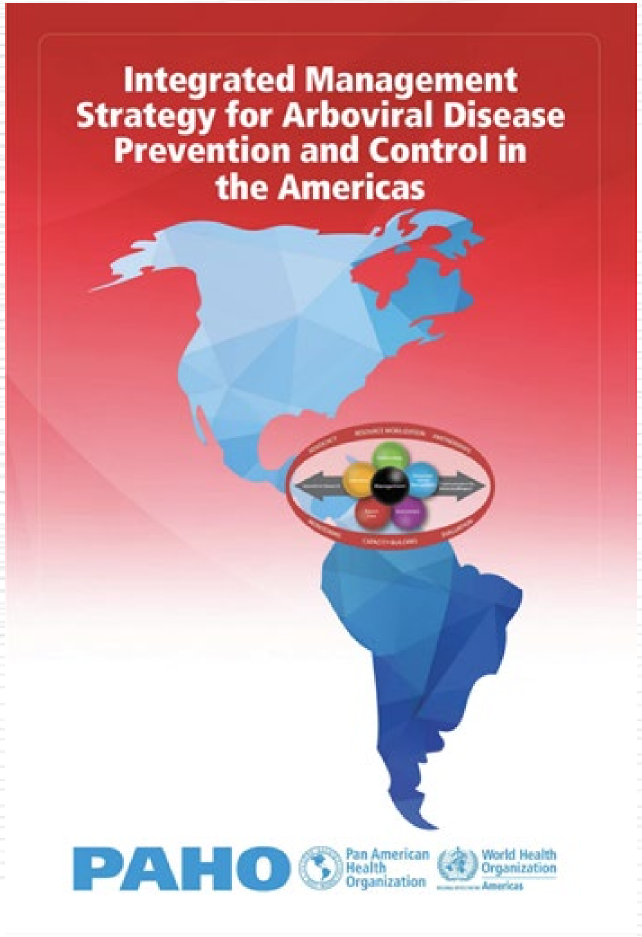


https://www.datos.bancomundial.org/indicator

IMS-Arbovirus

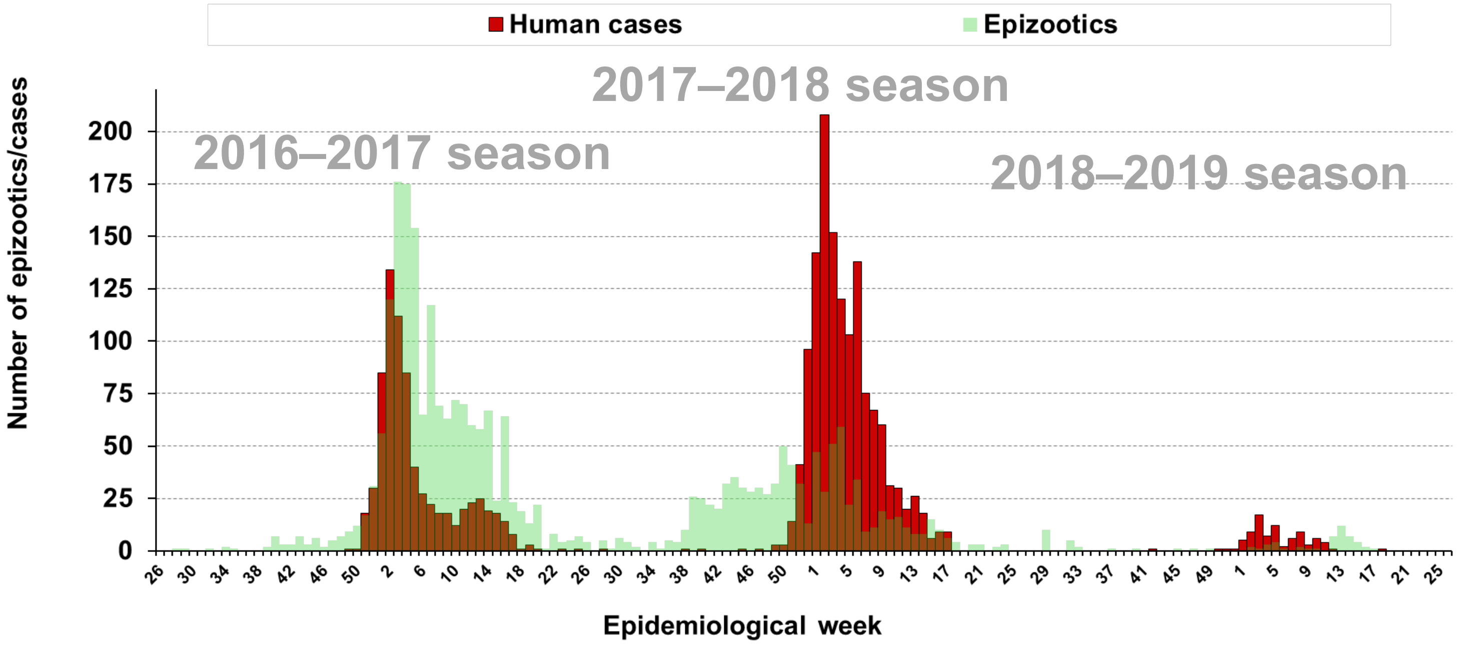
Integrated Management Strategy for the Prevention and Control of Arboviral Diseases



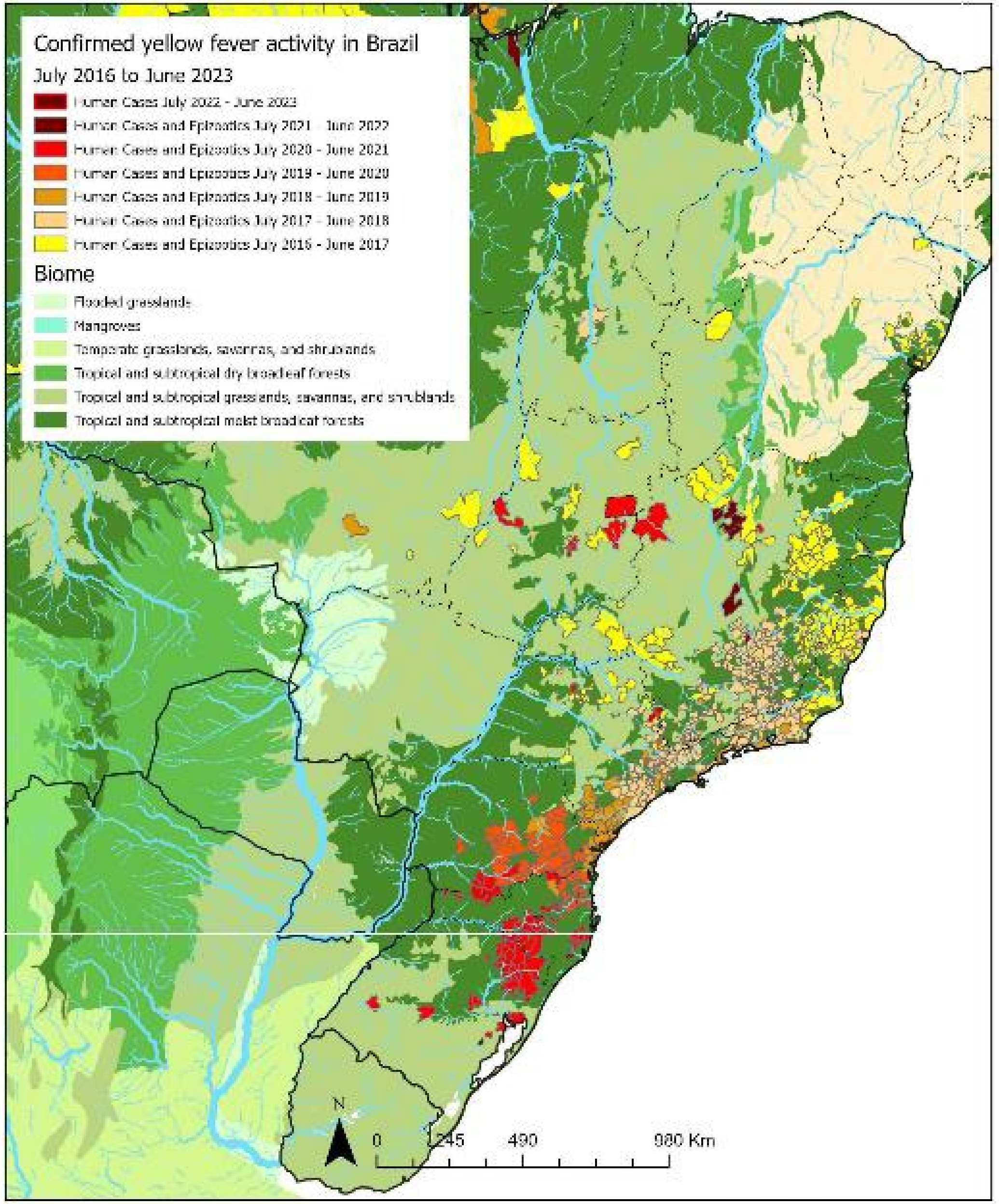


https://iris.paho.org/handle/10665.2/52492

Yellow Fever spread in Brazil from 2017 to 2022



Epidemic curve of epizootics and confirmed human cases of yellow fever—Brazil, 07/2016–05/2019*



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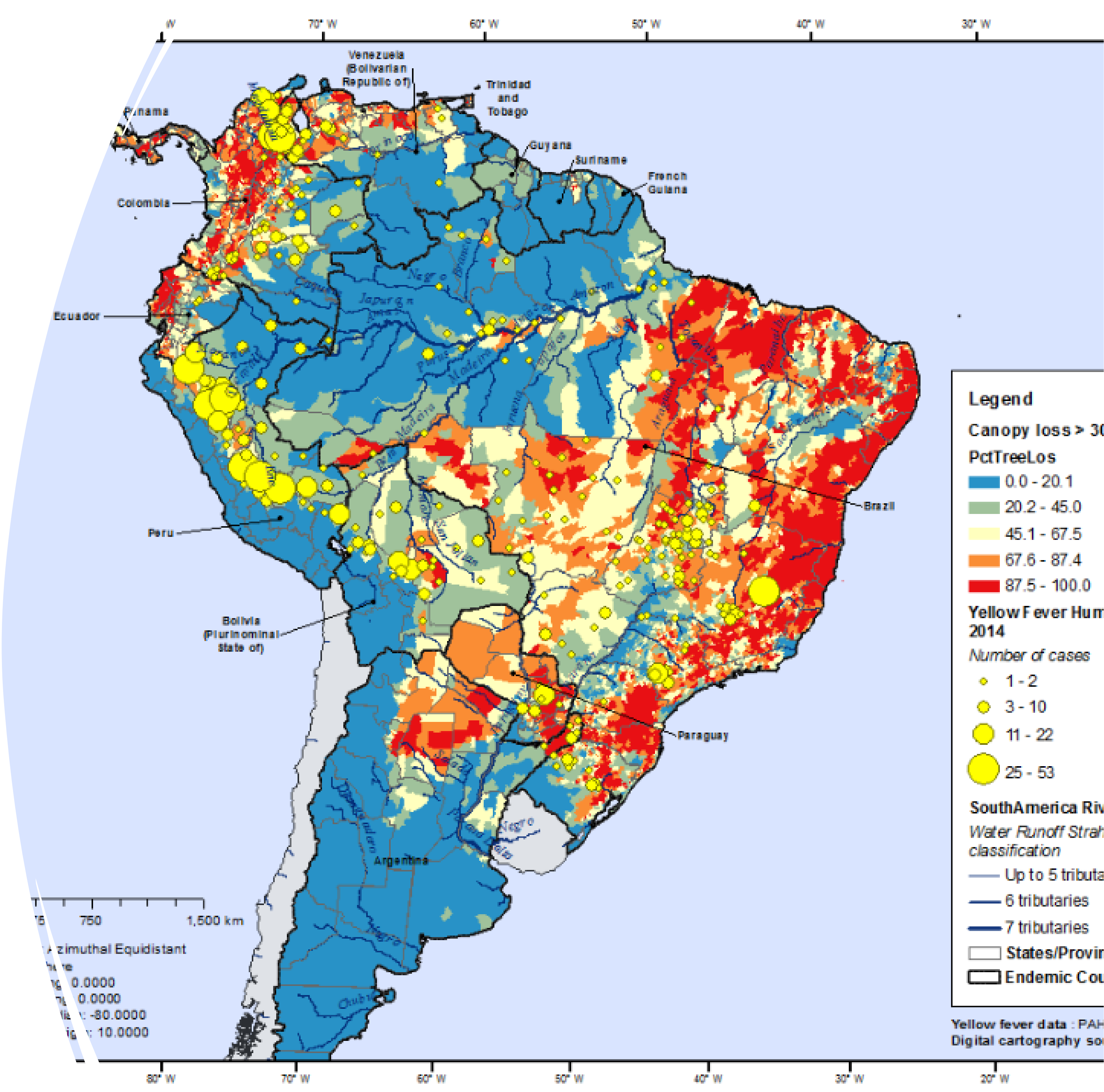
Environmental changes

- Deforestation (Canopy Loss)
- Sylvatic corridors
- Urban development (megapolis)
- High velocity of epizootics spread
- Edge habitat "sylvatic / peri urban / urban"
- Peri-urban (urban) transmission by sylvatic vectors



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Environmental factors conducive to spread & transmission of yellow fever virus

Ecological corridors

Urban & peri-urban edge habitat

One Health

Courtesy of Dr. Renato Pereira de Souza, Núcleo de Doenças de Transmissão Vetorial, Centro de Virologia, Instituto Adolfo Lutz, São Paulo, Brazil

Brazil, 2017

Yellow Fever Sylvatic Ecosystems: Ladainha, MG, 2017

Yellow Fever transmission by sylvatic vectors in peri-urban areas: Serra, ES, 2017

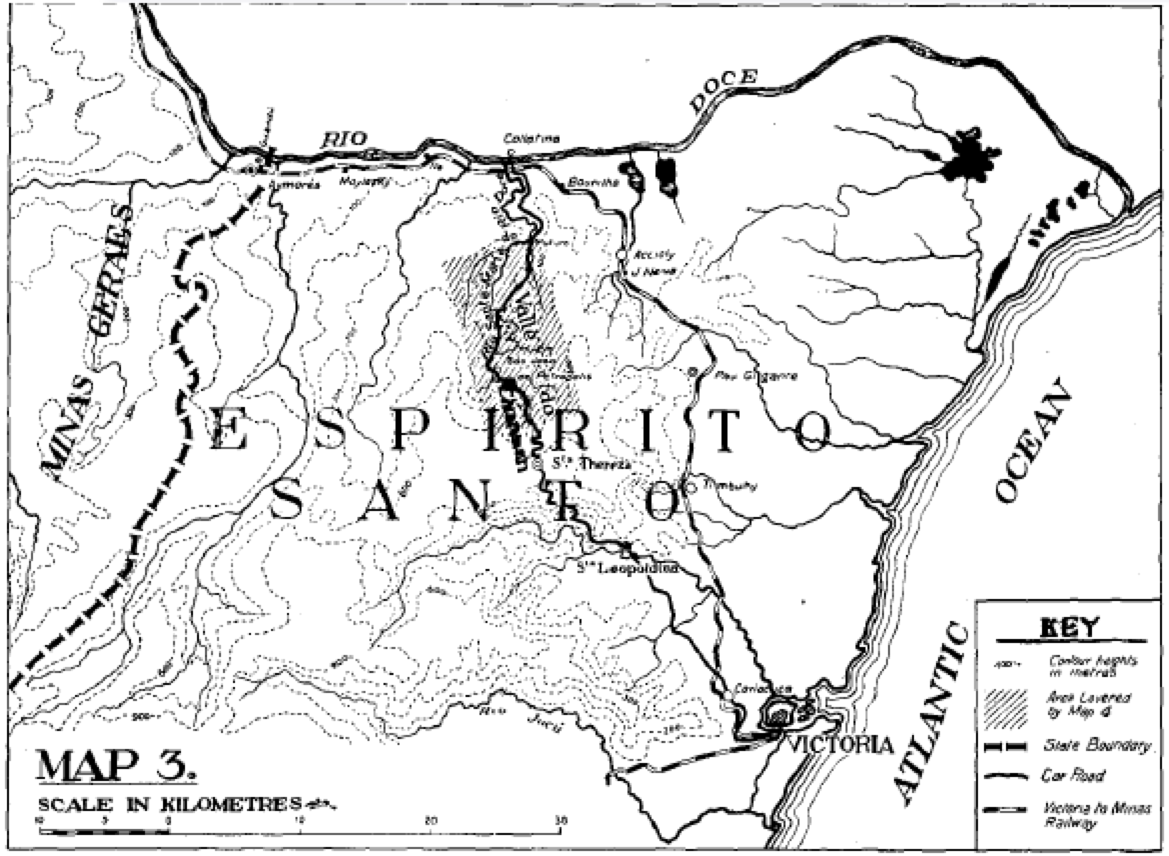
Conclusion

- The Region of the Americas presents a constant circulation of emerging and re-emerging arboviruses, many of them with high epidemic potential, which represents a permanent risk to public health.
- While the case numbers of diseases like dengue have consistently increased, Countries have been able to reduce the proportion of cases that progress to severe disease as well as those who die from the disease through systematic capacity building efforts
- Laboratory networks must be strengthened and leveraged to detect the emergence of new viruses and monitor existing viruses

YELLOW FEVER WITHOUT *AËDES AEGYPTI*. STUDY OF A RURAL EPIDEMIC IN THE VALLE DO CHANAAN, ESPIRITO SANTO, BRAZIL, 1932.*

By

F. L. SOPER, H. PENNA, E. CARDOSO, J. SERAFIM, Jr., M. FROBISHER, Jr., and J. PINHEIRO.



Soper et al., Am J Epidemiol 1933, 18:555–587