



Effective strategies to control dengue

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CDC disclaimer

The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of [the Centers for Disease Control and Prevention

Why should we care about dengue?

The Washington Post
Democracy Dies in Darkness

HEALTH Health Care Medical Mysteries Science Well-Being

Dengue fever is surging worldwide. A hotter planet will make it worse.

Climate change helped fuel an explosion of dengue cases in the Americas, including Puerto Rico, as mosquitoes multiply in warmer, wetter weather.

By [Lena H. Sun](#) and [Sarah Kaplan](#)
June 30, 2024 at 9:00 a.m. EDT



Genero Polanco Marte, 9, is treated by a doctor, Zarcadial Rivera Acosta, as a suspected dengue case at Hospital Auxilio Mutuo in San Juan, Puerto Rico, on May 30. (Erika F. Rodriguez for The Washington Post)

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SAN JUAN, Puerto Rico — The curly-haired girl came to the emergency room with fever, aches and signs of dehydration, common indications of many childhood illnesses. But the 9-year-old — pale and listless beneath her Pokémon blanket — looked sicker than most children and exhibited no respiratory symptoms. She could only whimper as a pediatrician stroked her hair and softly questioned her in Spanish.

The Brief

The most important stories for you to know today

HEALTH

CA battles dengue fever

Mosquito-borne illness continues to spread

By Claudia Boyd-Barrett | KFF Health News
Published November 12, 2024 9:31 AM



A vector control supervisor checks on an abandoned backyard pool in Tulare County that has become a breeding ground for mosquitoes.

(Anna Maria Barry-Jester / KHN)

A person wearing a dark uniform and a white face mask is walking outdoors. They are carrying a large, cylindrical, metallic container, likely an insecticide tank, which is mounted on a red and yellow bag. The background shows a paved path and some greenery.

Widespread insecticide
resistance globally

Overview

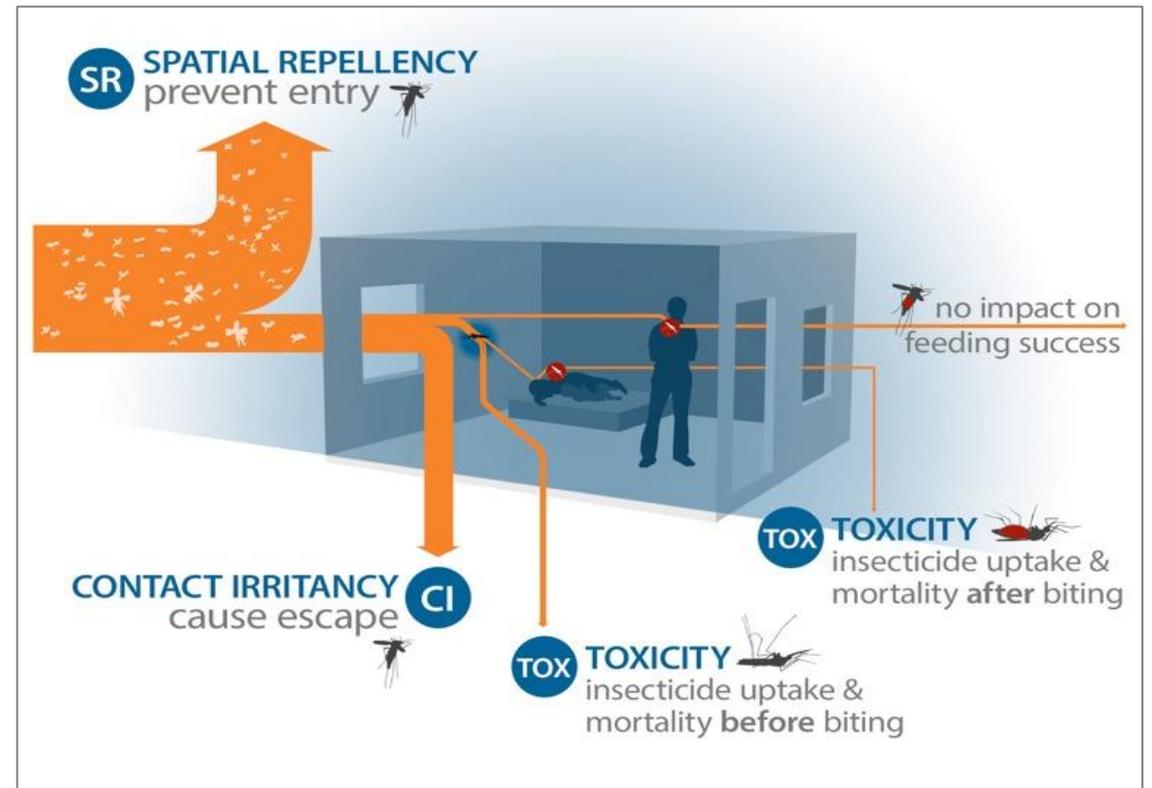
- Novel mosquito control strategies
 - Emanators
 - Wolbachia replacement
- Dengue vaccines

Spatial Emanators



What are spatial emanators?

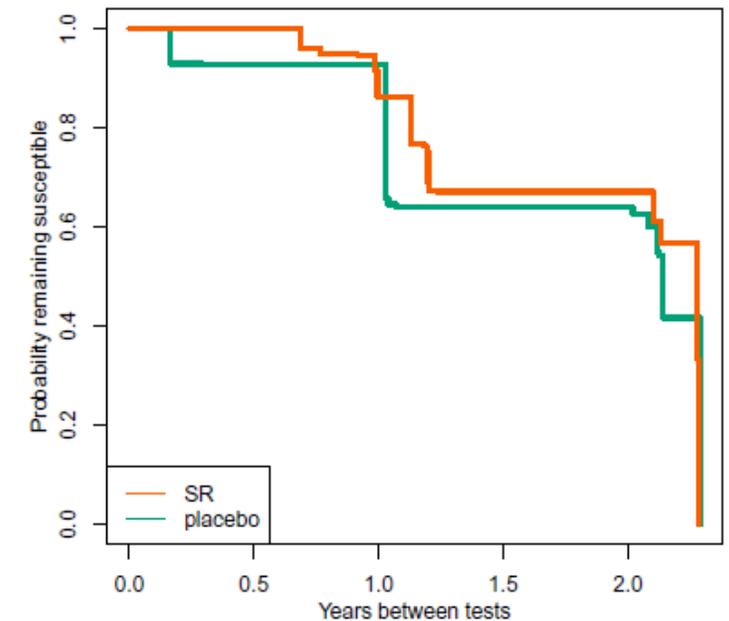
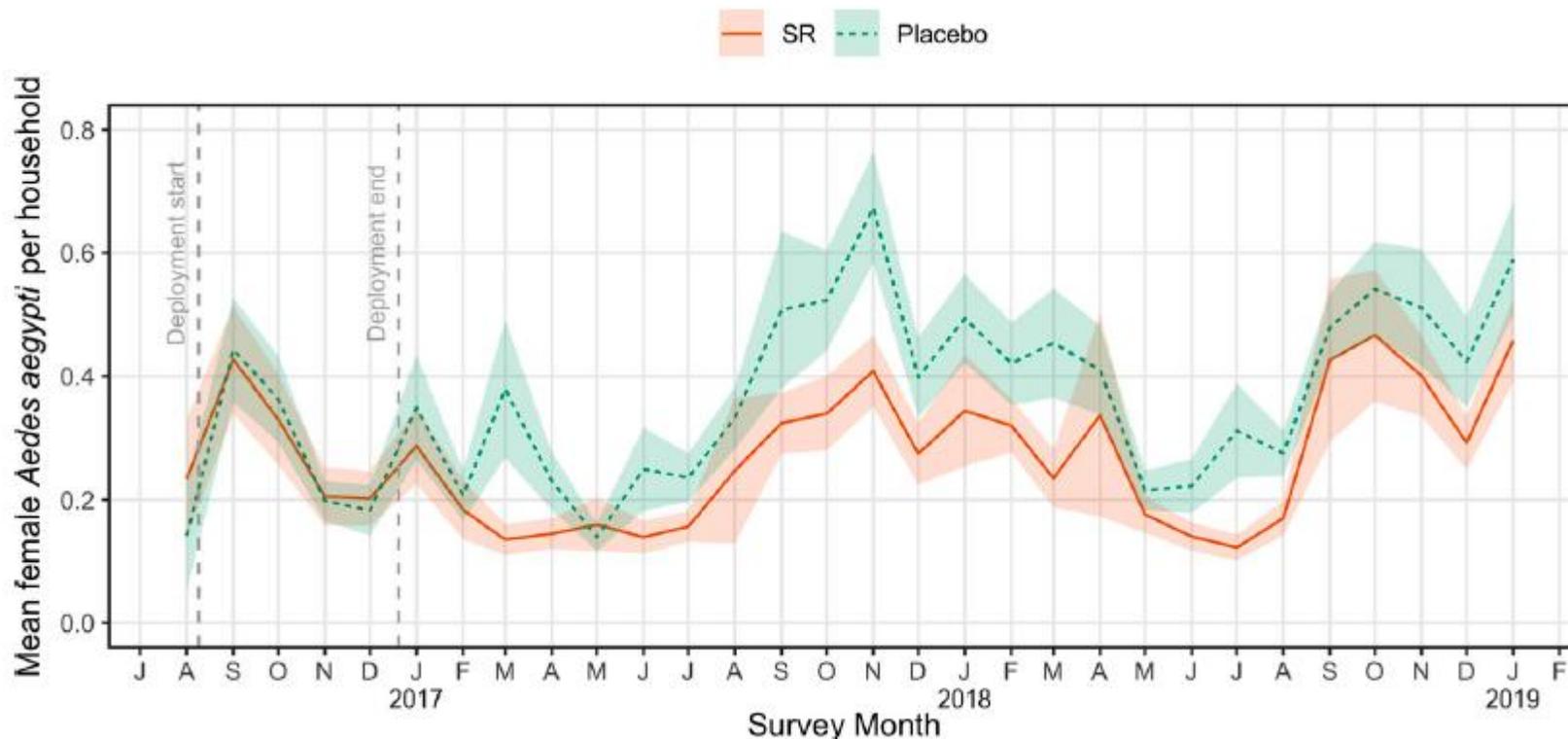
- Spatial emanators are chemical products designed to prevent human-vector contact (indoor and/or outdoors)
- Spatial repellency
 - Movement away from a chemical stimulus
 - Attraction inhibition
 - Feeding response
 - Toxic at higher doses
- Transfluthrin, metofluthrin, citronella



Transfluthrin Emanators, Iquitos, Peru Trial (2016-2018)

- 29% fewer indoor resting *Ae. aegypti*
- 9% fewer blood fed *Ae. aegypti*

- Seroconversion:
 - Hazard ratio = 0.659
 - PE = 34.1%, $p = 0.024$
- No effect on incidence of clinical dengue



Emanators as part of Integrated Mosquito Management Program in Puerto Rico

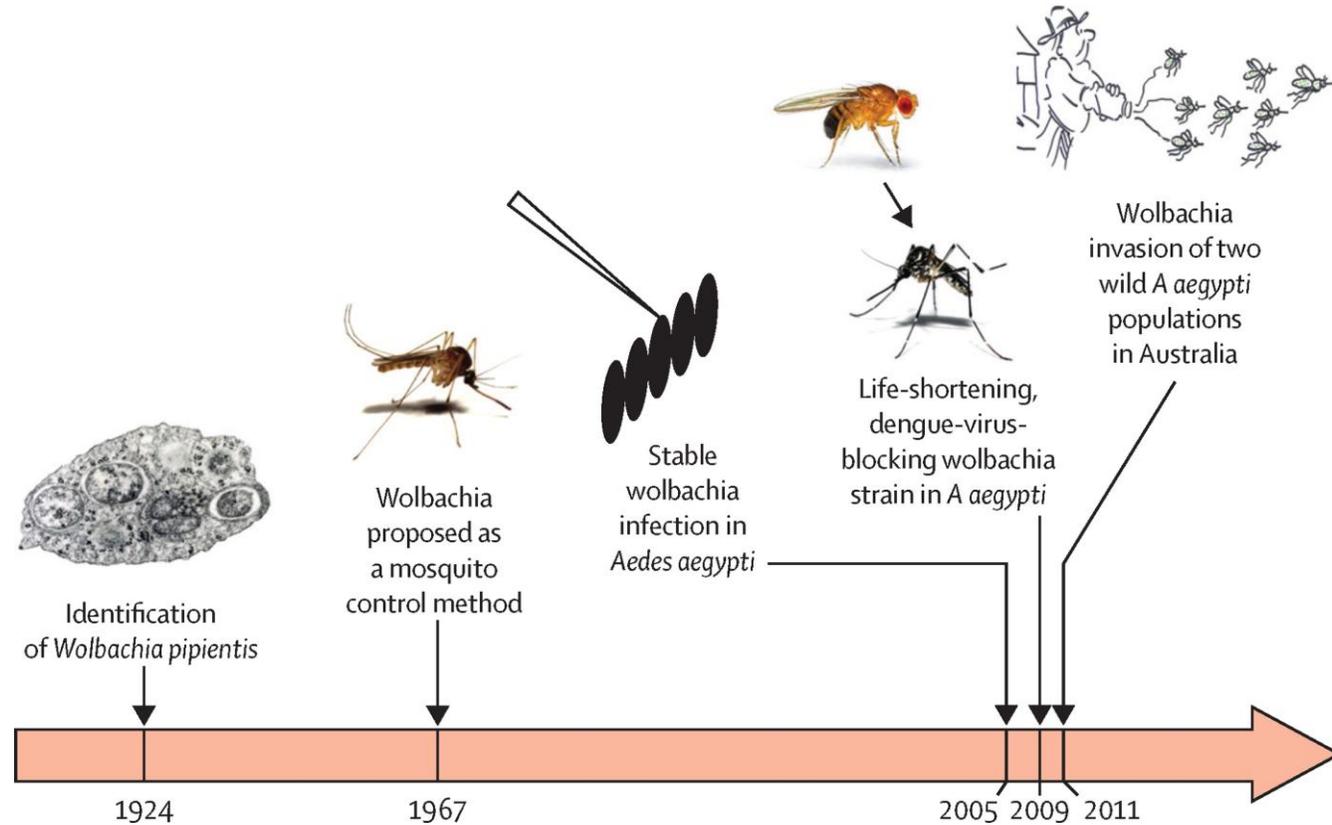


Puerto Rico Vector Control Unit



Wolbachia replacement

Wolbachia donated from naturally infected species

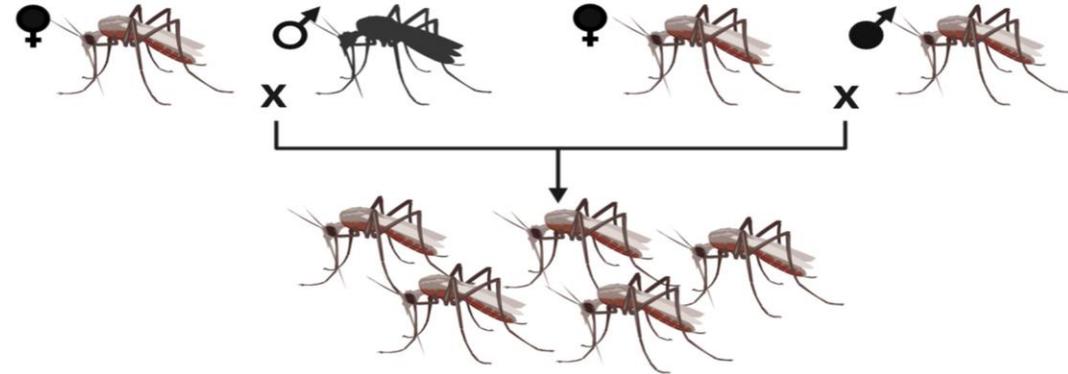
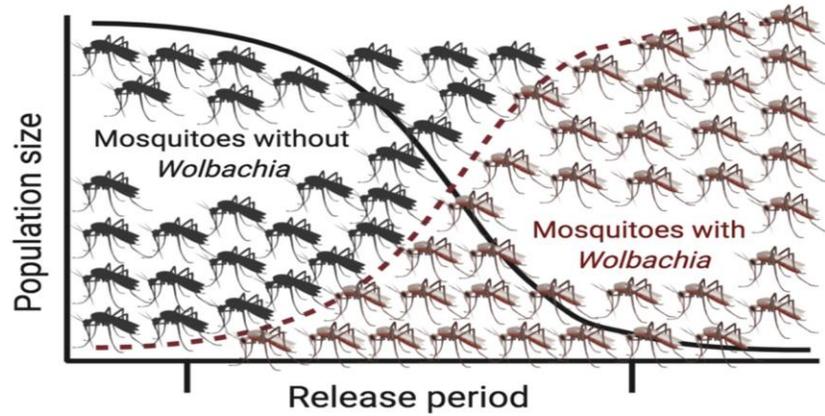


The Lancet Infectious Diseases 2015 15862-866DOI: (10.1016/S1473-3099(15)00091-2)

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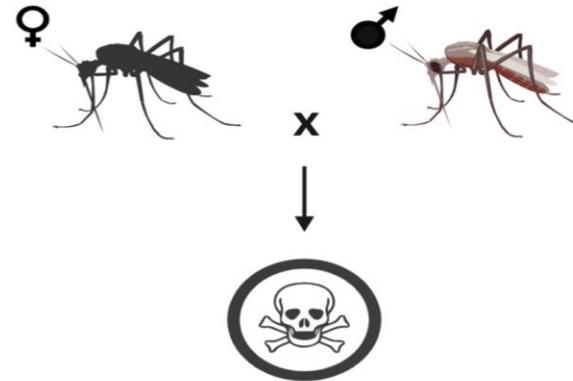
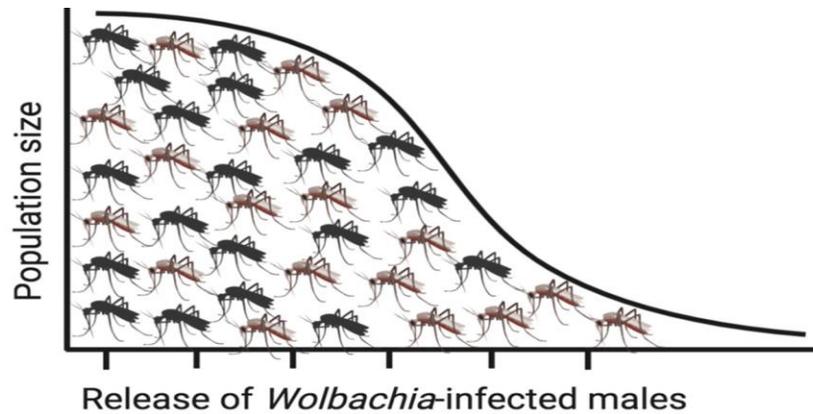
Wolbachia-based methods

A Population replacement



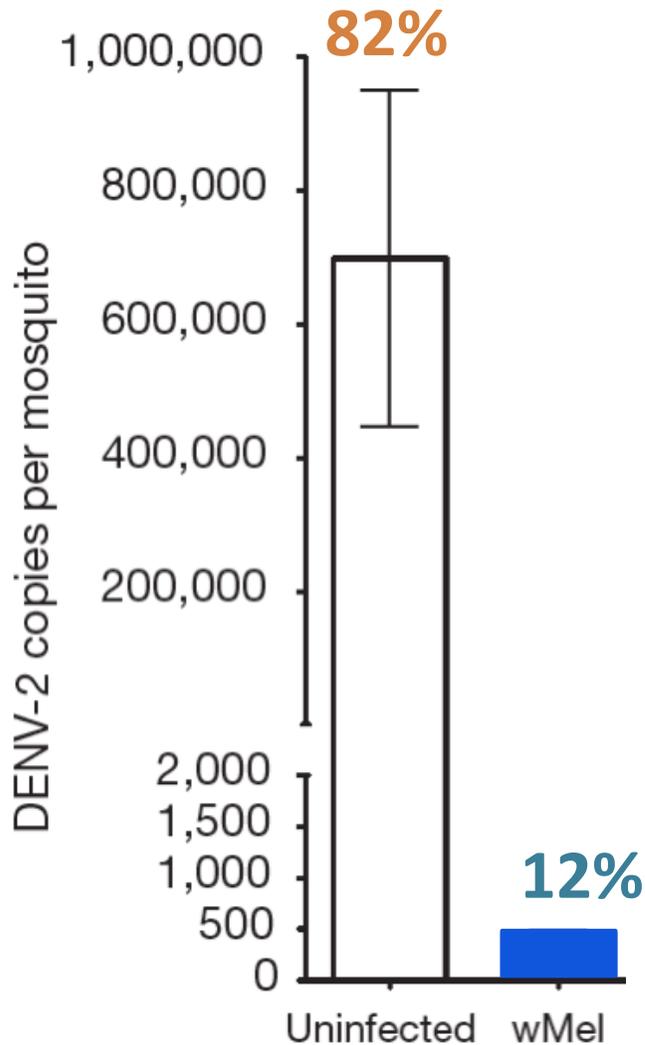
The spread of *Wolbachia*-carrying mosquitoes mediates pathogen blocking and reduction in arbovirus transmission

B Population suppression



CI causes a decline in mosquito population size

Wolbachia-mediated virus blocking

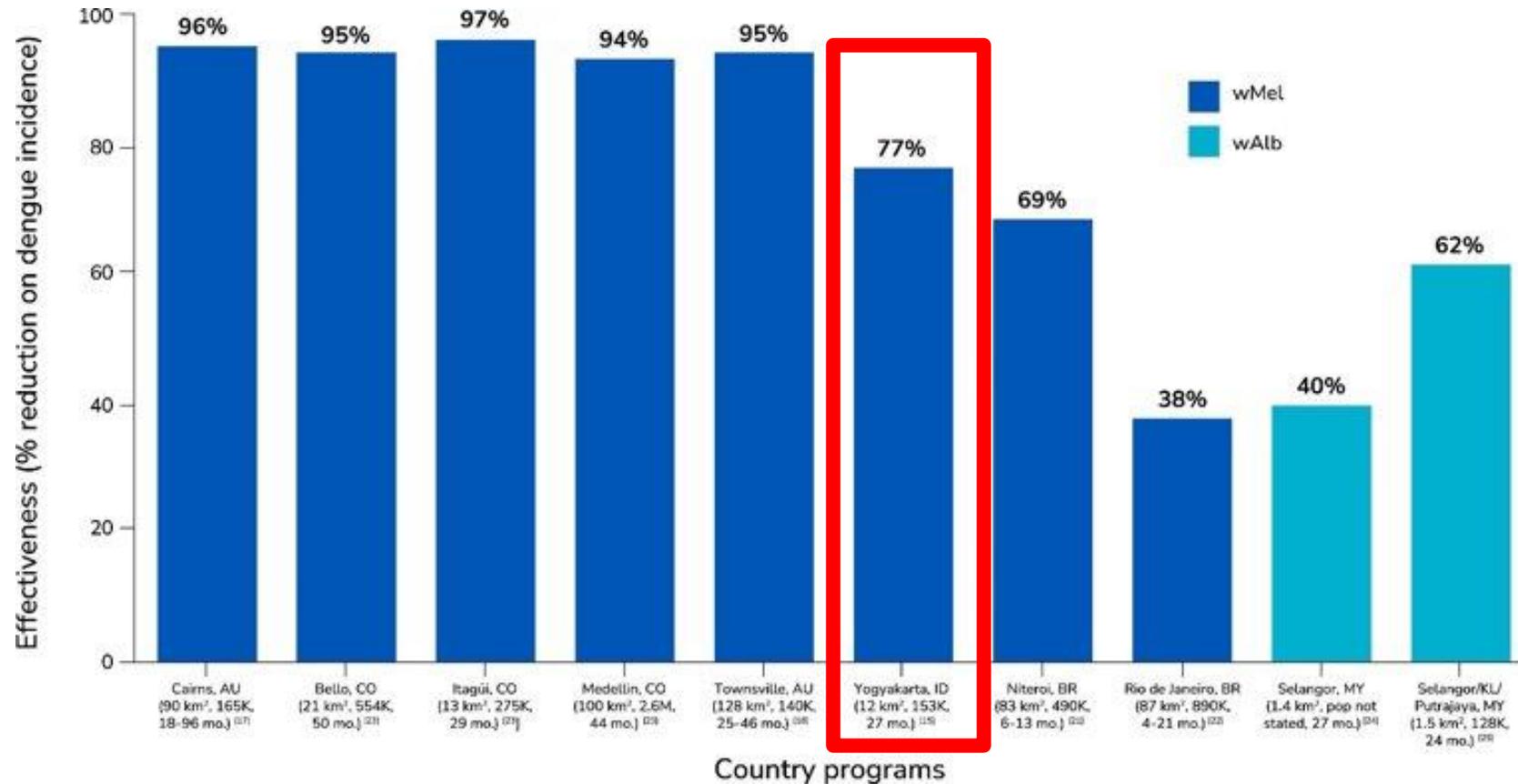


Also reduces: CHIKV, ZIKV,
WNV,
YFV
Plasmodium
Filarial nematodes
bacteria

T Walker *et al.* *Nature* **476**, 450-453 (2011)
doi:10.1038/nature10355

nature

Wolbachia reductions in dengue transmission

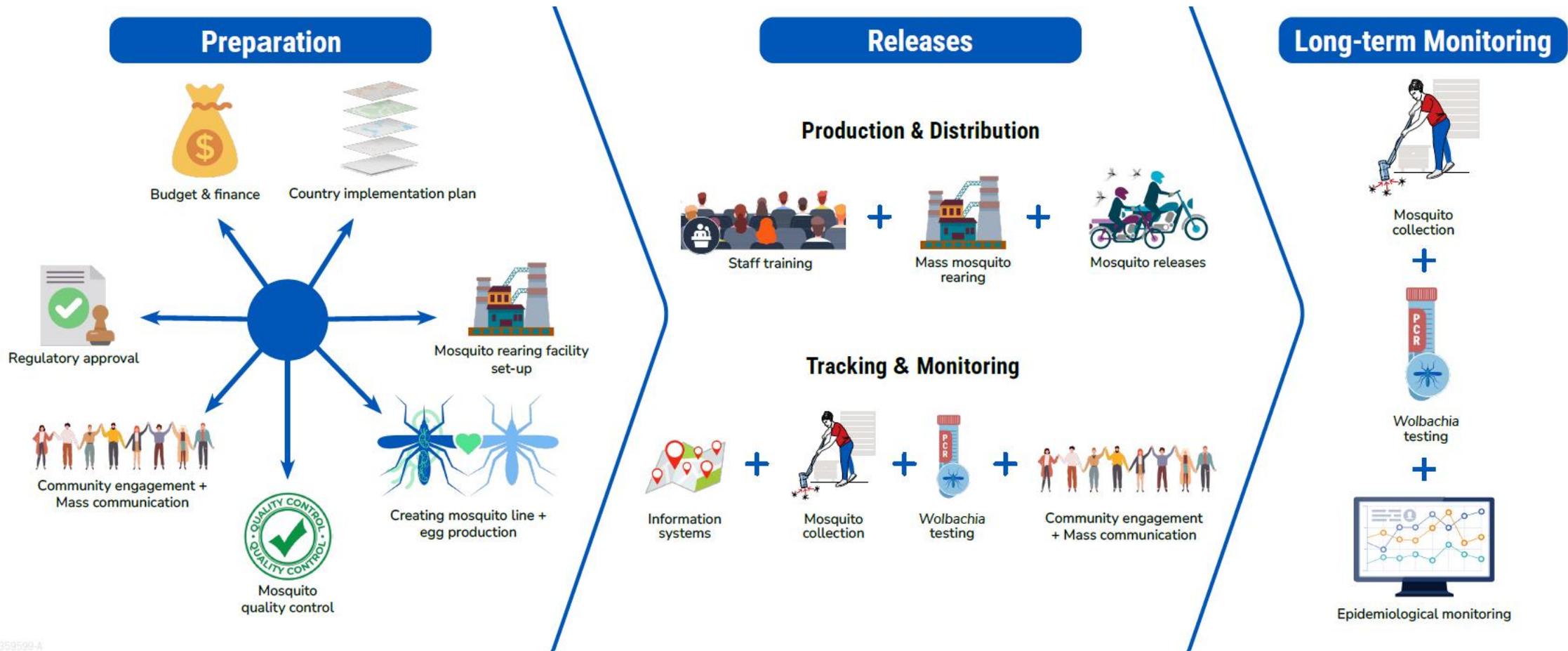


Paz-Bailey G. et al. New solutions against a global threat: opportunities for Wolbachia interventions.
<https://www.sciencedirect.com/science/article/pii/S1201971225001468?via%3Dihub>

Evaluation of Wolbachia replacement in El Salvador



Components of a Wolbachia program



Paz-Bailey G. et al. New solutions against a global threat: opportunities for Wolbachia interventions. <https://www.sciencedirect.com/science/article/pii/S1201971225001468?via%3Dihub>

Community engagement



Health fairs, house-to-house visits, tours of facilities



Community Reference Groups and Community leaders



Community events

Wolbachia acceptance by the community increased from **50%** in 2023 to **70%** in 2024



Unidad de Control de Vectores de Puerto Rico

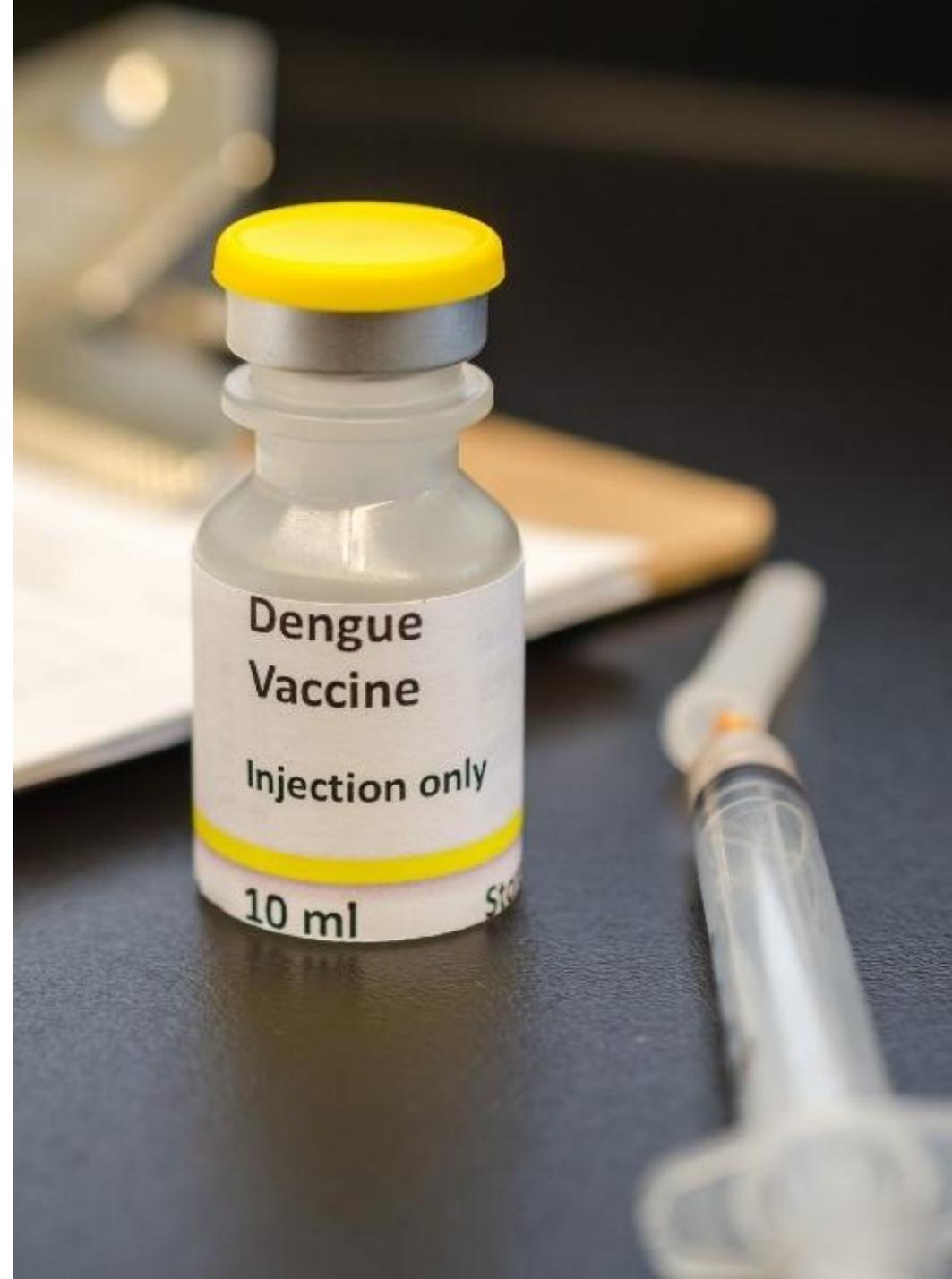
Un programa del:  Fidicomiso para Ciencia, Tecnología e Investigación de Puerto Rico



Dengue Vaccines

Dengue vaccines

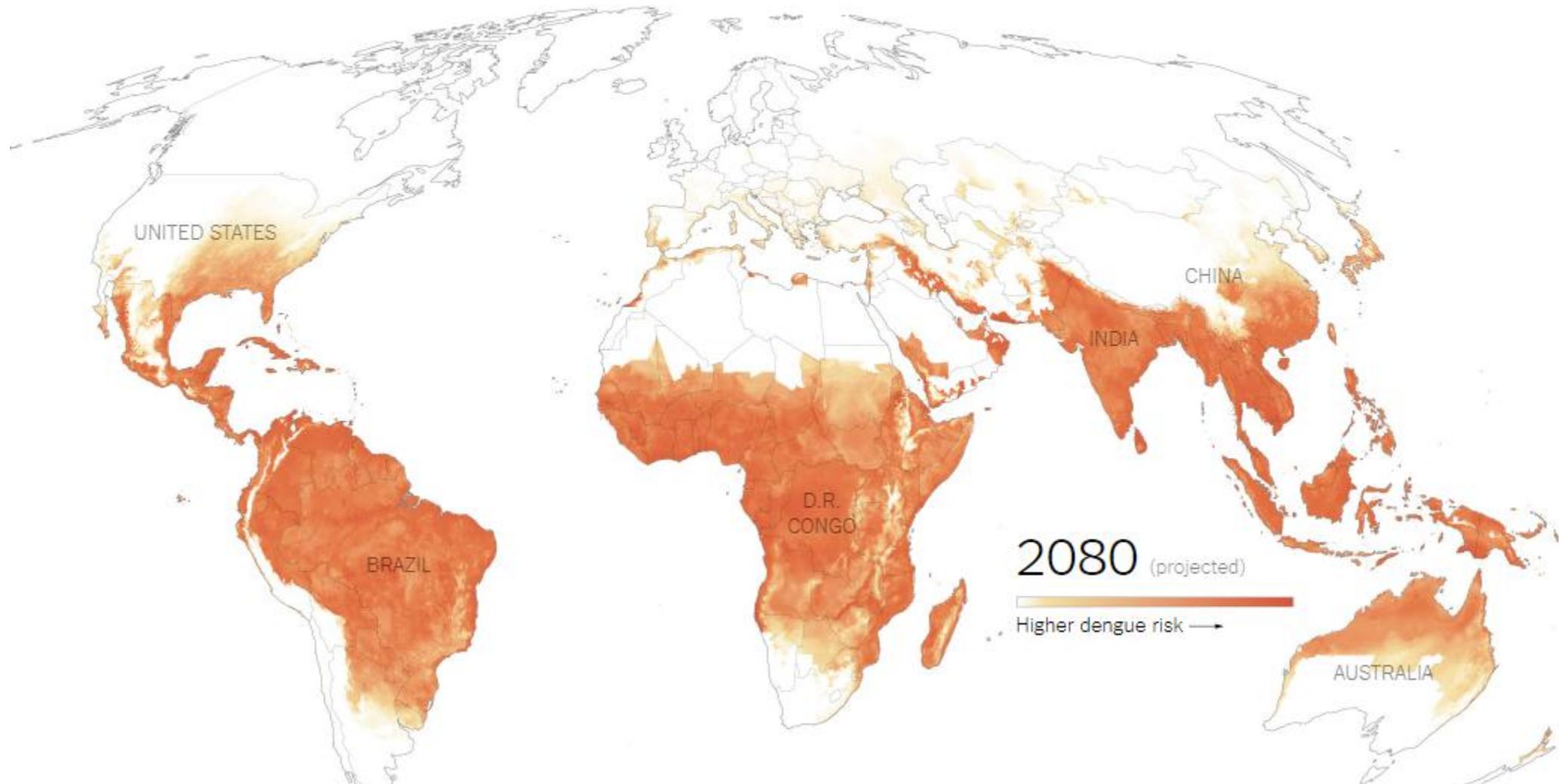
- **Dengvaxia:** recommended in US (children 9-16 years old with previous DENV infection and living in endemic areas)
- **QDENGGA:** licensed in several countries. Not licensed in the U.S.
- **Butantan-DV:** licensed for use in Brazil.
- No dengue vaccines are currently recommended for use in US travelers.



Take home messages



Expansion in the areas at risk for dengue

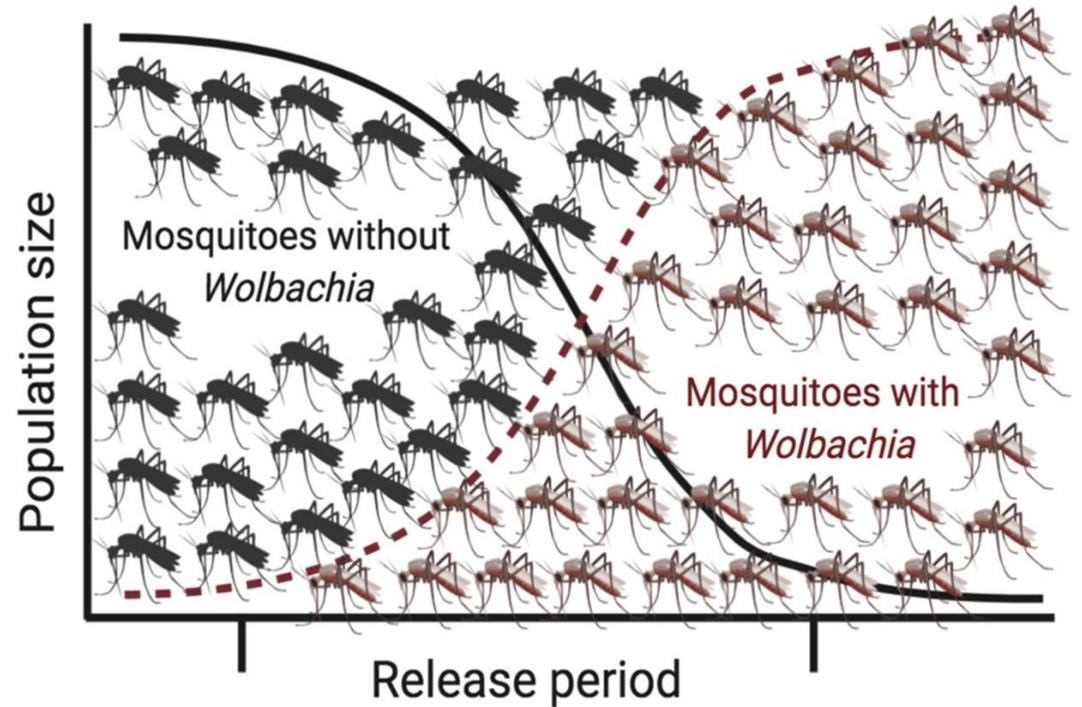


Messina, J.P., Brady, O.J., Golding, N. *et al.* The current and future global distribution and population at risk of dengue. *Nat Microbiol* **4**, 1508–1515 (2019). <https://doi.org/10.1038/s41564-019-0476-8>

Vaccines and Wolbachia mosquitoes are new tools for dengue control



Population replacement strategy (PRS)





The landscape for dengue prevention has changed.
New interventions are available to tackle the dengue
burden.

Questions

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