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# Integrated Zika surveillance in Singapore

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# A perfect storm

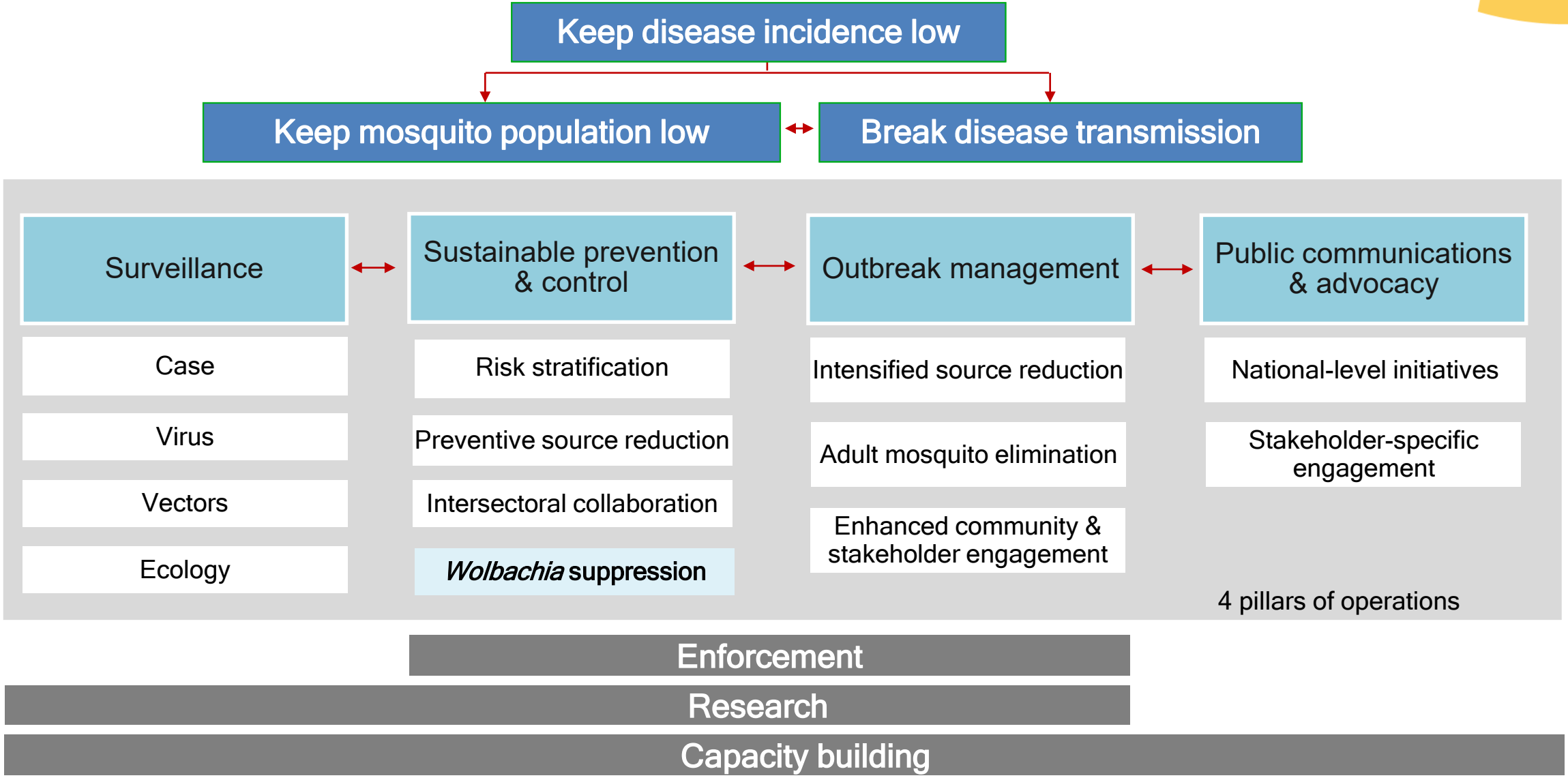
Warm and wet climate, set to change

*Aedes aegypti*: efficient vector, urban dweller

Aging buildings, construction sites

*Aedes albopictus*: Managed vegetation

# Integrated, evidence-based surveillance and control of *Aedes*-borne diseases



# Integrated approach to tackle Zika transmission, 2016

## Outbreak of Zika virus infection in Singapore: an epidemiological, entomological, virological, and clinical analysis

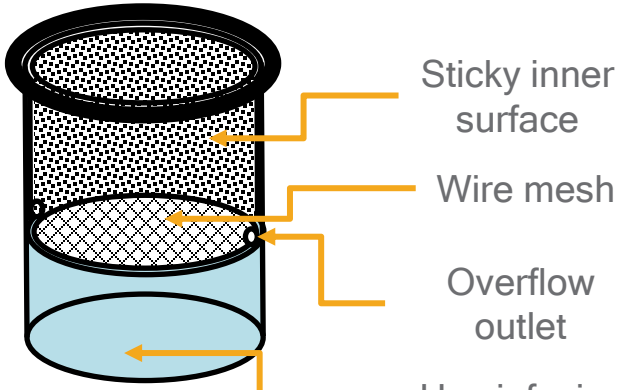
*The Singapore Zika Study Group**

**Summary**

**Background** An outbreak of Zika virus infection was detected in Singapore in August, 2016. We report the first comprehensive analysis of a national response to an outbreak of Zika virus infection in Asia.

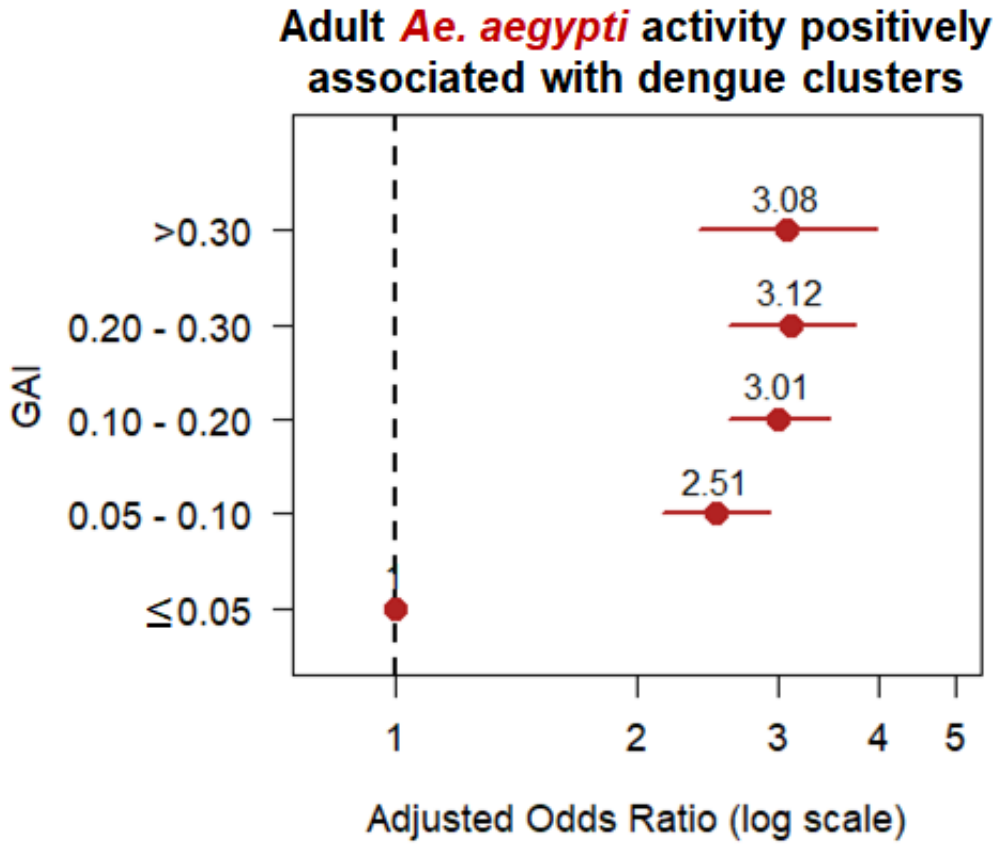
Lancet Infect Dis 2017; 17: 813-21

# Adult *Aedes* surveillance: 70,000 Gravitraps nationwide



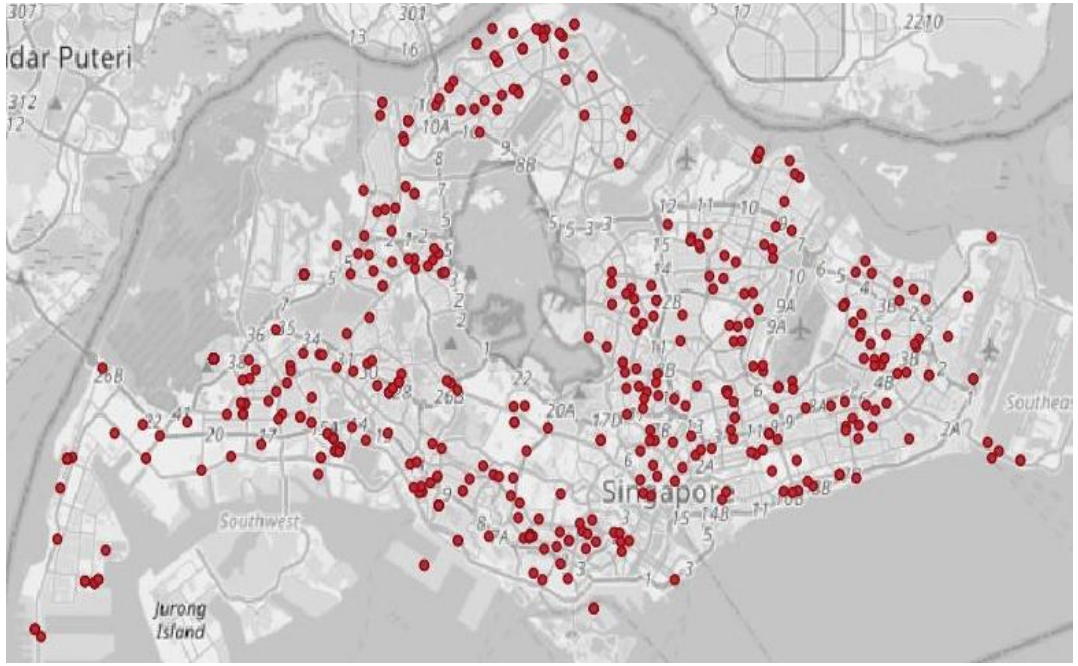



Areas with high population published online for community awareness



# Wastewater surveillance in Singapore

**Network of >500 sites**




**Case Investigations**
- Monitoring to facilitate early case detection

**Community Situational Awareness**
- Provides indication of COVID-19 transmission
- Monitoring dense living premises & residences
- Variant monitoring

**Aircraft Wastewater Surveillance**
- Feasibility for global pathogen surveillance

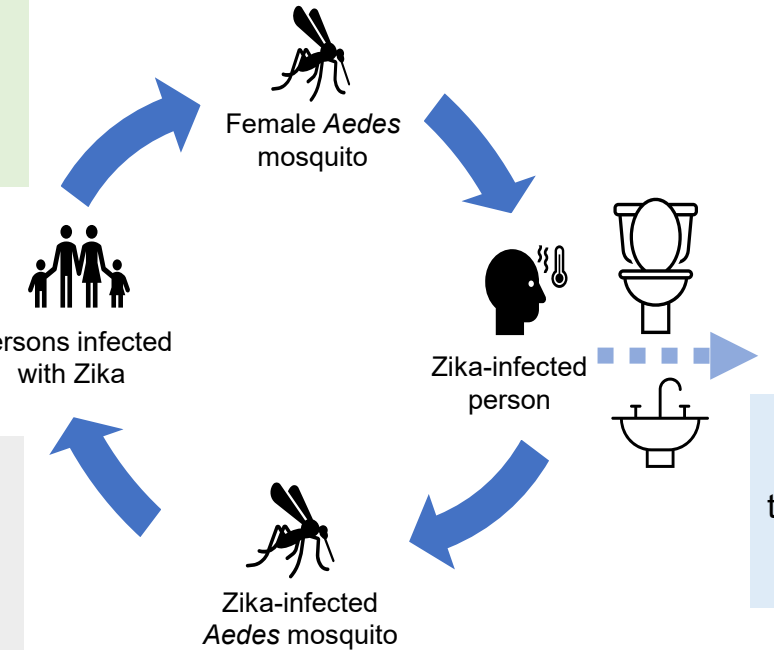
**Monitoring other Pathogens**
- Zika, Mpox, respiratory viruses, etc

**Pandemic to Endemic**

# Enhanced Zika surveillance through case, wastewater, and mosquito testing

CDA (Health) / NEA (Environment) surveillance programme for early warning

**Case surveillance**
Mandatory reporting of Zika cases to CDA by doctors and laboratories




**Wastewater surveillance**
Wastewater sampling and testing for ZIKV (shed via bodily discharges e.g. urine)

**Entomological surveillance**
Collection and testing of *Aedes* mosquitoes from areas with reported cases

**Gravitrap for *Aedes* mosquitoes**

## Case report: Zika surveillance complemented with wastewater and mosquito testing

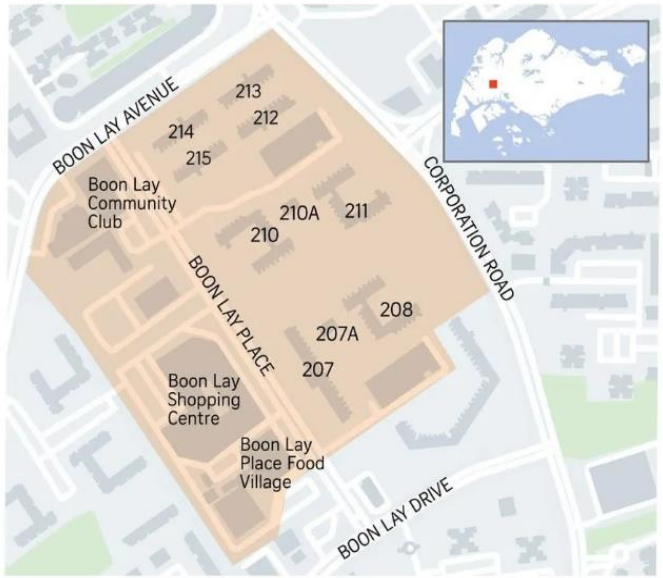
Judith Chui Ching Wong [1], Martin Tay [2], Hapuarachchige Chanditha Hapuarachchi [2], Benjamin Lee [2], Gladys Yeo [2], Dzulkhairul Maliki [2], Winston Lee [2], Nur-Afidah Mohamed Suhaimi [3], Kaiyun Chio [4], Wilson Cheong Huat Tan [2], Lee Ching Ng [5]

# Enhanced Zika surveillance: case + environmental data prompts public alerts

## Lack of ZIKV signals beyond neighbourhood suggests limited transmission

**Zika possibly being transmitted in Boon Lay Place; residents urged to protect themselves**

**Area with likely Zika transmission**




SOURCES: MINISTRY OF HEALTH, NATIONAL ENVIRONMENT AGENCY

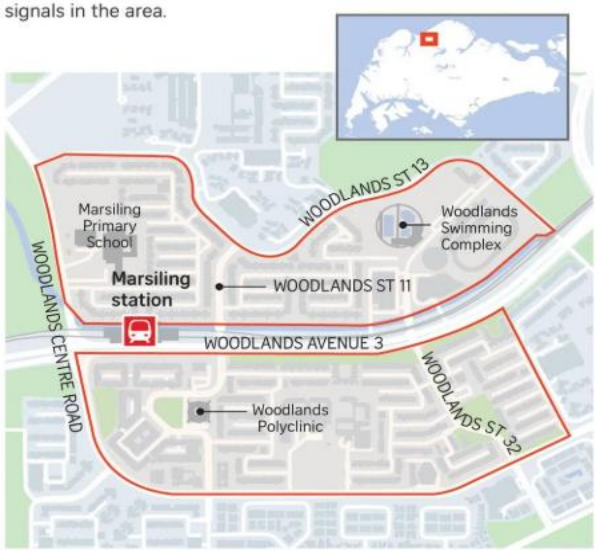
SINGAPORE - The authorities are on the lookout for Zika transmission in Boon Lay Place after mosquito and wastewater testing in the area found signs of the virus.

The Straits Times
22 February 2024

**2 Zika cases in Woodlands, NEA detects persistent virus signals in the area**

**Area with likely Zika transmission**

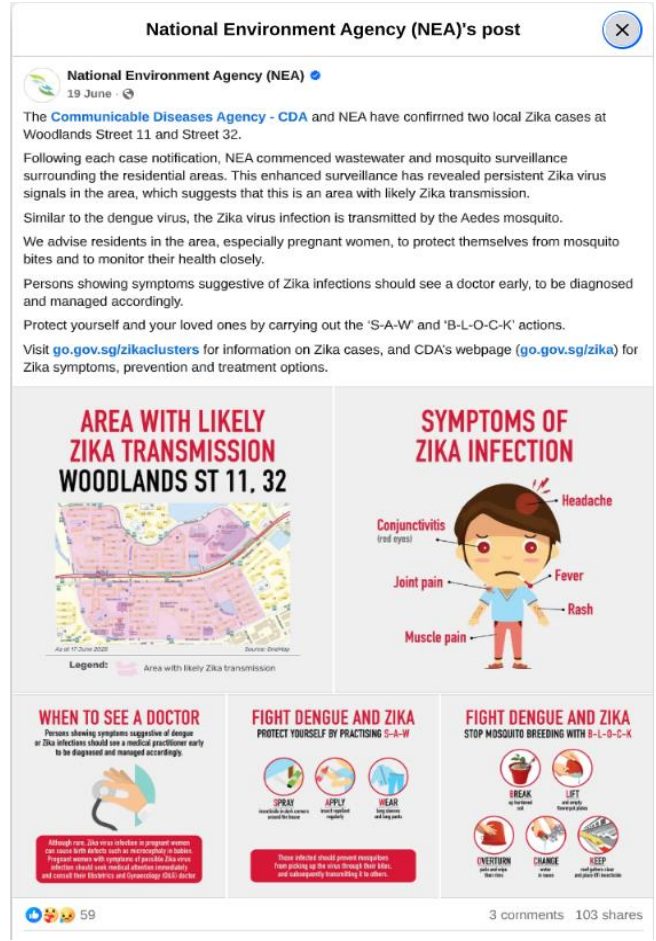
Two Zika cases were confirmed in Woodlands Street 11 and Street 32. NEA said surveillance revealed persistent Zika virus signals in the area.




NOTE: As at June 17, 2025

Source: NATIONAL ENVIRONMENT AGENCY
STRAITS TIMES GRAPHICS

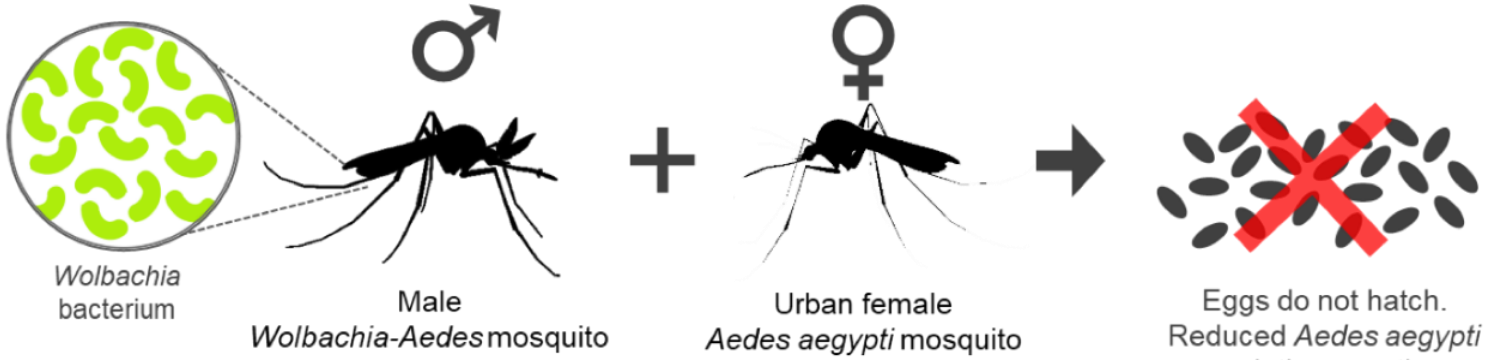
The Straits Times
19 June 2025

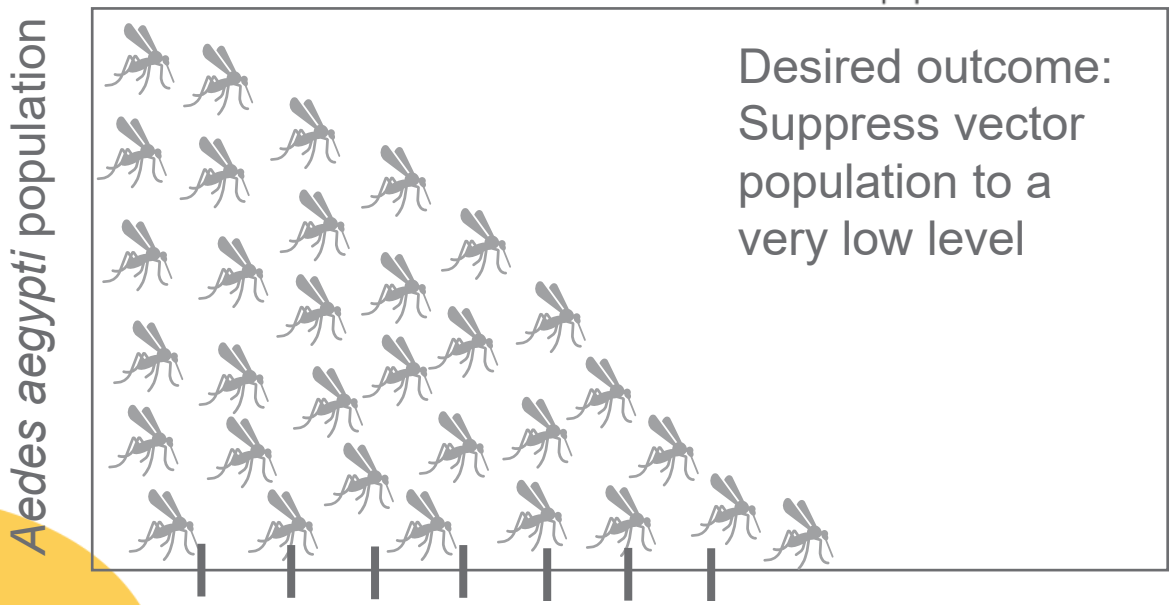



NEA Facebook post
19 June 2025

# Project *Wolbachia*: release of male *Wolbachia*-carrying mosquitoes to suppress *Aedes aegypti*

Close to 40% coverage of households in Singapore

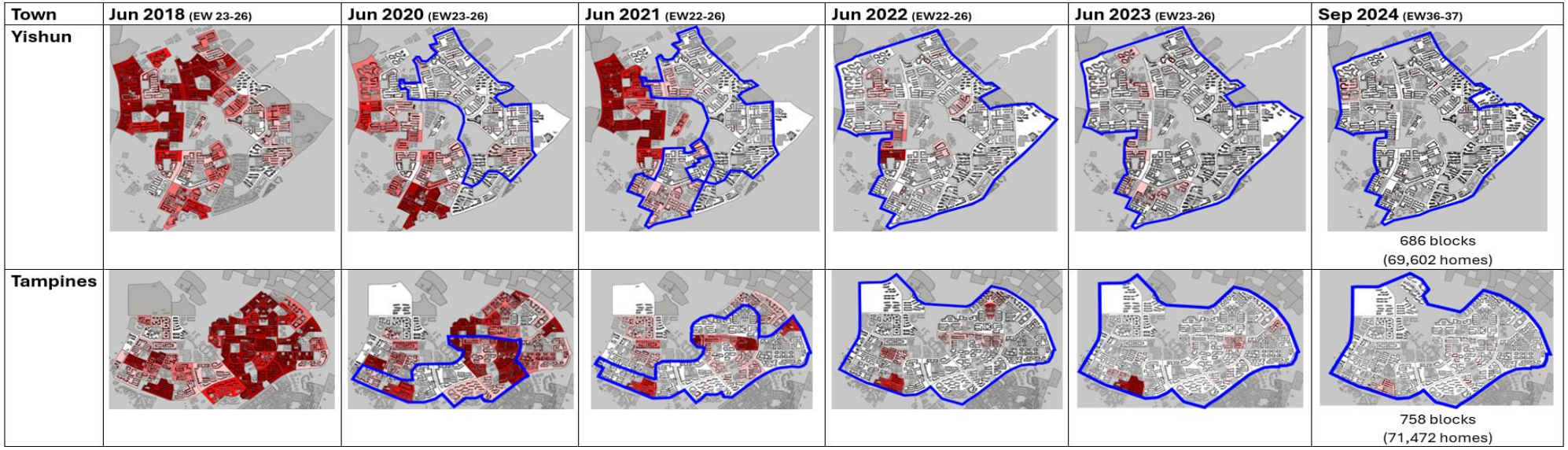


# *Wolbachia* suppression decimates *Aedes aegypti* population and reduces dengue risk

Likely contributes to control of other *Aedes aegypti*-borne diseases

NEJM 2025 – in press
BMC Med. 2025. 23(1):184.
Lancet Planet Health 2024. 8: e617-28
Lancet Microbe 2024. 5: e422-32
J Travel Medicine 2024 taae103
Sci Rep. 2025.15(1):2253




Release Areas

Entomological endpoint

## Randomised controlled trial – Epidemiological endpoint

| Exposure period (Months) | Protective efficacy (95% CI) | Test Positive % (Test Positive/Test Negative) Intervention Arm | Control Arm |
|---|---|---|---|
| 0+ | **65 (47-77)** | 10% (787/8245) | 23% (2402/10344) |
| 3+ | **71 (58-81)** | 7% (457/6743) | 21% (1717/8125) |
| 6+ | **72 (58-82)** | 6% (354/5722) | 22% (1519/7080) |
| 9+ | **71 (55-82)** | 7% (317/4668) | 23% (1403/6118) |
| 12+ | **71 (51-84)** | 7% (256/3724) | 21% (1037/4986) |

**90%** reduction in *Ae. aegypti* mosquito population

**>70%** reduction in risk of dengue in treatment site

45% reduction in risk in adjacent sites

# Summary

- Zika case surveillance complemented by virus surveillance in wastewater and mosquitoes
  - Early warning and public alert in affected neighbourhoods
  - Lack of signals in rest of community suggests limited transmission

- Reduced *Aedes aegypti* population through *Wolbachia* suppression and community vigilance - avoidance of Zika outbreaks despite localised transmission in some neighbourhoods

- Continued prevention and control: multi-source surveillance, community vigilance and environmental management, and integration of *Wolbachia* technology

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# Thank you!

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