DEPLOYMENT OF WOLBACHIA-INFECTED MOSQUITOES IN PORT VILA TO REDUCE DENGUE

A SAFE BIOLOGICAL INNOVATIVE

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VANUATU 2ND HEALTH RESEARCH SYMPOSIUM
Holiday Inn, Port Vila
23 – 24 September 2021

OUTLINE

- Introduction
- Methods
- Results
- Discussion
- Recommendation/ Implication
- Acknowledgment
- References

INTRODUCTION

What is Wolbachia ?

- Naturally occurring bacteria
- Lives inside insect cells
- Passed from mother to offspring
- Cannot live in other animals or people
- Safe for humans, animals and environment
- Blocks dengue, Zika and Chikungunya

World Mosquito Program

MINISTRI BLONG HELT

Australian Government
Department of Foreign Affairs and Trade

VANUATU RED CROSS SOCIETY

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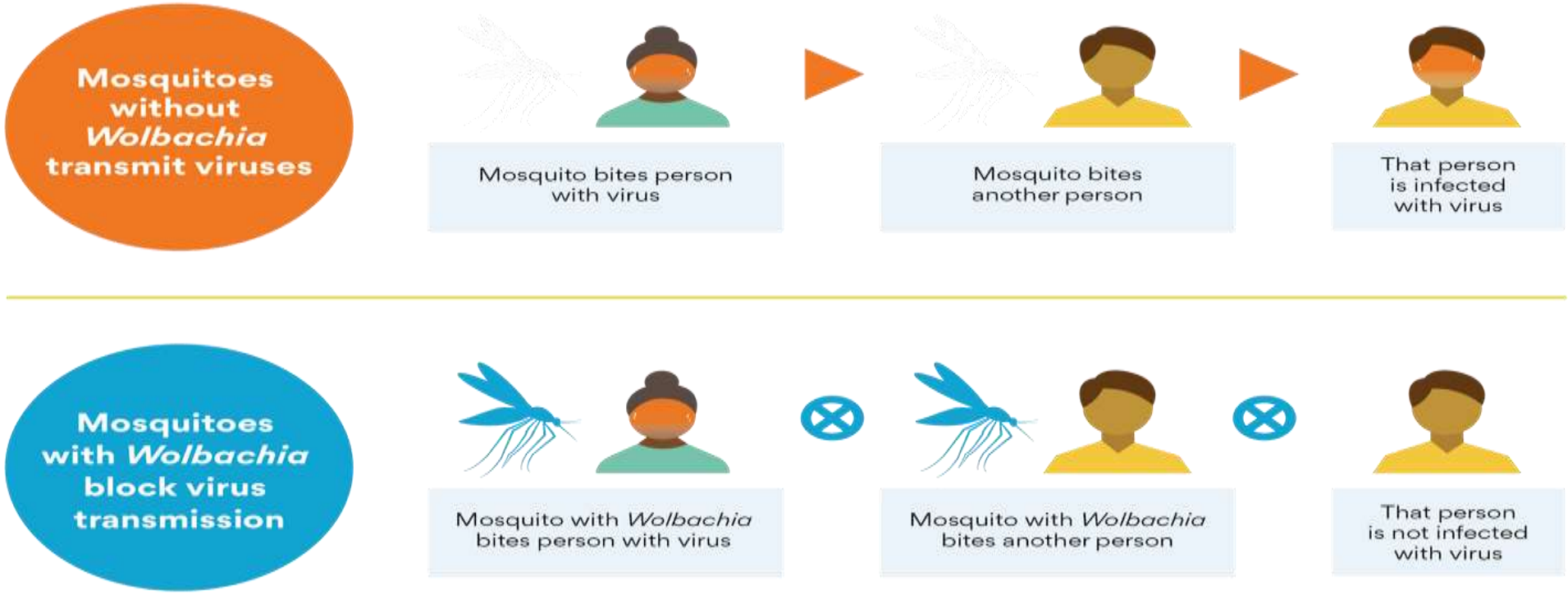
This is how it works



Research Hypothesis: "Releasing of *Wolbachia* mosquitoes blocks virus transmission and therefore reduces the risk of getting infected with dengue, Chikungunya and Zika.

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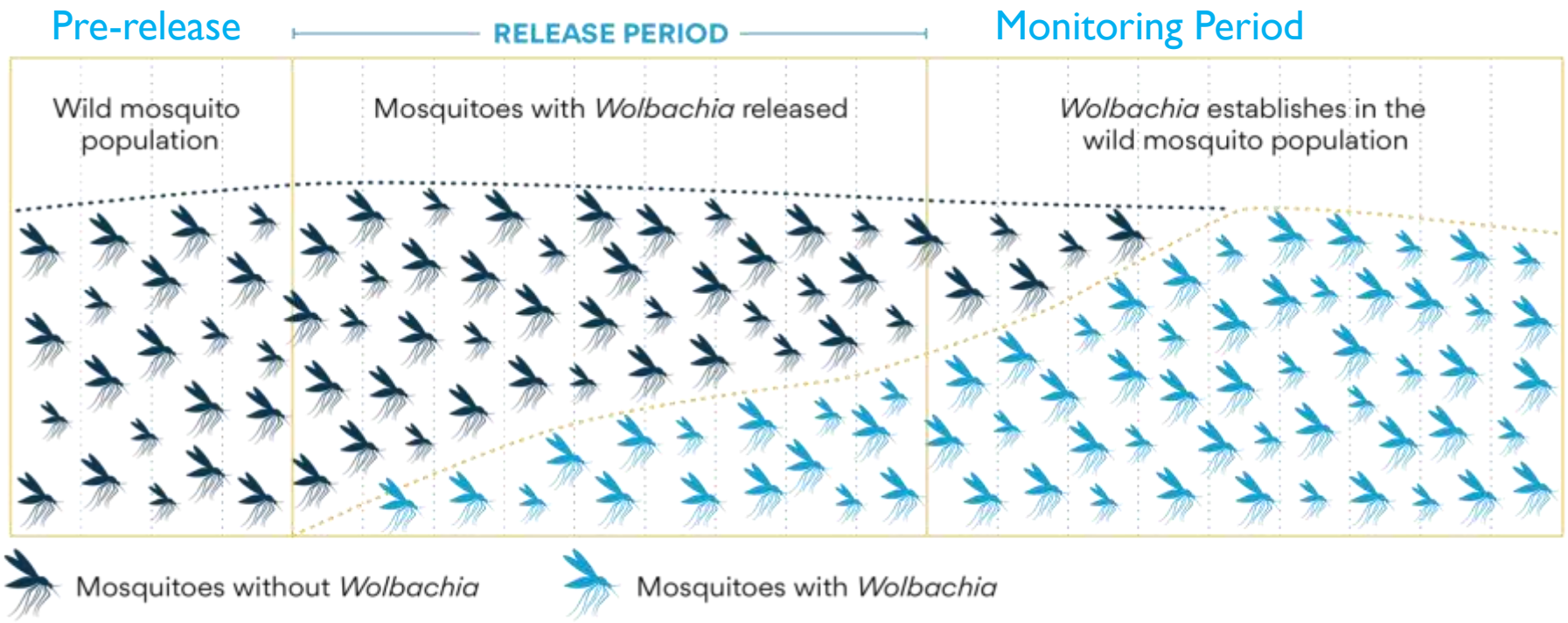
APPROACH


Pre-release
RELEASE PERIOD
Monitoring Period
Wild mosquito population
Mosquitoes with *Wolbachia* released
Wolbachia establishes in the wild mosquito population
Mosquitoes without *Wolbachia*
Mosquitoes with *Wolbachia*

METHODS (1): PROCESS

Three (3) phases

1. Pre-release (6-12 Months)
2. Releases (6 Months)
3. Post-release (6-12 Months)

1. Rear *Wolbachia* mosquitoes in the lab

2. Release *Wolbachia* mosquitoes in the field (adults or eggs)

3. Collect mosquito samples from 211 traps across all 12 reporting areas

4. Test if mosquitoes carry *Wolbachia*

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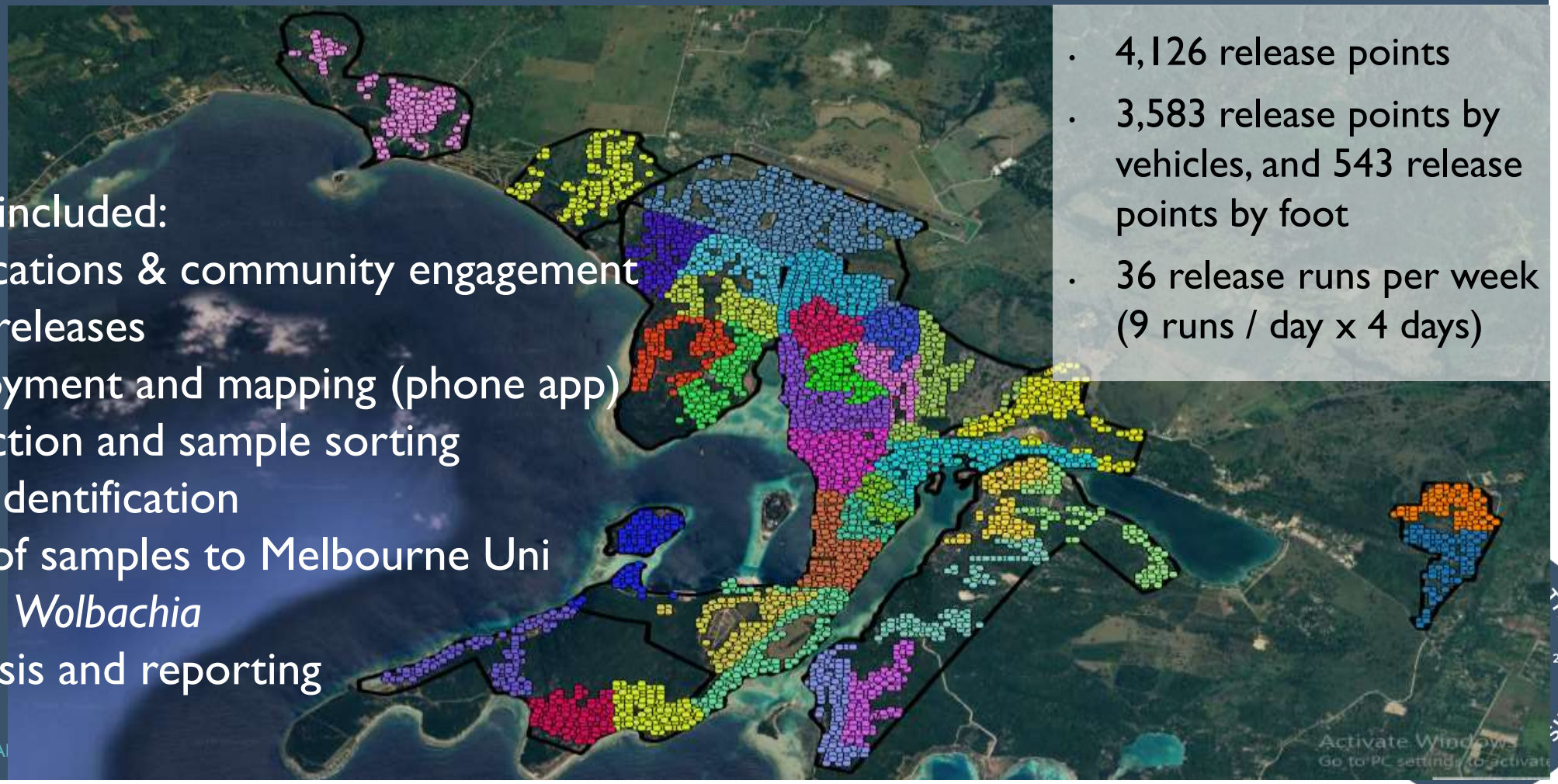
METHODS (2): RELEASES + COLLECTIONS

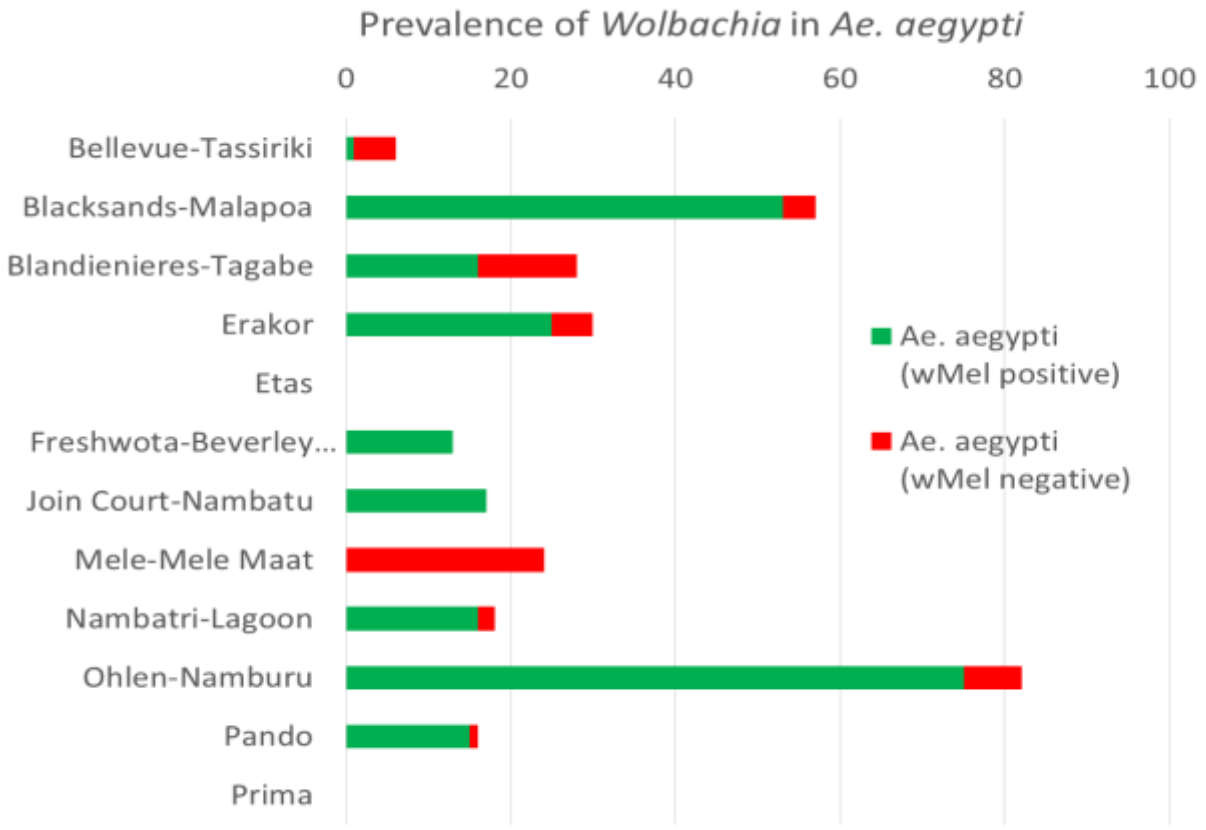
Component included:

- Communications & community engagement
- Mosquito releases
- Trap deployment and mapping (phone app)
- Trap collection and sample sorting
- Mosquito identification
- Shipment of samples to Melbourne Uni
- Testing for *Wolbachia*
- Data analysis and reporting



- 4,126 release points
- 3,583 release points by vehicles, and 543 release points by foot
- 36 release runs per week (9 runs / day x 4 days)

RESULTS (1) – LONG TERM MONITORING (2021)



BG Trap collections 3-16 May 2021 for mosquito.

Total

- 291 *Ae. aegypti* (Primary vector)
- 375 *Ae. albopictus*

Overall, *Ae. albopictus* more prevalent

Testing for *Wolbachia* in *Ae. aegypti* collected 3-16 May 2021

Total:

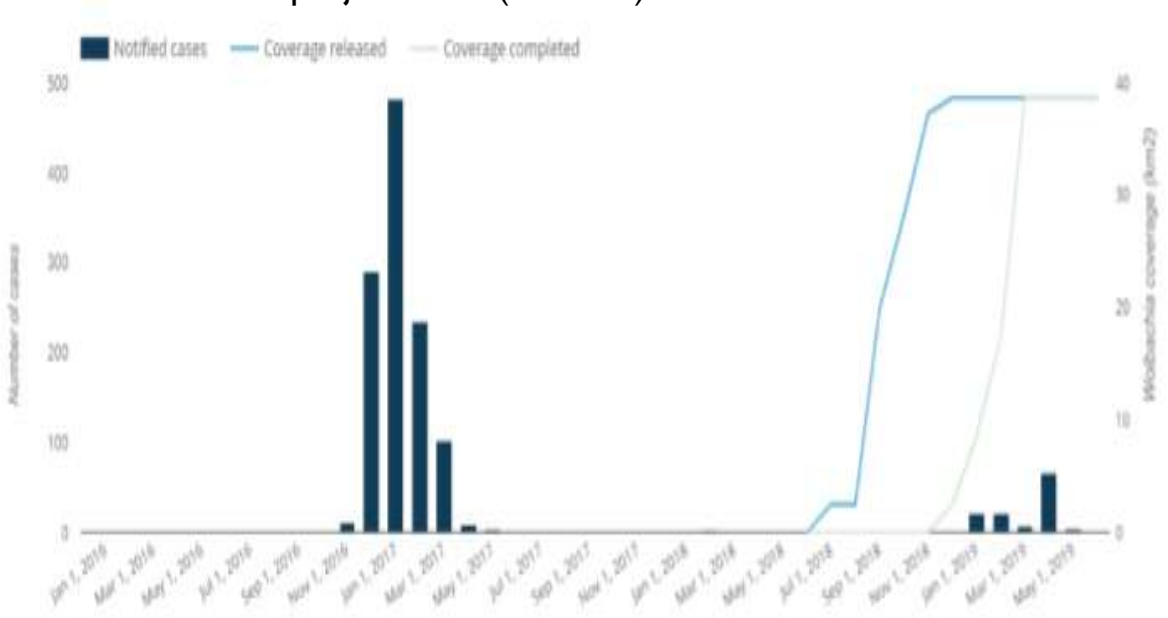
- 291 *Ae. aegypti*
- 231 *Wolbachia* positive

Overall, Wolbachia present in 79.4% of *Ae. aegypti* tested

***Wolbachia* present in most release areas**

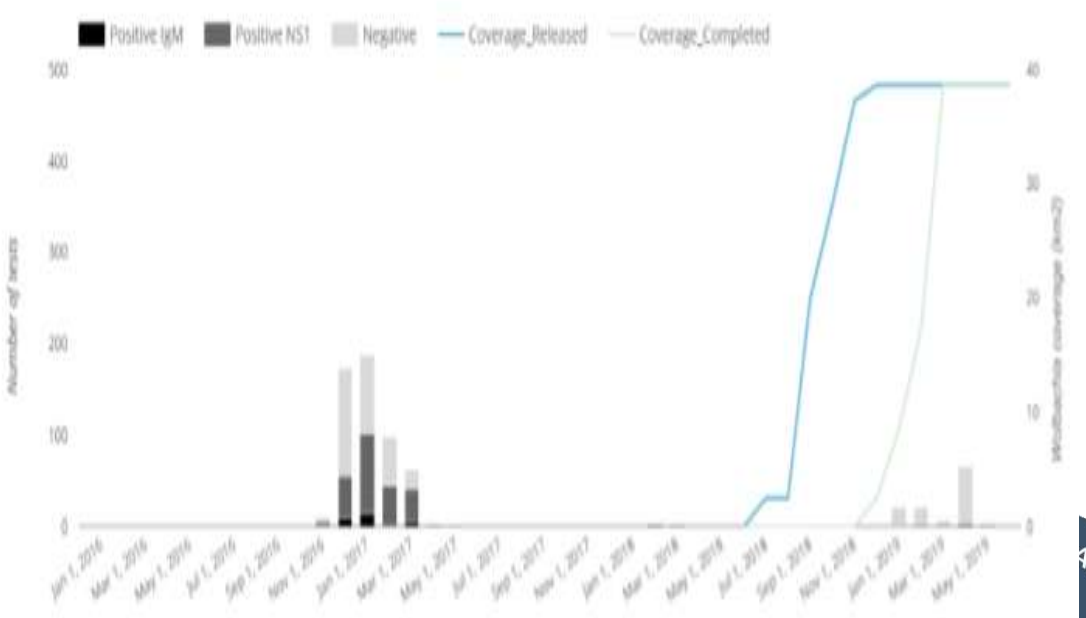
RESULTS (2) – DENGUE EPIDEMIOLOGY (2016-2019)

Dengue cases versus Wolbachia frequency in project areas (Port Vila)



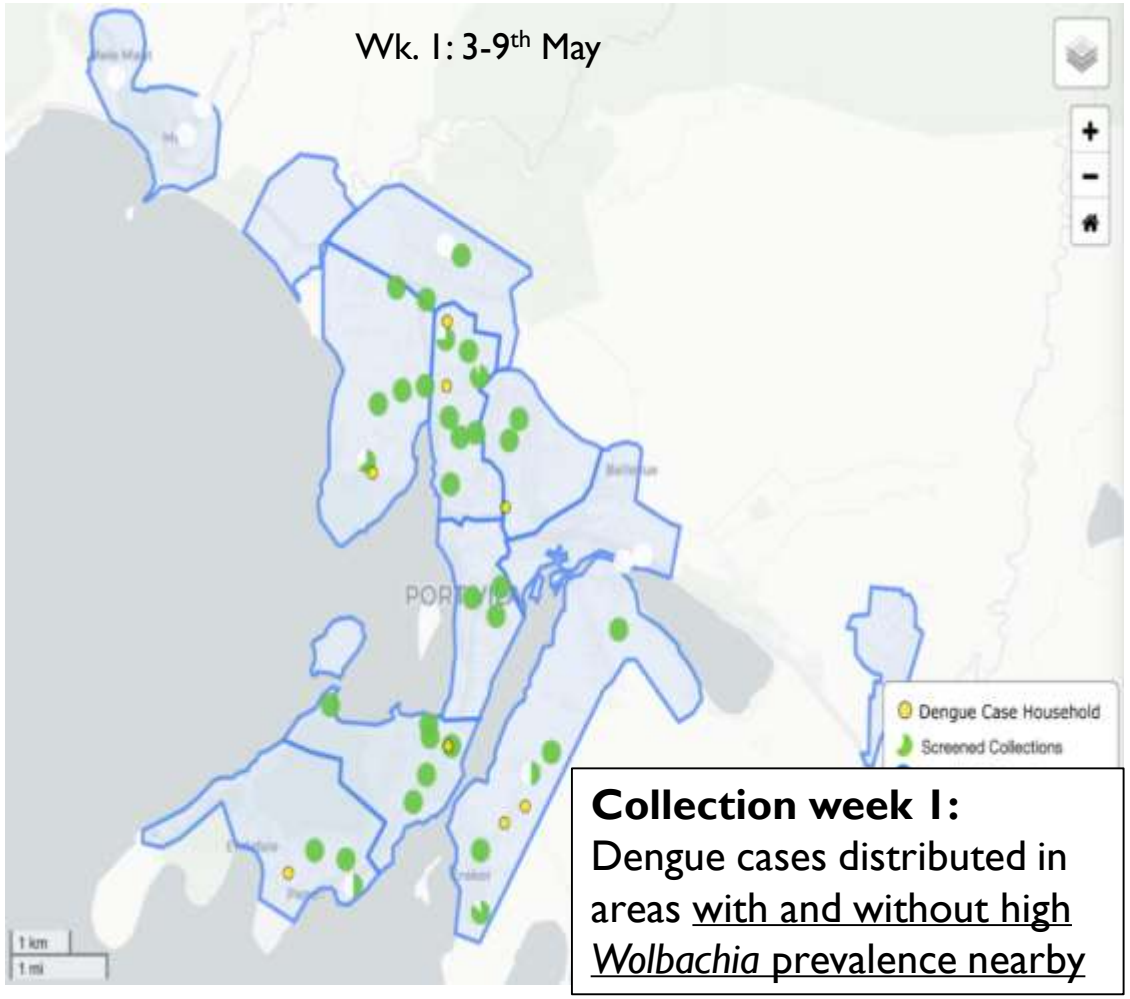
Shows the number of suspected dengue cases (Like illness) reported to the PHS system each month from Jan 2016 to Jun 2019, from the PV project area. Lines show the coverage (km2) of Wolbachia deployments in PV over time.

Dengue diagnostic test results versus Wolbachia frequency in project areas (Port Vila)

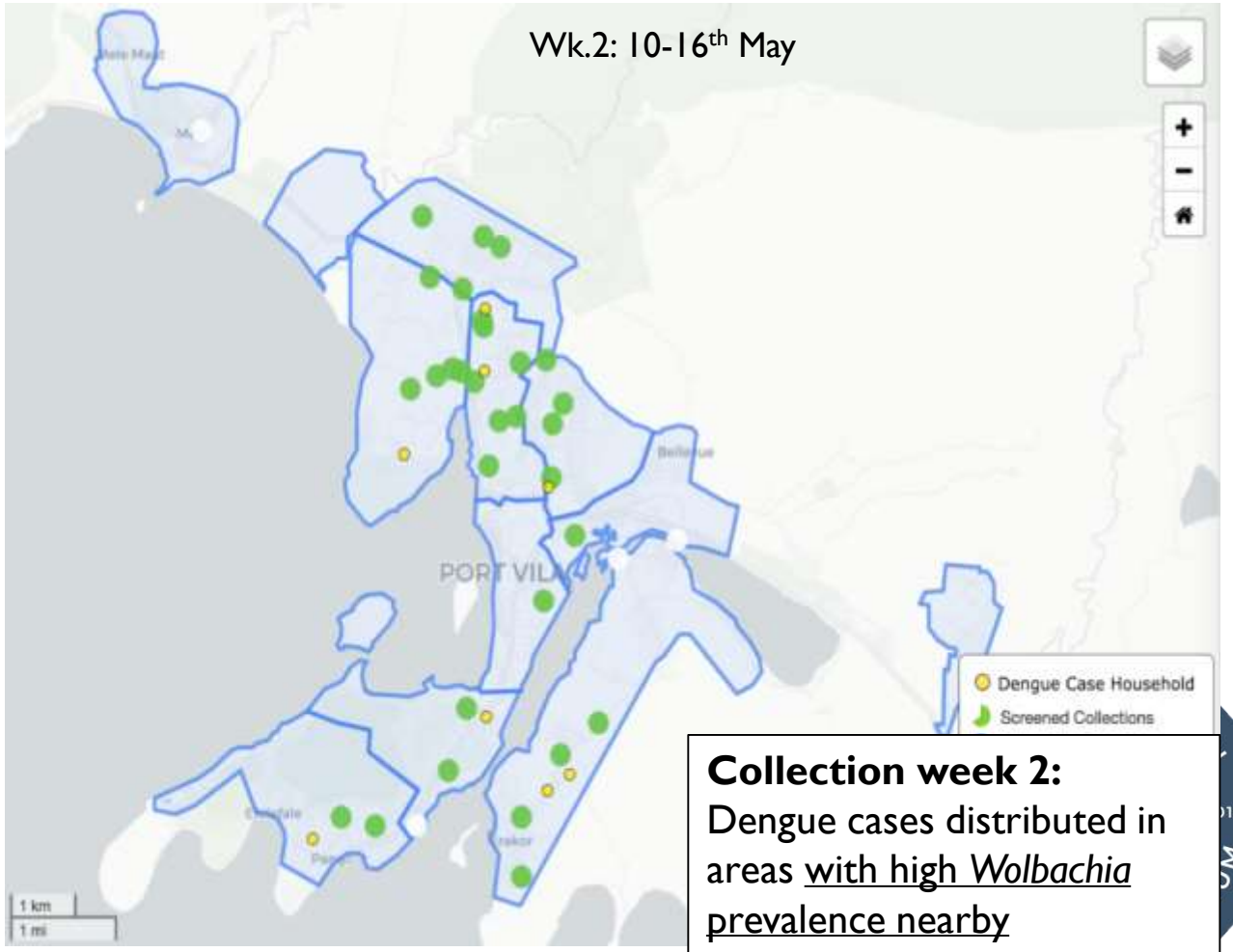


Shows the dengue diagnostic test results in the subset of cases that have lab testing. Diagnostic results are from RDT for dengue virus(DENV) NS1 antigen and DENV igM antibody, reported to the PHS system. A case with a positive NS1 and/or igM RDT results is considered lab-confirmed.

RESULTS (3): 2021 DENGUE CASES + *WOLBACHIA* MOSQUITOES

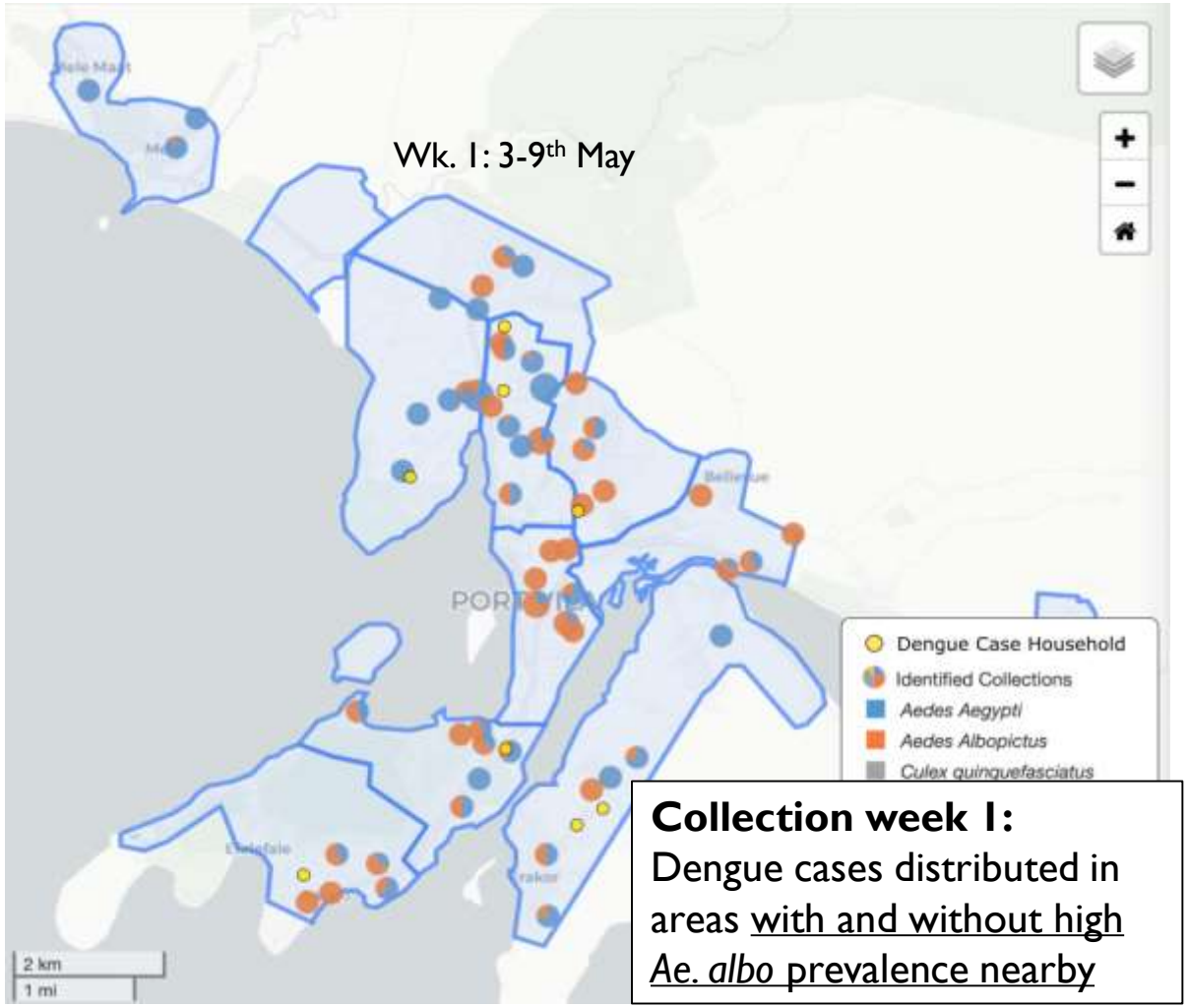


Collection week 1:
Dengue cases distributed in areas with and without high *Wolbachia* prevalence nearby

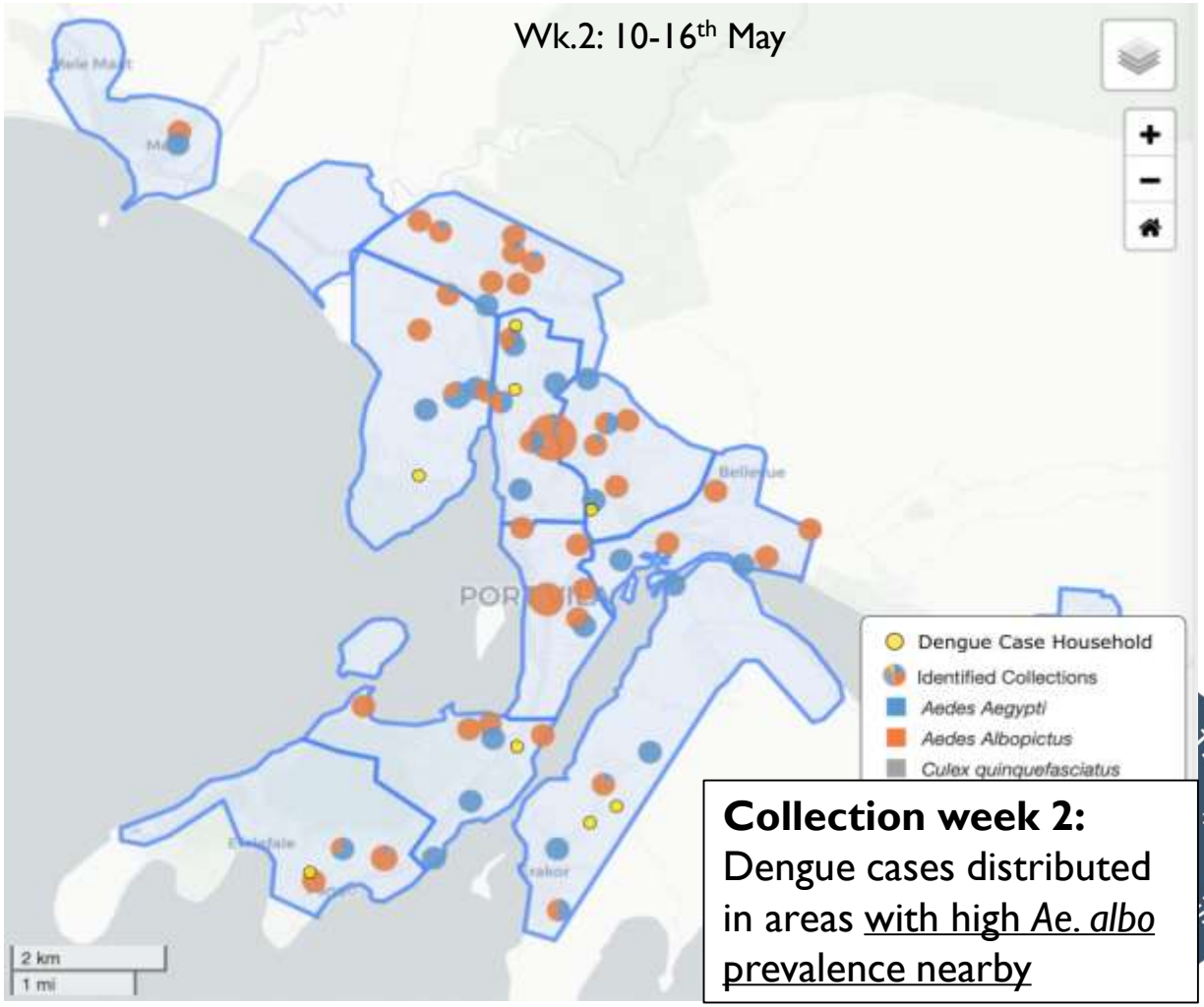


Collection week 2:
Dengue cases distributed in areas with high *Wolbachia* prevalence nearby

RESULTS (4): 2021 DENGUE CASES + *AE. ALBOPICTUS*



Collection week 1:
Dengue cases distributed in areas with and without high *Ae. albo* prevalence nearby



Collection week 2:
Dengue cases distributed in areas with high *Ae. albo* prevalence nearby

SUMMARY

- Indications are that the *Wolbachia* project has progressed well - *Wolbachia* at high frequency in *Ae. aegypti* populations near release points throughout Port Vila as shown by monitoring in April – May 2021:
  - overall frequency = 79.4% of *Ae. aegypti* tested
  - > 80% frequency in almost all reporting areas
- From the recent dengue outbreak experience, some of the cases occurred close to trapping sites that showed high frequency of *Wolbachia* in *Ae. aegypti* but data were sparse
- Observed high densities of *Ae. albopictus* also (a secondary vector that is generally less efficient than *Ae. aegypti*)
- Not clear if transmission is being sustained by *Ae. aegypti* or *Ae. albopictus*
- Cannot yet conclude whether *Wolbachia* has been a success in reducing disease burden of dengue in Port Vila

RECOMMENDATIONS / IMPLICATIONS

- More monitoring data needed to support the hypothesis of a change in species abundance. Need to consider other variables eg. seasons, position of traps (indoor versus outdoor).
- Further monitoring is required to continue measuring in Port Vila:
  - vector distributions (*Ae. aegypti* versus *Ae. albopictus*)
  - *Wolbachia* frequency in *Ae. aegypti*
  - dengue case distribution
- Support to long-term monitoring will be provided by MoH to monitor sustainability of this promising new innovation.

ACKNOWLEDGEMENTS

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- The Government of Vanuatu through MoH & other NGOs / partners (WHO, MoE, Churches, Youth groups, School children, Mass media outlets, Port Vila Community)

ALL for accepting and making it a dream come true to roll out this special innovation in Vanuatu.

REFERENCE(S)

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