“Dengue Awareness” Campaign Planning Utilising Singapore’s Historical Weather Data

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Presentation Outline

- Background
- Problem Statement
- Datasets
- Data Analysis
- Key Takeaways
- Recommendations
- Limitations and Future Exploration

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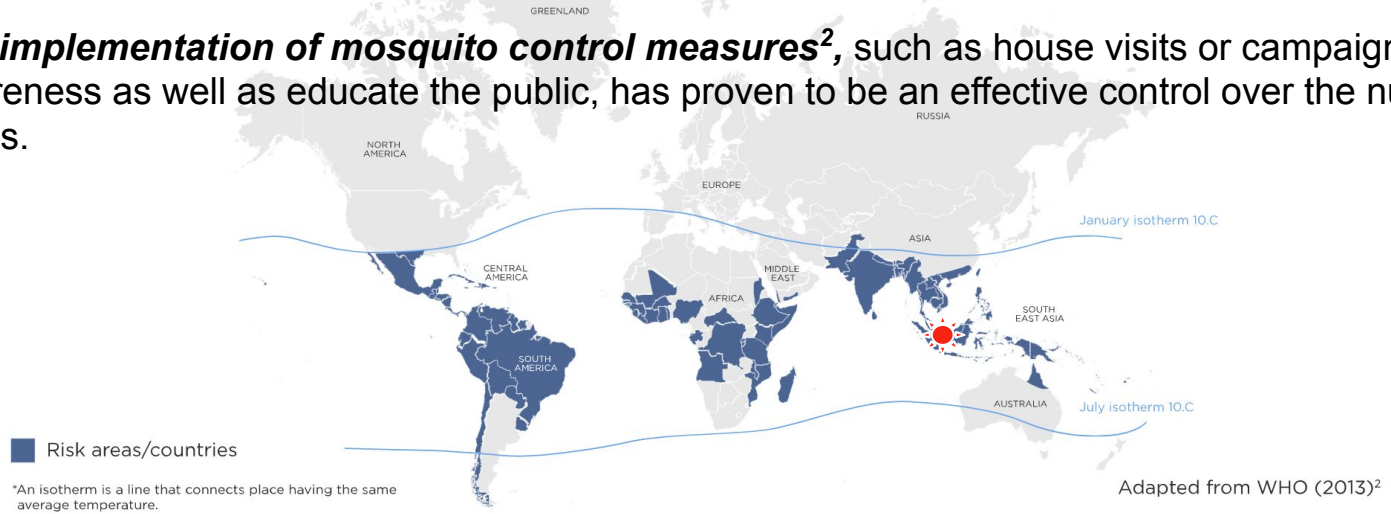
Background

- Singapore, being situated near the equator, experiences ***tropical climates which promotes the transmission of dengue[1].***
- ***The primary carrier of dengue cases are infected Aedes mosquitoes*** and their population increase has been encouraged through favourable weather conditions.
- ***The implementation of mosquito control measures[2],*** such as house visits or campaigns to raise awareness as well as educate the public, has proven to be an effective control over the number of cases.



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Problem Statement

When should NEA plan their “Dengue Awareness” campaigns to maximise its benefits in reducing the transmission of dengue?

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Weather conditions contributing to the Aedes mosquito population increase which leads to the rise in dengue cases.

High Surface Air Temperature (°C)

High Total Rainfall (mm) & Number of Rain Days

High Relative Humidity (%)

Increase in Aedes mosquito population

Increase in the number of dengue cases

Note: Underlined datasets were obtained from data.gov.sg and used for analysis.

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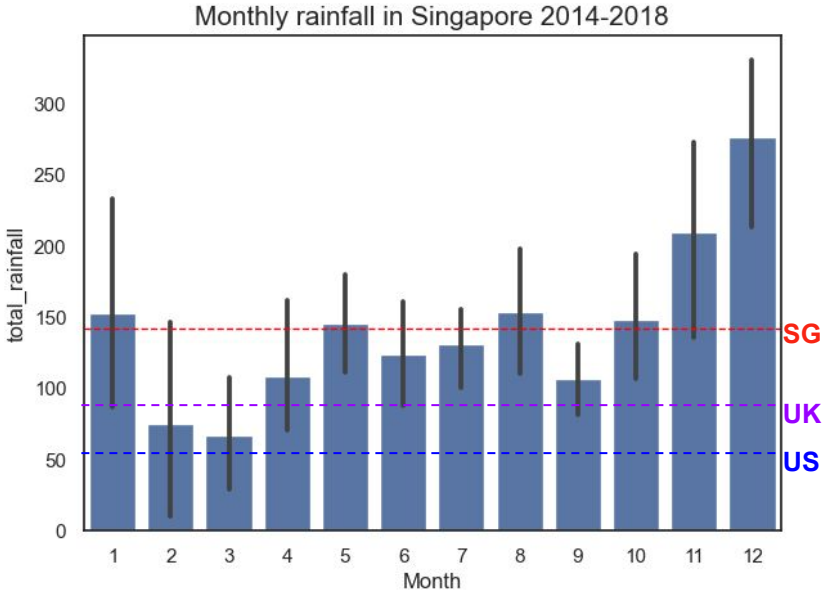
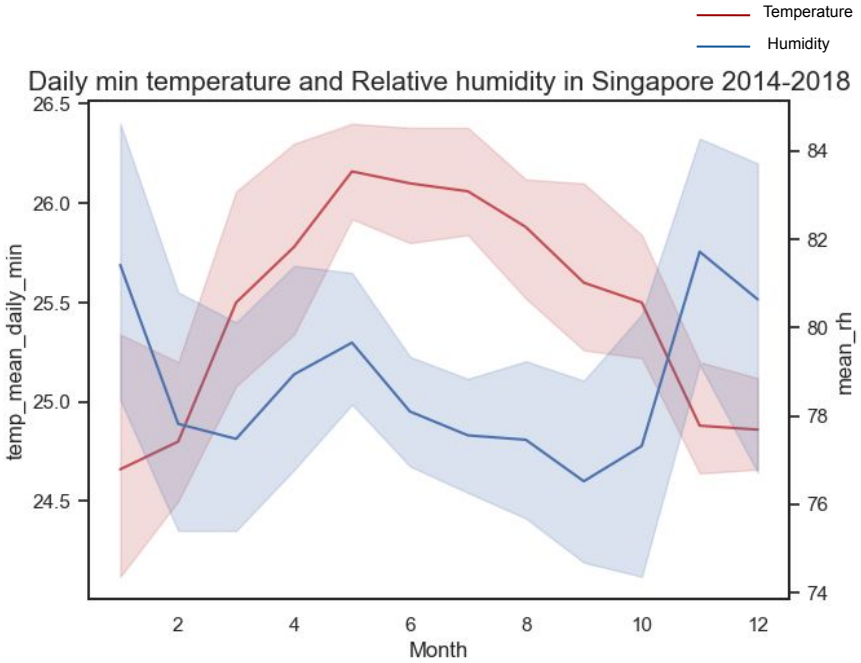
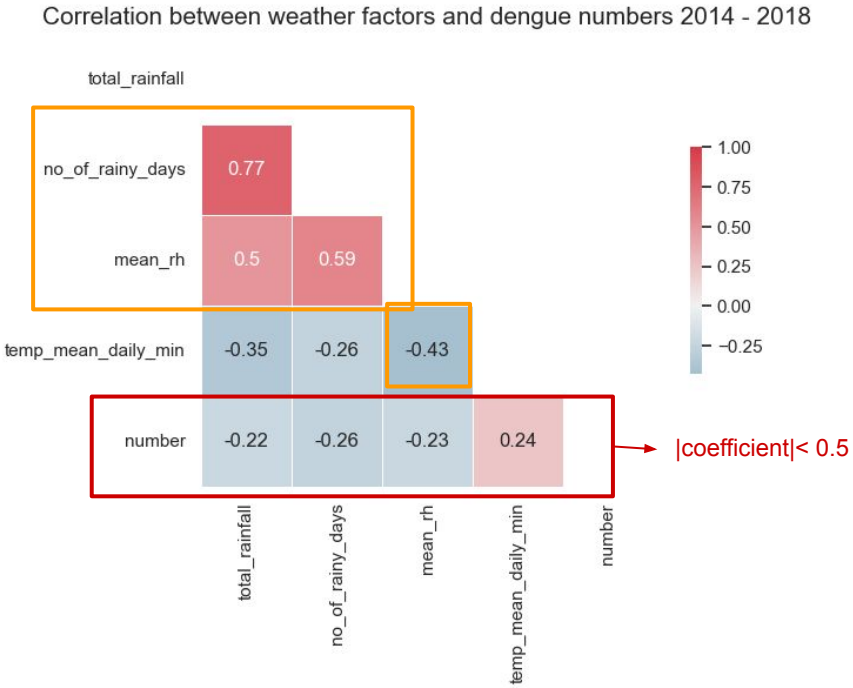
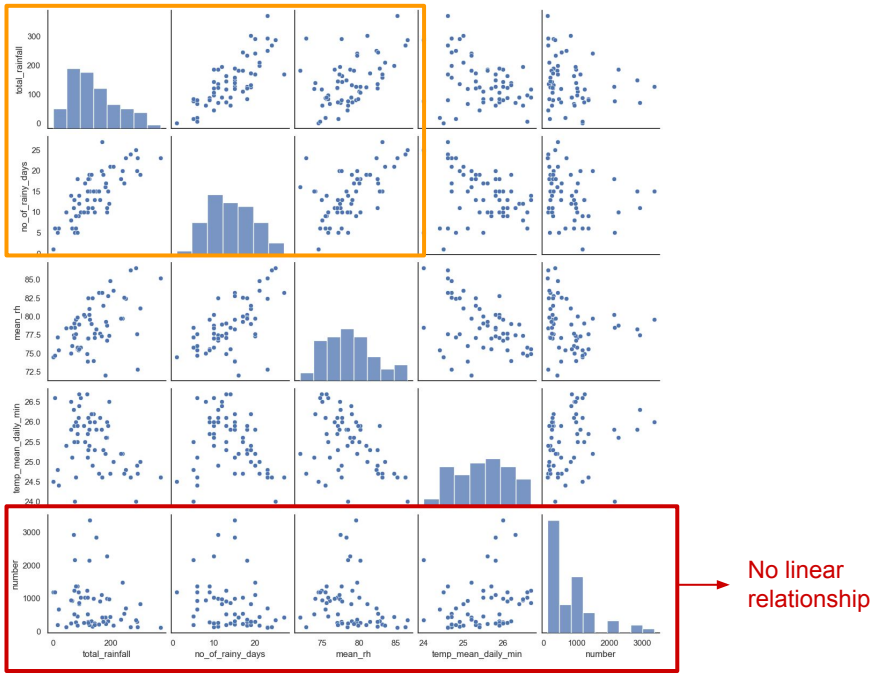
For the period of study, the abundant rainfall, high temperature and high humidity created optimal breeding conditions for Aedes mosquitoes in Singapore



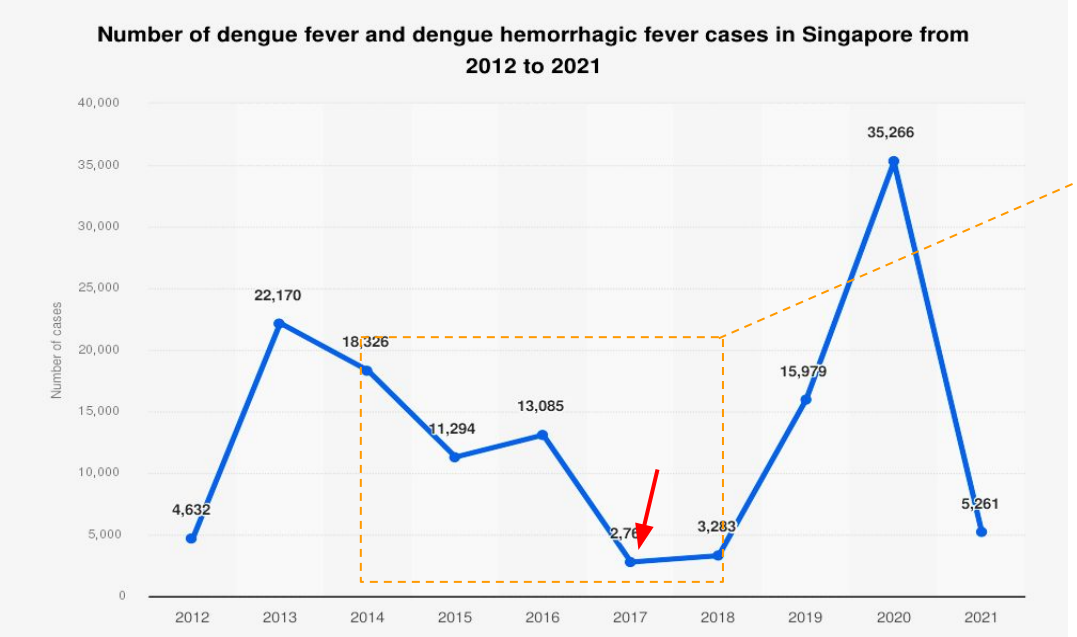


However, weak correlations observed between the number of dengue fever cases and analysed weather factors suggest otherwise…

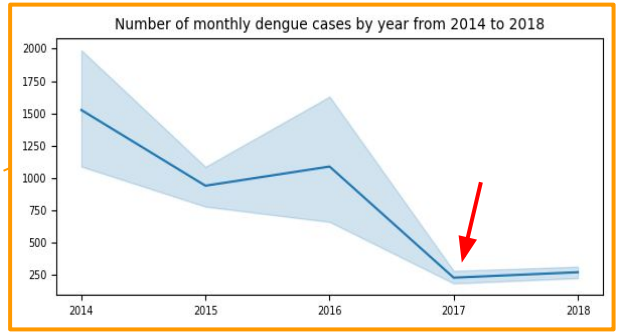




Dengue fever cases were inconsistent throughout the years with a noticeable sharp decline in the 2017 which may lead to a high variance of the data used for this study



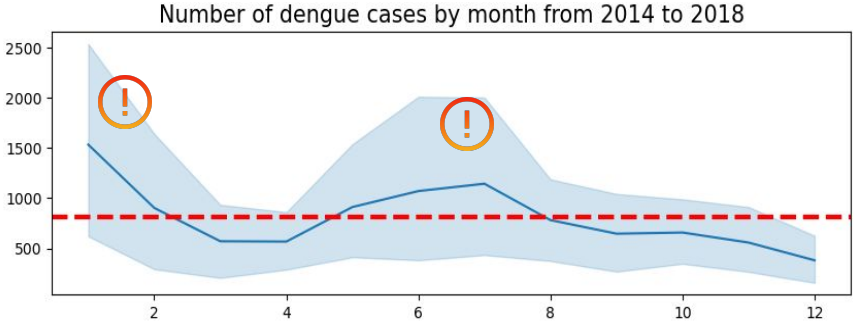
Group from: https://www.statista.com/statistics/963019/number-of-dengue-fever-cases-singapore/

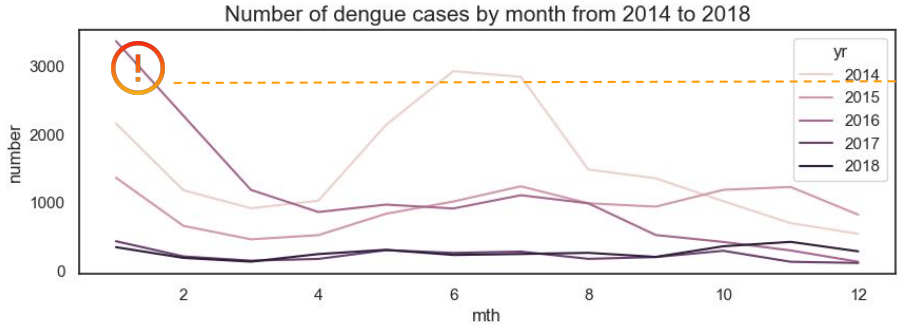


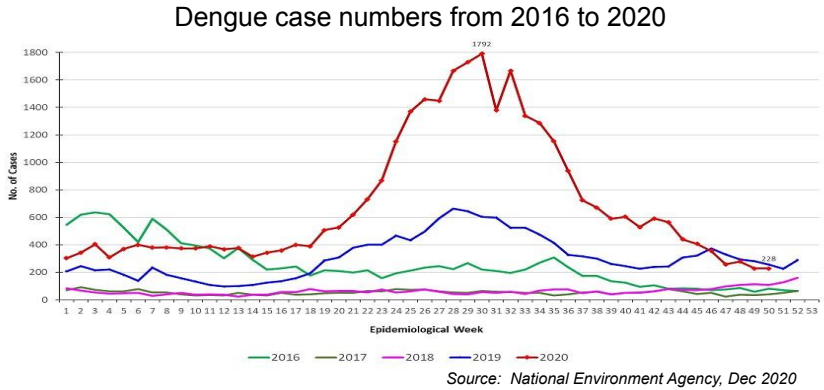
Possible reasons for the sharp decline[3]:

- Improved immunity of the human population.
- Results of concerted effort by the community and NEA in response to the Zika outbreak in 2016.

Higher number of dengue fever cases are observed in the months of May to July, which would require NEA to pay special attention to







Source: National Environment Agency, Dec 2020

Possible reasons for the surge:

- Record warmest Jan due to the El Nino phenomenon
- Change in the main strain of the virus from the DENV-1 to DENV-2 serotype

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Key Takeaways

- Weak correlation between analysed weather factors and number of dengue cases observed despite our research findings telling us so. This may be due to larger factors at play, contributing to rise in number of dengue fever cases.
- Although the total number of dengue fever cases differ year to year, months of May to July are observed to be the peak season of infection.

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Recommendations

1) Presently, NEA should plan for their “Dengue Awareness” campaigns to be held in April, May and June, which is 1 month before the predicted peak period of dengue cases.
2) Although a weak correlation was observed between weather factors and dengue fever cases, NEA should still retain this information and explore more factors which contributes to the rise in dengue cases, for a more accurate prediction of their campaign periods.
3) NEA should continue working on the measures (e.g. Gravitraps) that was proven to contribute to the fall in dengue cases.

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Limitations and Future Research

1) Insufficient data points:
   - More datasets with wider data points could prove the correlation between the chosen weather factors and number of dengue fever cases.
2) Lagged data collection[4]:
   - Lagged response between recording of weather data and number of dengue cases.
3) Additional factors not included part of the analysis
   - Factors contributing to the rise and fall of dengue cases[5] (i.e. Surge in Zika, Gravitraps by NEA) could potentially affect the results of analysis and lead to an improved accuracy of recommendation.

THANK YOU!


APUSKAN DENGGI
Booklet
THE ESSENTIAL GUIDE TO MOZZIE-PROOFING YOUR HOME FROM DENGUE.
Wooden Plant Pot Markers
Fridge Magnet
BTI Dunk
MOZZIE-PROOF YOUR HOME.
SG CLEAN
THINKING OF A STAYCATION?
SO ARE MOZZIES IN YOUR HOME.
HIGH AEDES MOSQUITO POPULATION IN THIS AREA.
PLEASE REMAIN VIGILANT.
STOP DENGUE NOW

Citations

1. Chen, Y., Cook, A. R., & Lim, A. X. L. (2015, September). *Randomness of dengue outbreaks on the equator*. Emerging infectious diseases. Retrieved January 7, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4550167/
2. Sandpiper. (2022, December 29). *Improving dengue awareness is critical in 2021*. Sandpiper. Retrieved January 7, 2023, from https://sandpipercomms.com/health/improving-dengue-awareness-is-critical-in-2021/
3. Lydia, L. (2018, February 9). *2,772 dengue cases in 2017, the lowest in the last 16 years: NEA*. The Straits Times. Retrieved January 8, 2023, from https://www.straitstimes.com/singapore/2772-dengue-cases-in-2017-the-lowest-in-the-last-16-years-nea
4. Yawen Wanga, et al. (2022, September 19). *Impact of extreme weather on dengue fever infection in four Asian countries: A modelling analysis*. Environmental factors. Environment International. Retrieved January 8, 2023, from https://www.sciencedirect.com/science/article/pii/S0160412022004457
5. Valencia, B. M., et al. (2022, October 14). *Effect of prior zika and dengue virus exposure on the severity of a subsequent dengue infection in adults*. Nature News. Retrieved January 8, 2023, from https://www.nature.com/articles/s41598-022-22231-y