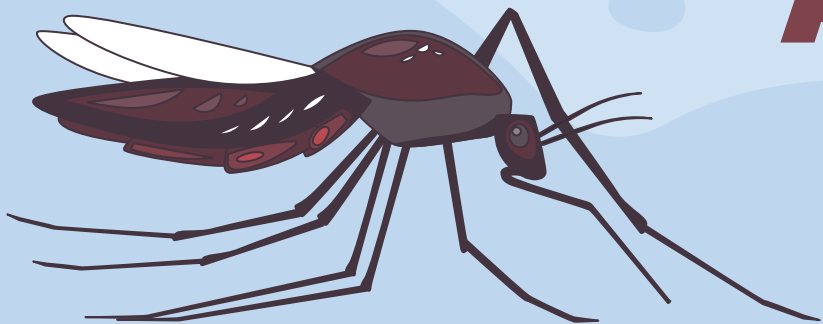




Dengue vs Rainfall Analysis



JIN JIN
DSI 37

Context



I am ...
A Junior Analyst

You are from ...
NEA

This is ...
an exploratory session on the
relationship between rainfall on
dengue cases



[1] National Medical Research Council (NMRC). (n.d.). Integrated Dengue Surveillance in Singapore.
[2] Chong, K. (n.d.). Singapore records 19 dengue deaths in 2022, nearly four times 2021's toll. The Straits Times.

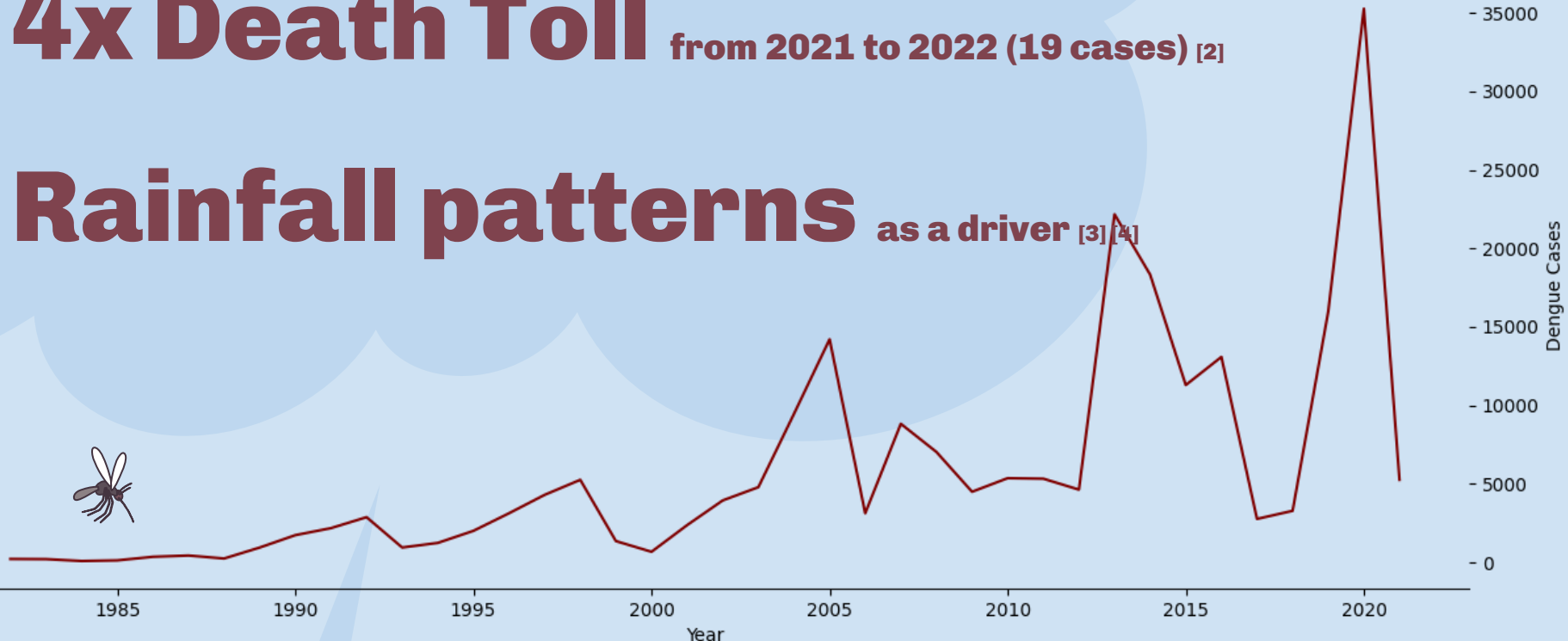
[3] Met Office. (n.d.). Singapore Holiday Weather Guide.

[4] Ng, L. C., et. al (2018). IL-1 β , IL-6, and RANTES as biomarkers of Chikungunya severity. PLOS Neglected Tropical Diseases, 12 (5), e0006935.

Top endemic infectious disease [1]

4x Death Toll from 2021 to 2022 (19 cases) [2]

Rainfall patterns as a driver [3] [4]



Problem Statement



Improving resource allocation and preventive measures by exploring rainfall-dengue trends to reduce public resource overload.

Method

Datasets	
Number of Rainy Days	
Dengue Cases	
Yearly (1966 -2021)	Weekly (2014-2018)



Analysis	
Monthly Trend	
Correlation	Lagged
Yearly Trend	
Anomalies	

MONTHLY TREND (2014-2018)

Number of rainy days depends on monsoon cycles [5]



NE Monsoon season

Dry phase

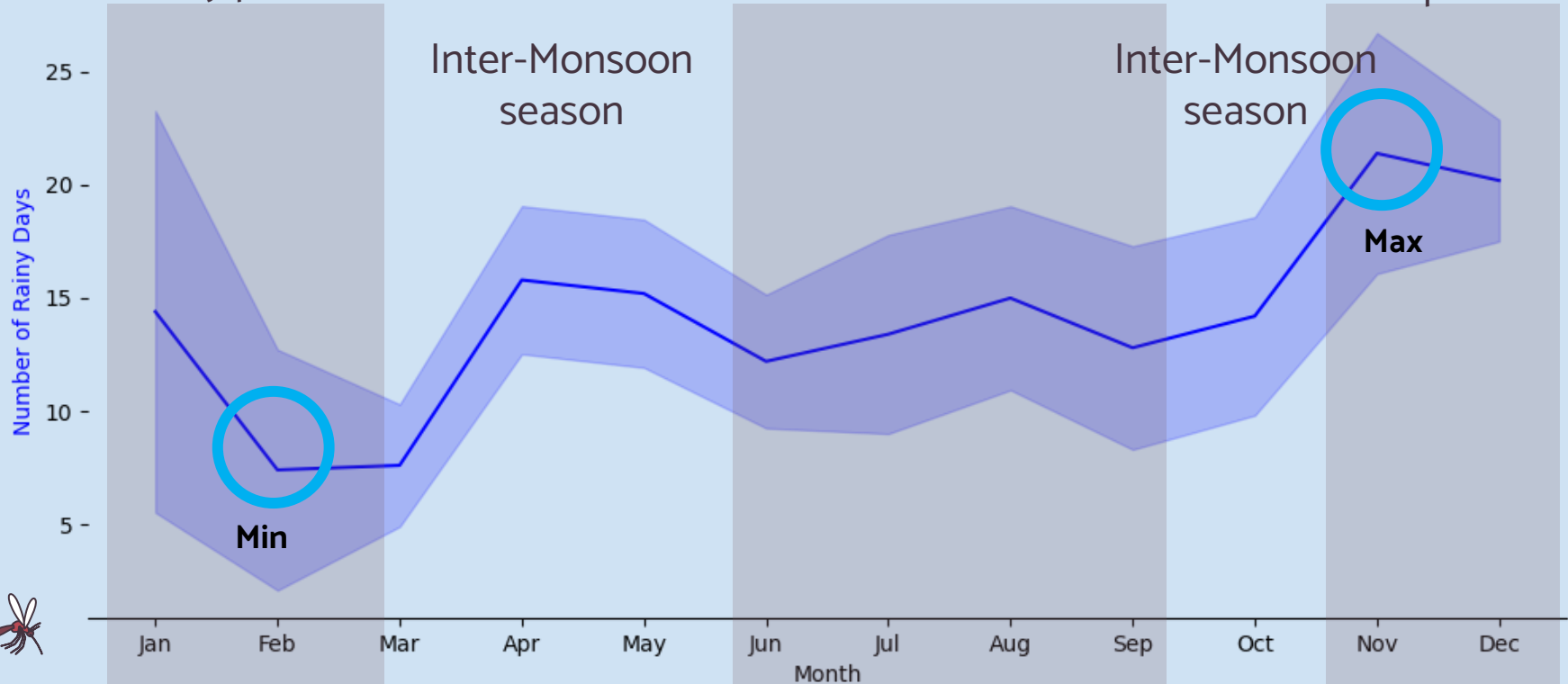
SW Monsoon season

NE Monsoon season

Wet phase

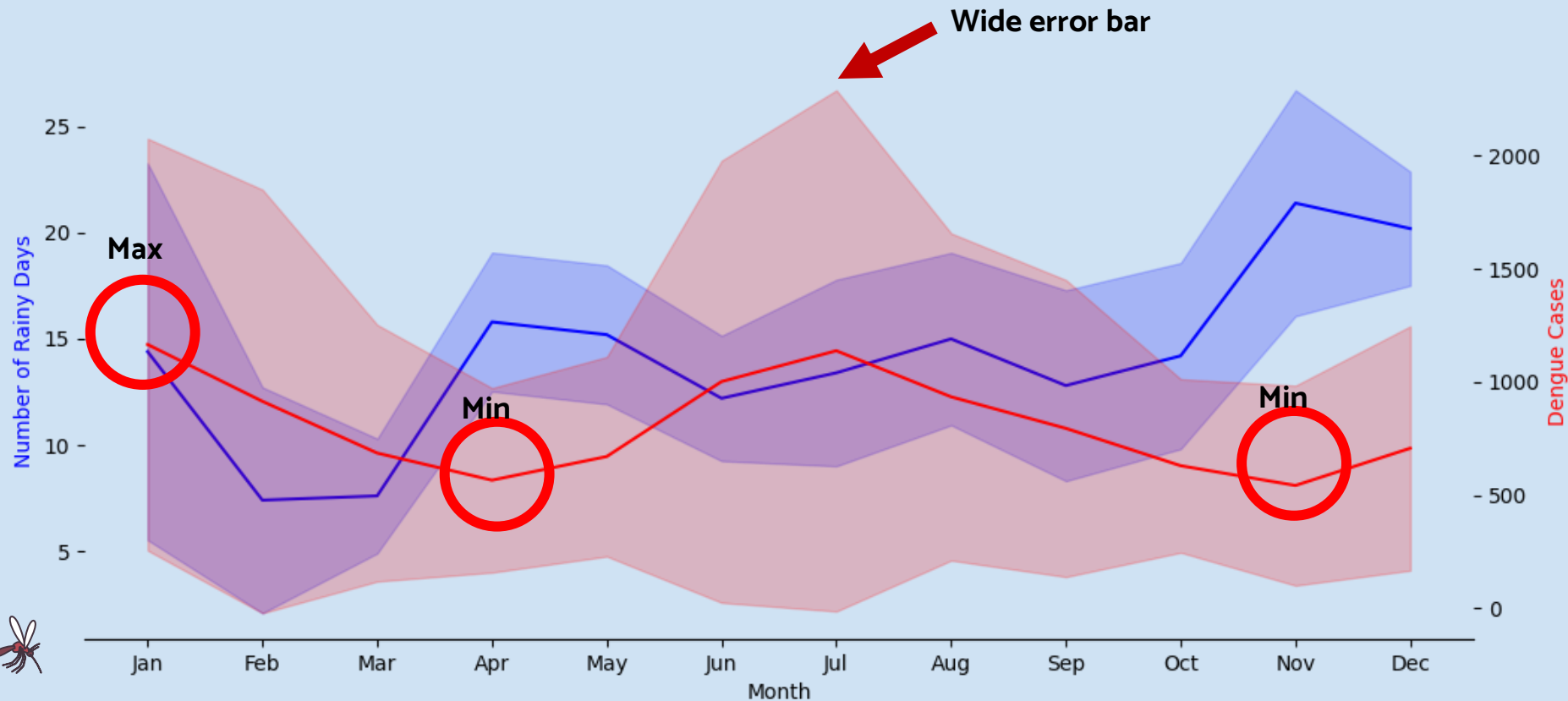
Inter-Monsoon
season

Inter-Monsoon
season



MONTHLY TREND (2014-2018)

Cyclic trend of dengue cases seemed to “lag behind”

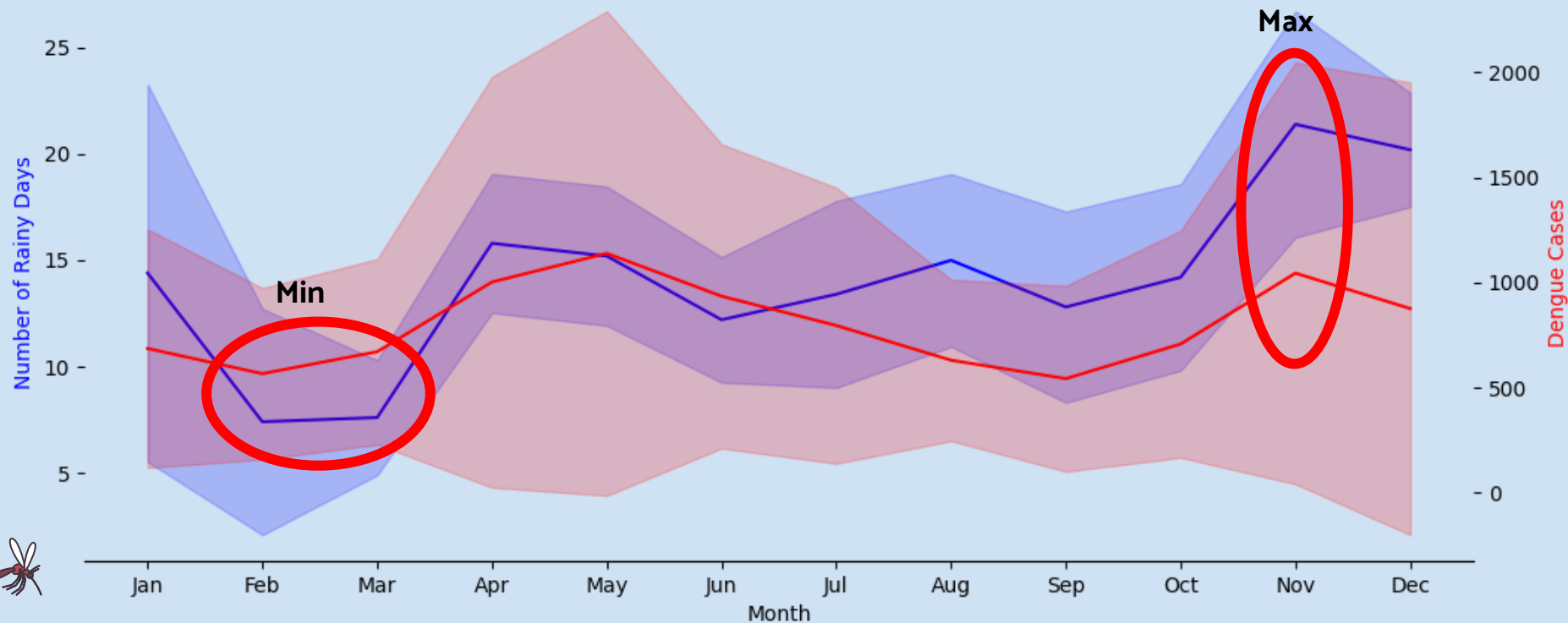


MONTHLY TREND (2014-2018)

Lagged Analysis: Optimal 'match' at 2 months lagged period



Shifted dengue data forward by 2 months - Mosquitoes take time to breed and transmit diseases



YEARLY TREND (1982-2022)

Rather irregular fluctuations

Extremities attributed to La Nina and El Nino effects [6]

Greater fluctuations in recent years



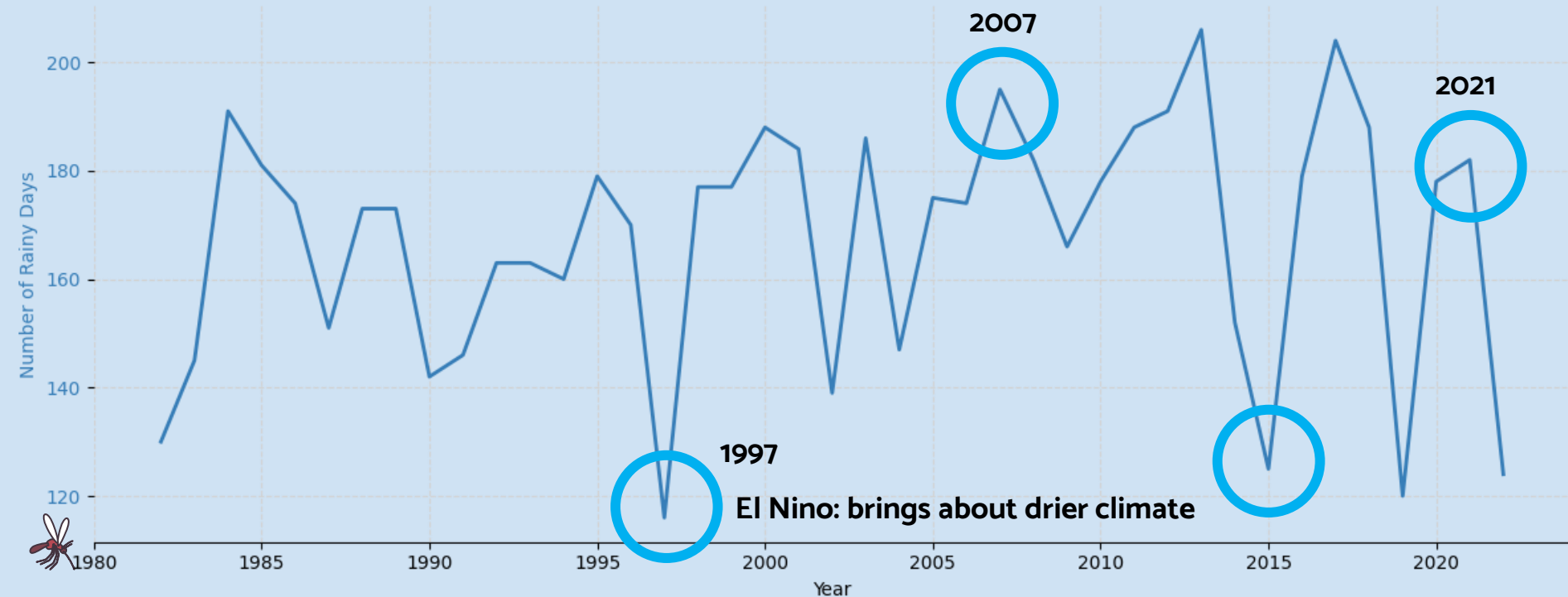
La Nina: brings more rain over equatorial SEA

1997

El Nino: brings about drier climate

2007

2021



YEARLY TREND (1982-2022)

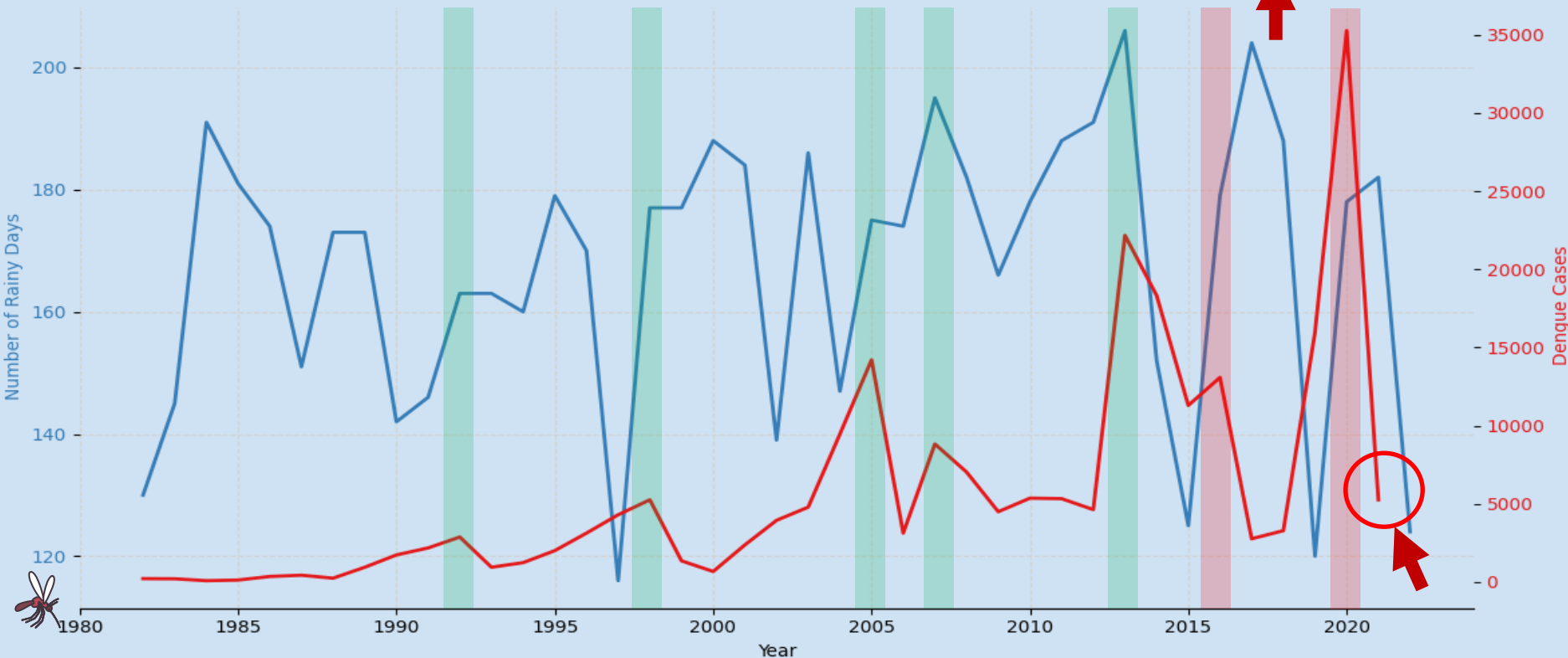
Most dengue peaks are associated with peaks in total rainfall

2020: Dengue transmission in or near homes due to increase in WFH [7]

2021: Covid-19 surge in cases, affecting detection and reporting of dengue cases [8] [9]

[7] National Centre for Infectious Diseases. (n.d.). Epidemic Dengue in Singapore During COVID-19 Pandemic.
[8] Channel NewsAsia. (n.d.). Dengue cases in Southeast Asia plummeted in 2021 amid COVID-19 lockdowns.
[9] Duke-NUS Medical School. (n.d.). Singapore dengue numbers may swell again.

Inconsistent observation in recent years



CLUSTER TREND (2015-2020)

Project Wolbachia - suppresses urban *Aedes aegypti* mosquito populations, as eggs produced by matings between released male Wolbachia-Aedes mosquitoes and urban female *Aedes aegypti* mosquitoes do not hatch. –NEA [10]

Progress of Project *Wolbachia* – Singapore

GRADUAL
ROLL-OUT

Phase 1 (Oct 2016 – Jan 2017)

To understand the behaviour of male *Wolbachia-Aedes* mosquitoes in our urban environment

- Braddell Heights
- Tampines
- Yishun

39 HDB blocks covering 3,941 households

1 landed estate covering 216 households

50% suppression of the urban *Aedes aegypti* mosquito population

Phase 2 (Apr 2018 – Jan 2019)

To mitigate high-density and high-rise challenges and improve release strategies

- Tampines
- Yishun

76 HDB blocks covering 7,056 households

70-80% suppression of the urban *Aedes aegypti* mosquito population

Phase 3 (Feb 2019 – Oct 2019)

To determine the sustainability of mosquito suppression over larger areas

- Tampines
- Yishun

144 HDB blocks covering 13,510 households

More than 90% suppression of the urban *Aedes aegypti* mosquito population

Phase 4 (Nov 2019 – Jul 2020)

To continue the development and testing of release tactics for use in future deployment efforts

- Tampines
- Yishun

14 times larger than Phase 1

553 HDB blocks covering 56,000 households

65-80% fewer dengue cases in 2019 compared to in areas without releases

Phase 5 (From 27 Jul 2020)

To determine the sustainability of *Aedes aegypti* mosquito suppression over entire towns

- Tampines
- Yishun

Gradual roll-out to 1,455 HDB blocks covering 142,347 households

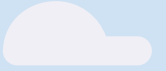
To cover 15% of total HDB blocks in Singapore

2016

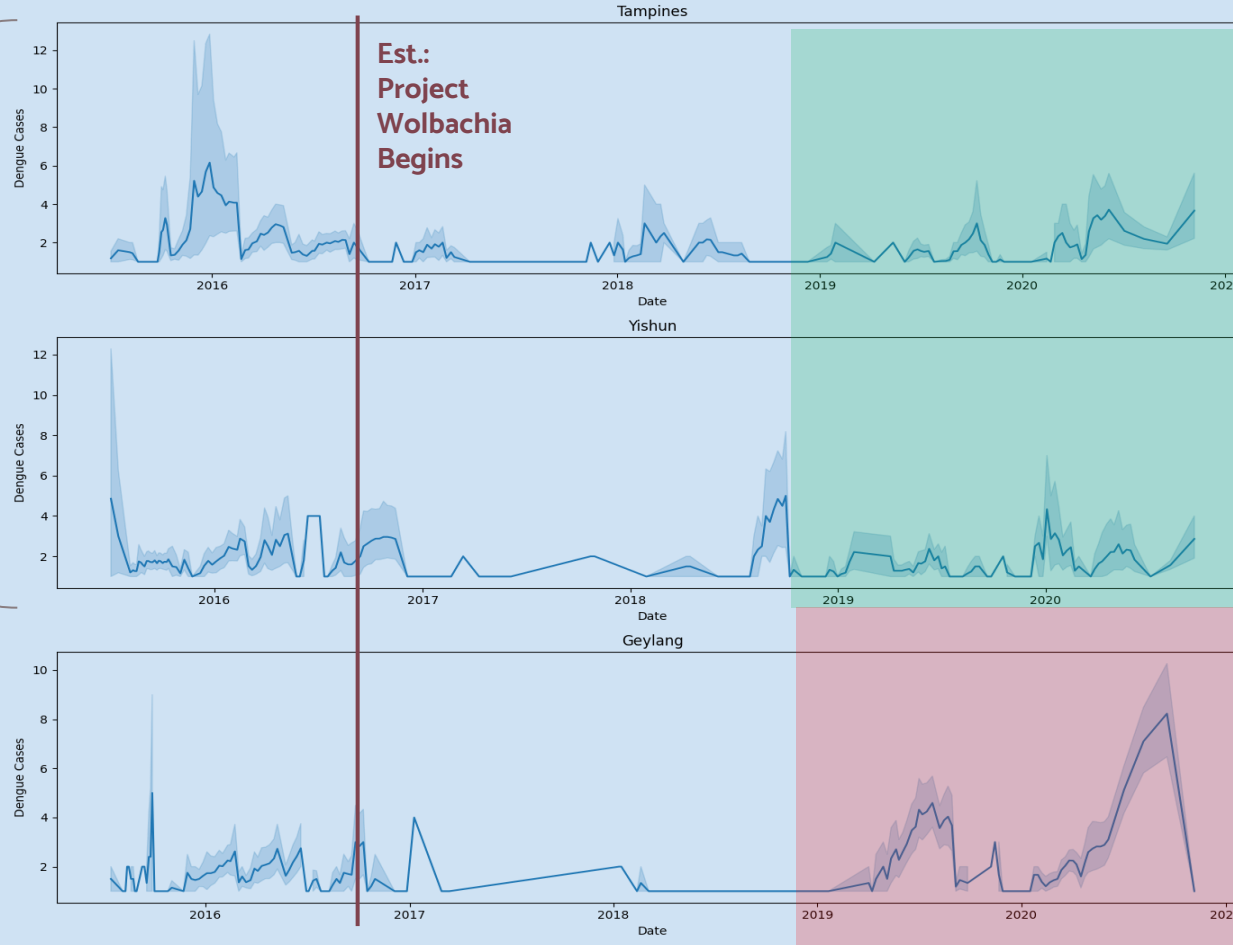
2022



CLUSTER TREND (2015-2020)



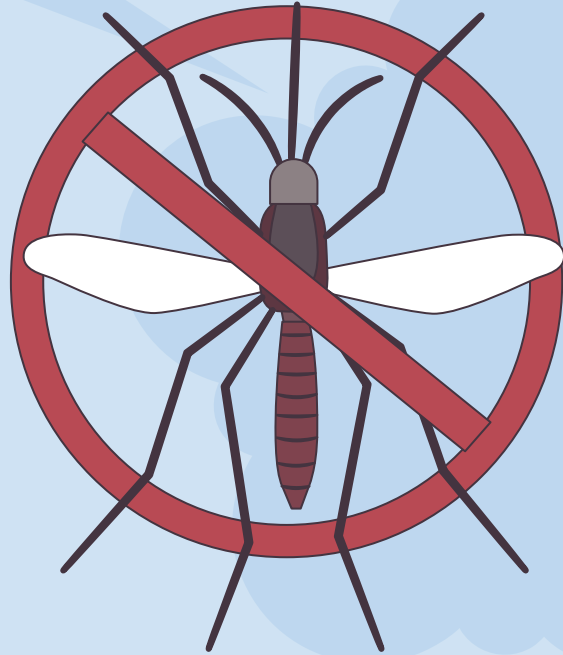
Targeted estates



No significant increase in dengue cases at targeted estates.

Future work to integrate estate rain data.





Recommendations

Resource allocation

Use lead time of 2 months to optimise prevention strategy and medical resources

Data-sharing

Share data after 2019 to leverage crowd efforts to generate better analysis and prediction of dengue cases

Accelerate Project Wolbachia

Prioritise efforts to wetter areas



Thank You



CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik

Please keep this slide for the attribution

