Dengue Rates in HCMC, Vietnam: Cleaning, Analyses, a Forecasting

Ramon Espinoza ’26, Medical Anthropology
Ho Chi Minh City (Saigon), Vietnam

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Introduction

- Dengue fever is a mosquito-borne viral infection transmitted primarily via the bite of an infective mosquito
- Dengue affects millions of people worldwide, particularly in tropical and subtropical regions.
- Dengue can be fatal, and building predictive models is crucial in addressing the issue of rising cases. Since there is no specific treatment for dengue fever, prevention becomes essential

Objective of the Study

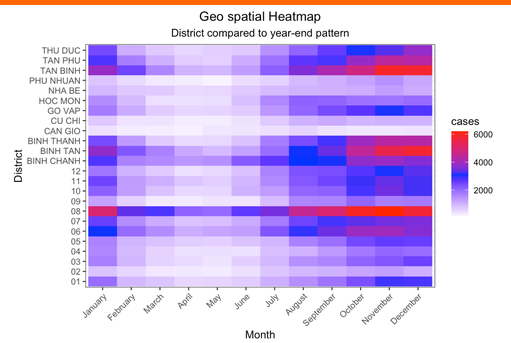
To anticipate and allocate resources effectively, relationships between variables in dengue case data collected by the CDC, Saigon chapter, were explored. These insights aided in building a predictive model to forecast dengue outbreaks, providing a framework for future analysis in coming years.

Methods

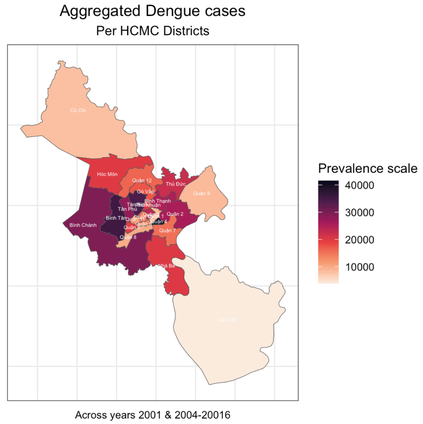
- This investigation employs data analysis and statistical methods in R to develop a predictive model for forecasting dengue outbreaks using a seasonal ARIMA model.
- To assess the spatial autocorrelation of dengue cases in Saigon, Moran's I test was conducted. A p-value of less than 0.05 was considered statistically significant.
- A quasi-ethnographic report is utilized to interpret the data and present its significance

Results

- Distinct from its regional neighbors, dengue cases disproportionately affect younger demographics in Saigon
- A consistent seasonal trend in dengue cases is observed across all districts as seen by the graph on the right
- The graph below illustrates that certain districts consistently exhibit higher rates of dengue proportionally.



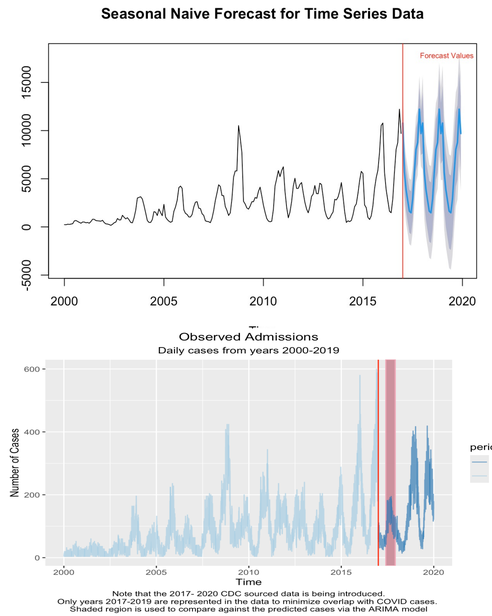
Following the Year-end cases pattern and introducing spatial information from district cases. Averaged across years 2000-2016



Across years 2001 & 2004-20016

ESTIMATE1	ESTIMATE2	ESTIMATE3	STATISTIC	P.VALUE
<DBL>	<DBL>	<DBL>	<DBL>	<DBL>
-0.1826662	-0.04347826	0.01689148	-1.070946	0.8579032

- The results of the Moran’s I test is shown in the table above. No statistically significant correlation was determined for spatial clustering for dengue case
- Some other feature within the districts is influencing the dispersion of cases
- A considerable number of patients (~89%) traveled to access care, suggesting a disparity in the availability of healthcare resources across different districts



Note that the 2017- 2020 CDC sourced data is being introduced.
Only years 2017-2019 are represented in the data to minimize overlap with COVID cases.
Shaded region is used to compare against the predicted cases via the ARIMA model

• The forecast generated by the naive ARIMA model did not align well with the observed trend for the initial seasonal cycle of admission cases, indicating that the model may have been too simplistic to capture the underlying dynamics
• The model’s accuracy in the following periods suggests that some interesting insights may still emerge

Discussion

- Although the Moran’s I showed no statistical clustering of cases, the extent to which case density is influenced by terrain is still to be explored
- SIR model may help determine how immunity and recovery influence disease dynamics.

Questions

- The data provided did not include information on patients who received the dengue vaccine, raising questions about vaccine efficacy and recovery times.
- Although admission rates showed an increasing trend over multiple years, the extent to which this increase is due to improved accessibility to care is still to be explored.

Conclusion

The analysis combining Moran's test and the S-ARIMA model offers a comprehensive view of dengue case distribution and trends, emphasizing the importance of considering both spatial and temporal factors in disease monitoring and prevention efforts.

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