

## Research Narrative

### Background and Significance

Dengue fever is a viral infection where it transported through Aedes mosquitoes carrying dengue virus to human. There is more than one-third of the worldwide population are effected by dengue. [8] The symptoms of dengue fever include abdominal pain, bleeding under the skin, diarrhea, headaches, nausea, and pain in muscles, bones or joints. [4] Dengue disease is a tropical mosquito viral illness spread through in Asia. In particular, Southeast Asia, the tropical part of Asia, experiences higher cases and mortality rates of dengue disease annually. [5]



Figure 1: Infected Aedes mosquitoes [1]

Malaysia, one of the countries located in Southeast Asia, has a high number of dengue cases that fluctuate markedly from one year to year. In 2013, there is a total of 43,436 dengue cases occurred in the country. In the following two years (2014 and 2015), the number tremendously increased to 108,698 and 120,836, respectively. [6] In fact, dengue infection is a major health concern in Malaysia.

In Southeast Asia, severe dengue hemorrhagic fever cases are predominant among patients who are between 2 to 15 years old. [2] However, the dengue disease pattern has shifted and inclined more towards the adult population. In Malaysia, the majority of the dengue affected population are the people who aged between 13 to 35 years old. [10].

Throughout the years, Selangor (one of the states in Malaysia) has been the top hotspot for dengue fever outbreak. The state has a high population density in Malaysia compared to other states. In addition, Selangor has about half of the total number of dengue fever cases in Malaysia. [9]

Dengue fever can progress into a more severe condition which is known as dengue hemorrhagic fever

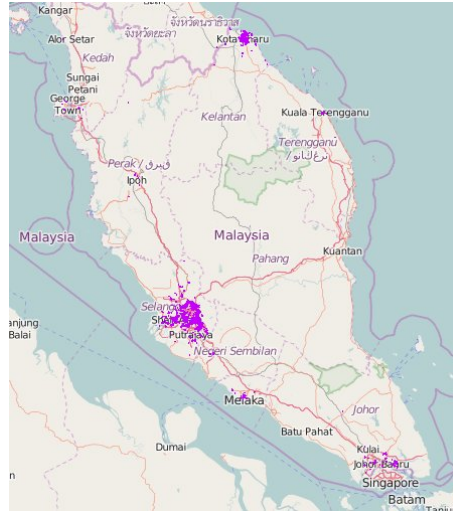


Figure 2: Dengue Hotspots (communities) in Malaysia based on Website IDengue [9]

(DHF). The difference between dengue fever and DHF is the plasma leakage due to the increased vascular permeability. [7] DHF can cause severe bleeding, sudden hypotension, and death.

Although researchers are working on dengue fever vaccines, the best dengue fever prevention is to control the transmission of dengue virus by identifying and reducing mosquito breeding areas where the disease is prevalent. For example, if a state is associated with high number of DHF cases, then it will compel the Malaysian government and citizens to combat mosquito breeding in that particular state. On the other hand, if a certain age group is identified as the most infected dengue hemorrhagic fever cases, then the government will know which specific age group should be prioritized and provide immediate dengue prevention/treatment to that group. Therefore, there is a need to run predictive analysis to identify which age groups and states have the highest number of dengue hemorrhagic fever infected cases in Malaysia. The project results will be significantly helpful to get an early dengue disease warning and awareness to the people living in Malaysia.

## Previous Work

In the 2019 MATH380 project “Predictive Analysis of Malaysian Dengue Hemorrhagic Fever Data”, Foong Min has done literature review and ran a regression analysis on BigML to identify which age group and state have the highest number of dengue hemorrhagic fever cases based on the data from 2010 to 2017. According to her results, people who aged between 20 to 24 years old have the most number of DHF cases and the

people who are older than 75 years old have the least number of DHF cases. Besides that, among all the states, Selangor has the highest number of dengue hemorrhagic fever cases in the past 8 years. And, Perlis has the lowest number of dengue hemorrhagic cases compared to the other states.

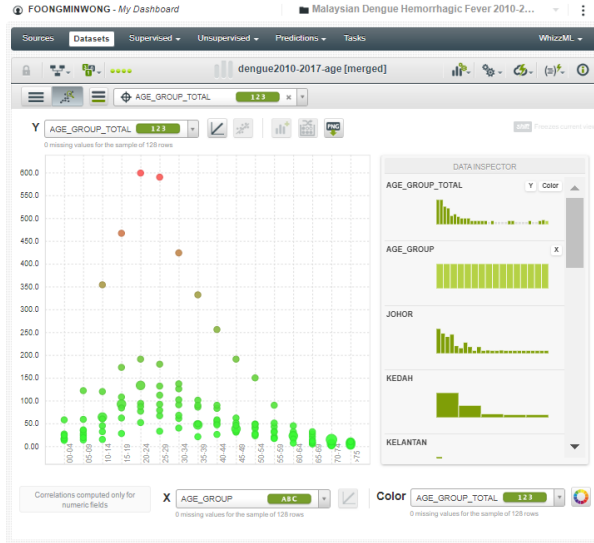


Figure 3: Dengue Hemorrhagic Fever Cases by Age Groups

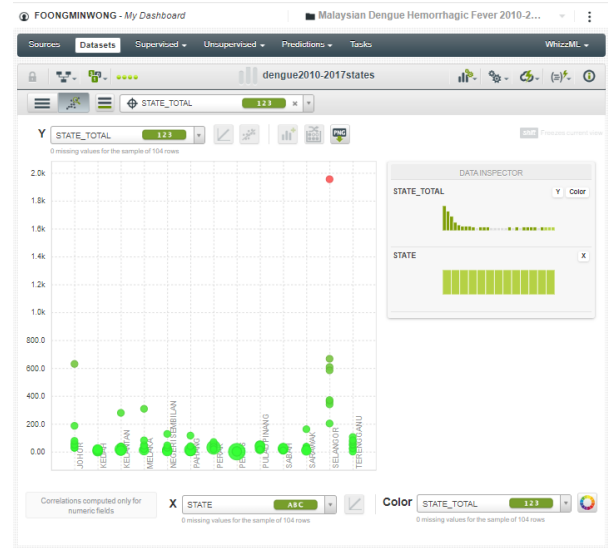


Figure 4: Dengue Hemorrhagic Fever Cases by States

## Methodologies

In this project, we will download the 2010-2017 dengue hemorrhagic fever datasets from the Malaysian Government Data Portal and do data statistical analysis using BigML.[3] . We will reformat each dengue dataset before loading the data into BigML. The original contains columns of 13 states and two federal territories. Since the states are already part of both federal territories, we will not include the federal territories columns so that the dengue cases are not counted twice.

Once the two federal territories data columns are removed, we will recalculate the total count of DHF cases for each state and age group. Since there are seven annual set of DHF data, we will create a Python script to automate the data cleaning process to export seven new re-formatted dengue hemorrhagic fever datasets. Once the new datasets are generated, they are ready to be loaded to BigML.

In BigML, we can set the 13 states names and age groups as categorical variables. Then, we merge all the seven data into one master data in the software. After merging the data, we will run a times series analysis

on BigML to determine the dengue hemorrhagic fever pattern and forecast the future DHF outbreaks.

## References

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