Identifying the Relationship between Precipitation and Zika Outbreaks in Argentina

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Abstract

Dengue, Malaria and Zika are vector-borne diseases caused by mosquitoes that carry the parasites that lead to illnesses. According to the World Health Organization (WHO) hundreds of thousands of people around the world die every year due to disease-transmitting mosquitoes. Mosquito outbreaks occur most commonly in warm climates, in areas close to the equator and tropical regions. Female mosquitoes lay their eggs in the ponds and puddles where water accumulates due to rainfall.

In 2016, there was a significant spike in the number of dengue cases in Argentina; there were 79,455 cases of dengue reported in 2016 compared to 3250 cases in 2014 and 4774 in 2015 and went back down to the hundreds in 2017 and rose to thousands again in 2018. The goal of this project is to determine if there is a correlation between the number of Zika cases and rainfall precipitation levels.

In this poster, we discuss our data sources and our analysis results.

Data Sources

For the analysis, we use available Zika data for Argentina obtained from the Centers for Disease Control and Prevention (CDC) database. The precipitation data is obtained from the National Aeronautics and Space Administration (NASA) through the Global Precipitation Measurement Mission (GPM).

Data Analysis and Results

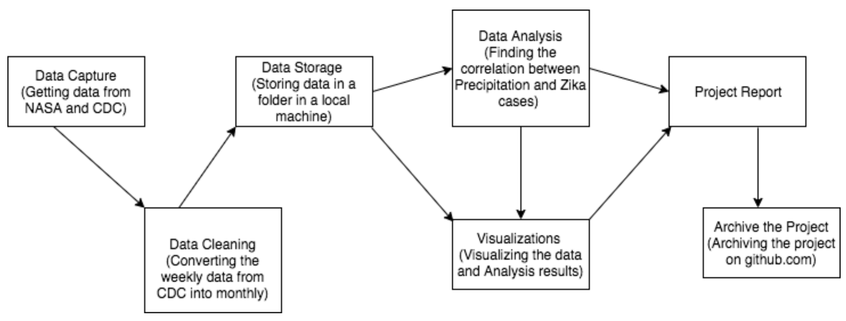

Figure 1: Project Workflow

We did the analysis using Python in Jupyter Notebooks. We also used various libraries such a Pandas, a library for data manipulation and analysis, GeoPandas, a library for working with geospatial data, and Matplotlib and Seaborn for creating data visualizations.

Data Analysis and Results

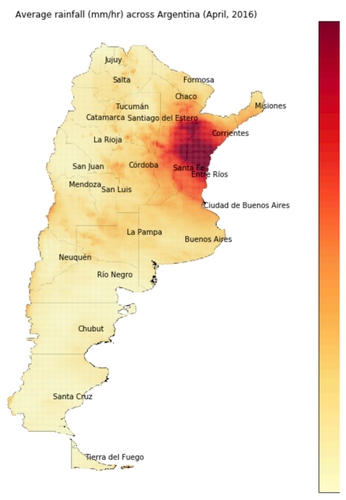

Figure 2

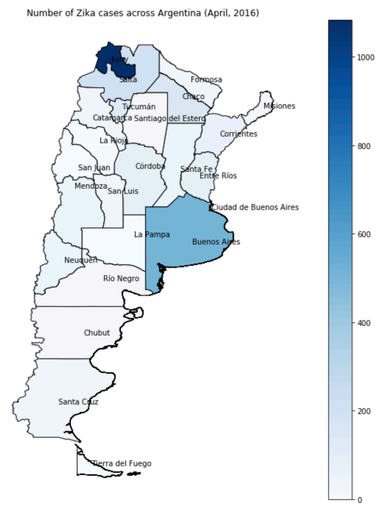

Figure 3

Figure 2: A choropleth map depicting the number of Zika cases in each province in Argentina in April 2016.

Figure 3: A map of Argentina showing average rainfall spread across Argentina for April 2016.

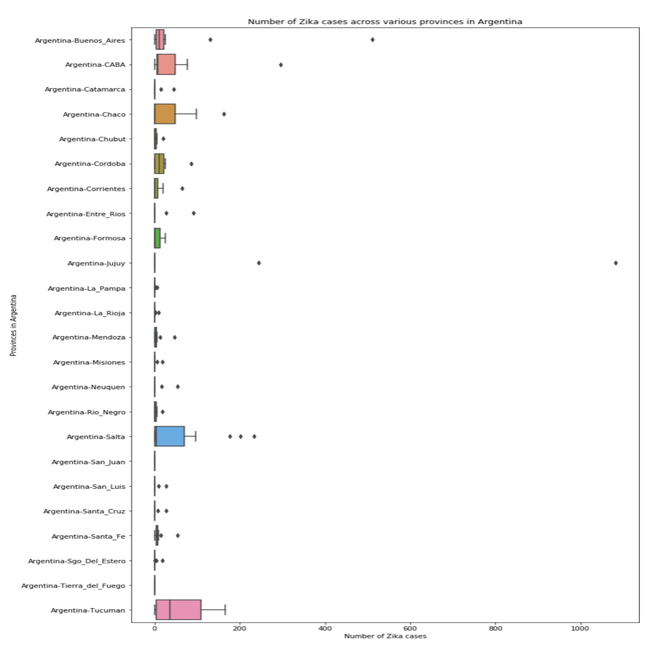

Figure 4: A box plot showing how the Zika disease data is spread across various provinces.

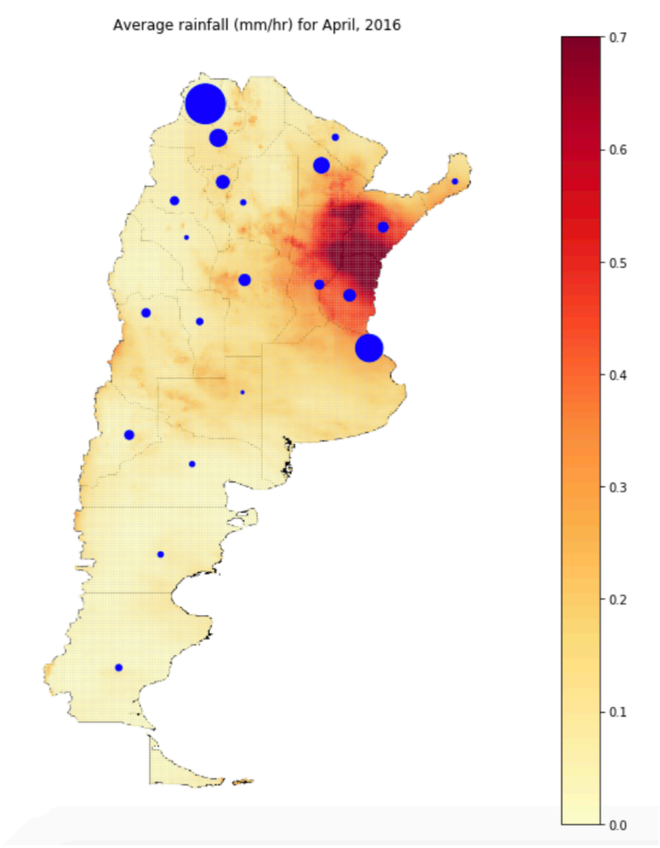

Figure 5: A map showing the overlay of Precipitation and Zika Data for April 2016

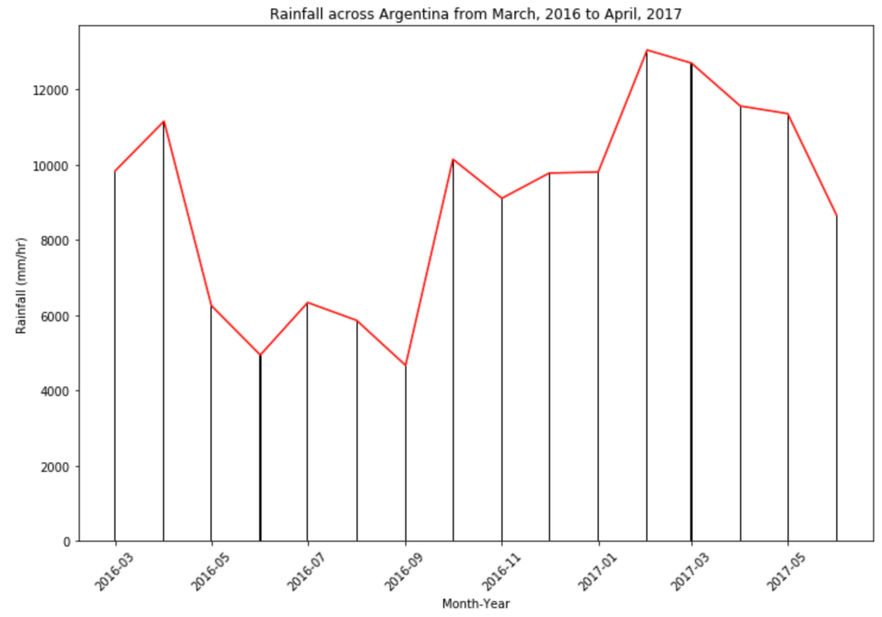

Figure 6: A line plot showing the overall precipitation in Argentina. As we can see there has been high rainfall around April, 2016 and then again from October, 2016 till February, 2017.

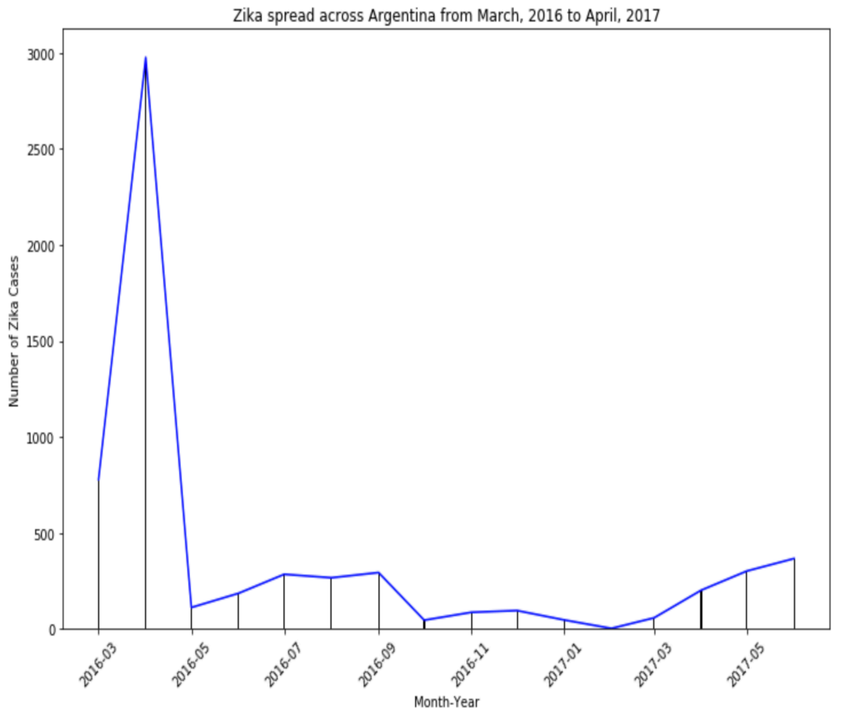

Figure 7: The line shows that the number of Zika cases is high in April 2016 and fairy low for the rest of the months.

Conclusion

From both the geo-plots and line plots, there does not seem to be a general correlation between precipitation levels and the total number of Zika cases. That is, the highest and lowest levels of precipitation do not specifically correspond to the highest and lowest number of Zika cases.

Other climatic factors such as humidity, temperature, population density, pollution, deforestation, income levels, and water supply could have a correlation with the number of Zika cases, but they are beyond the scope of this project.

Sponsors:

Glossary:

Python – A programming language, capable of processing data/statistical analysis
Library - software package to be loaded to perform extra tasks

Resources:

Our Project GitHub Repository: https://github.com/ITWSDataScience/ArgentinaZikaForecating2019