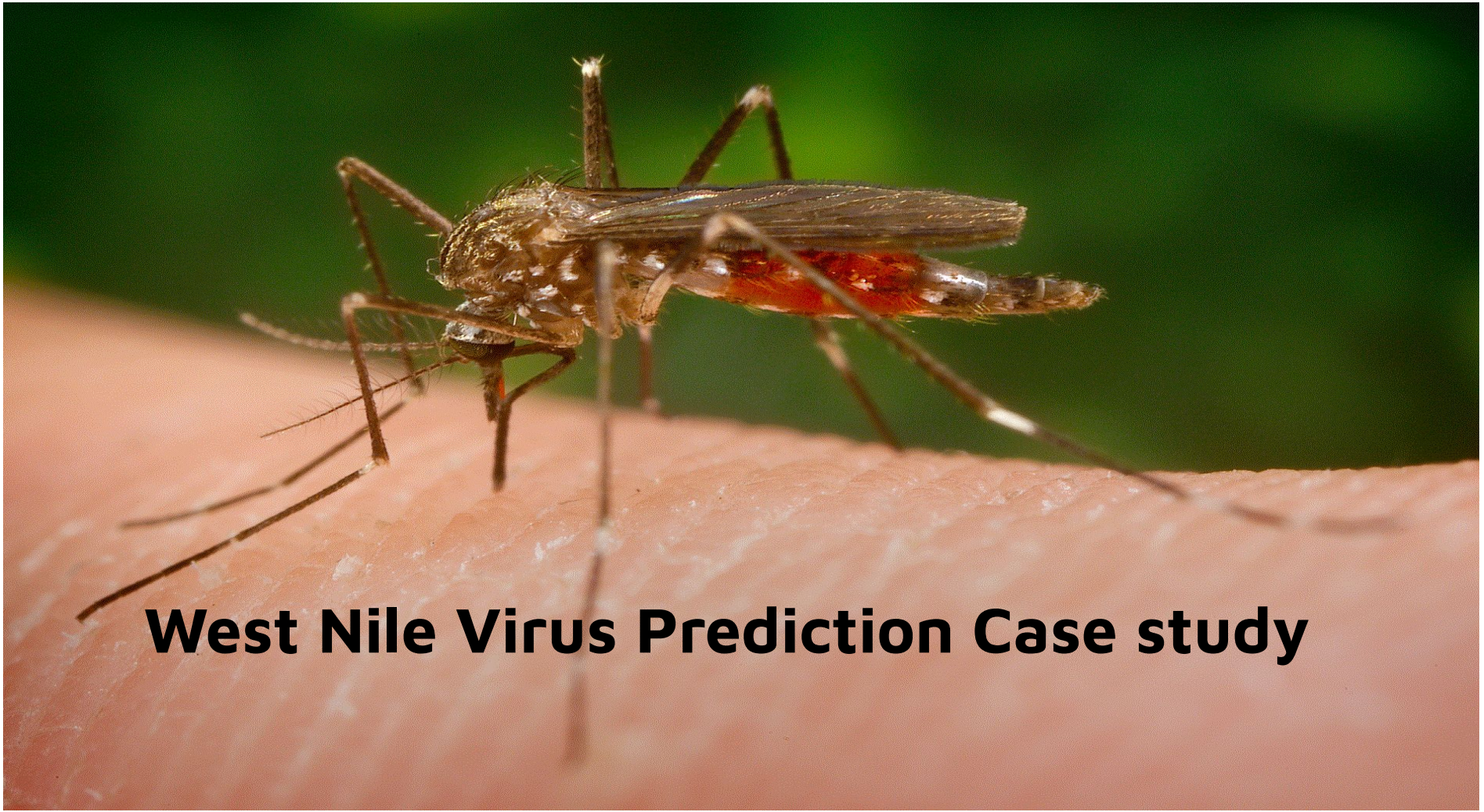


West Nile Virus Prediction Case study

Purpose of the case study

- Determine the dynamic effects of weather on virus
- Identify potential causes of virus spread
- Analyze the effectiveness of aerial spraying
- Propose an effective model to control the outbreak of WNV virus in Chicago region

Key Facts

- West Nile virus (WNV) can cause a fatal neurological disease in humans.
- Approximately 80% of people who are infected don’t show any symptoms.
- There is no vaccine for it’s treatment yet.
- Birds are the natural hosts of West Nile virus.

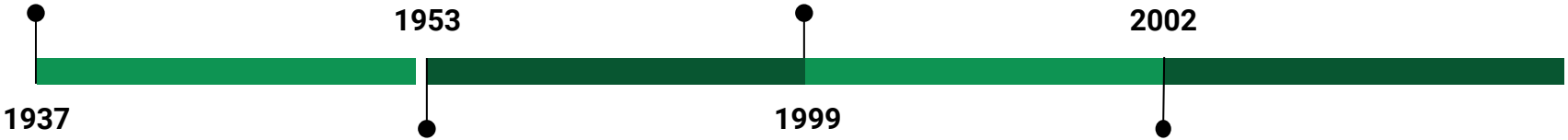
Timeline

The first case

West Nile Virus (WNV) was first isolated in a woman in the West Nile district of Uganda in 1937

The first case in US

First seen in New York producing a large and dramatic outbreak that spread throughout the US



Virus spotted on birds

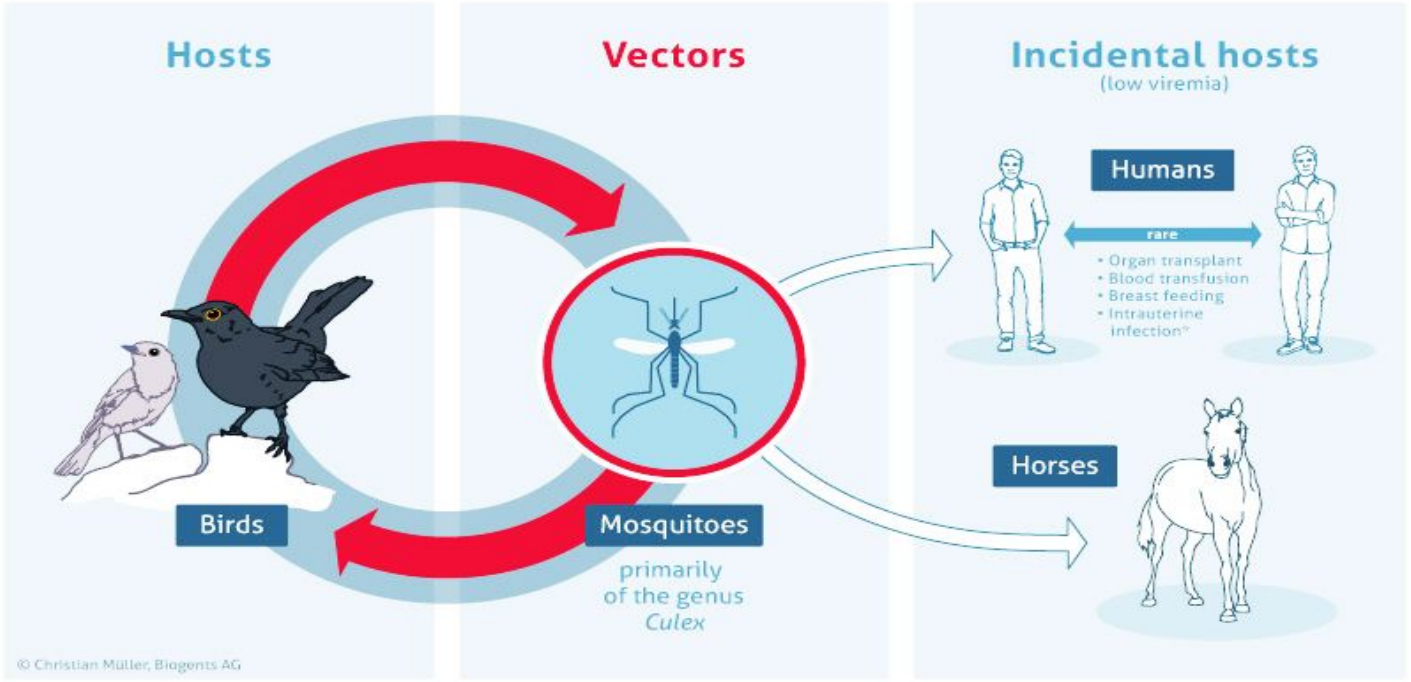
caused the death of different bird species presenting signs of encephalitis and paralysis

case in Chicago region

First reported case in chicago region

West Nile Virus

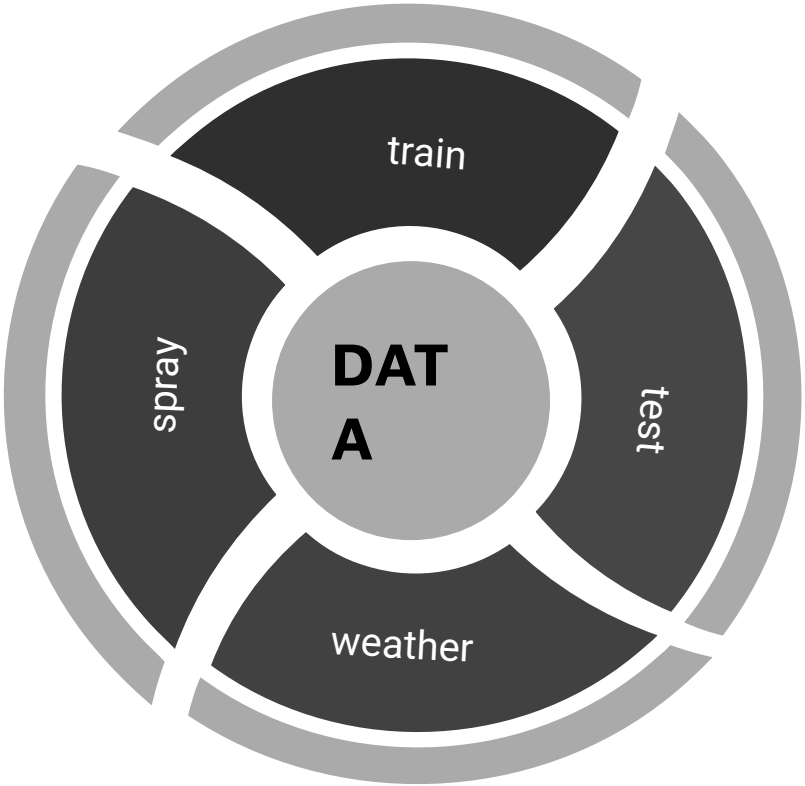
Transmission Cycle



Biogents

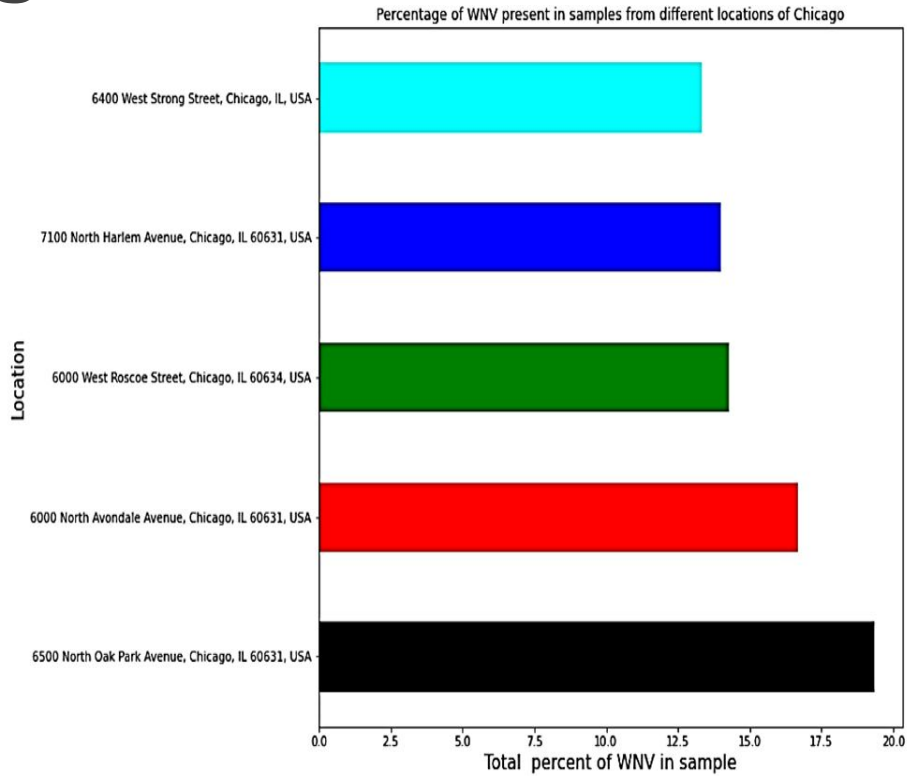
DATA

- **Source: Kaggle (provided by Chicago health department)**
- **Contains 4 dataset (train, test, weather, and spray)**

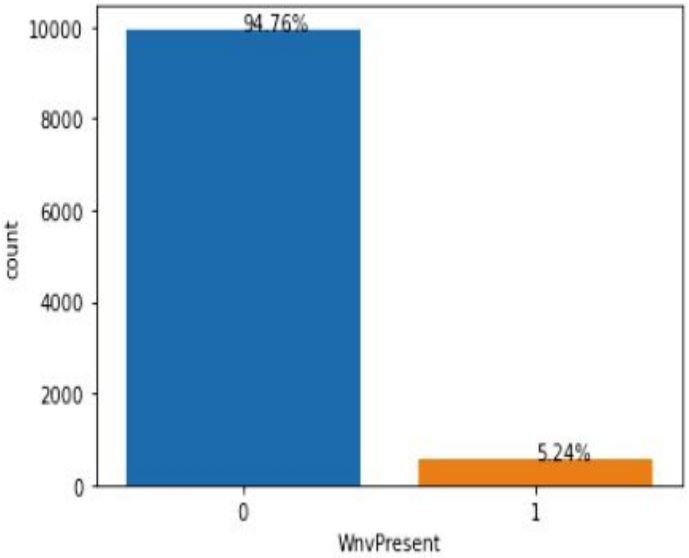


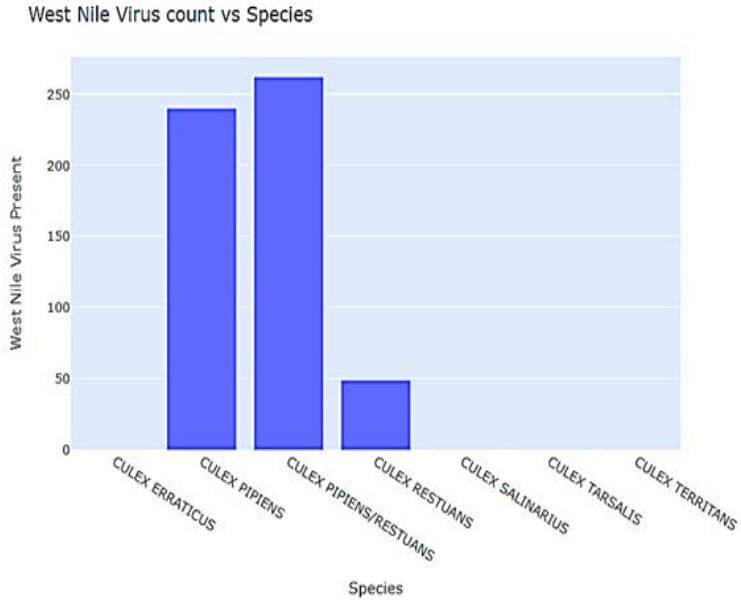
Some interesting facts

- **Highest sample collection area :** O'Hare International Airport
- **The most infected area:** 6500 North oak park Ave (19.35 % sample contains WNV)
- **2nd most infected area:** 6000 N Avondale Ave (16.67% infection rate)



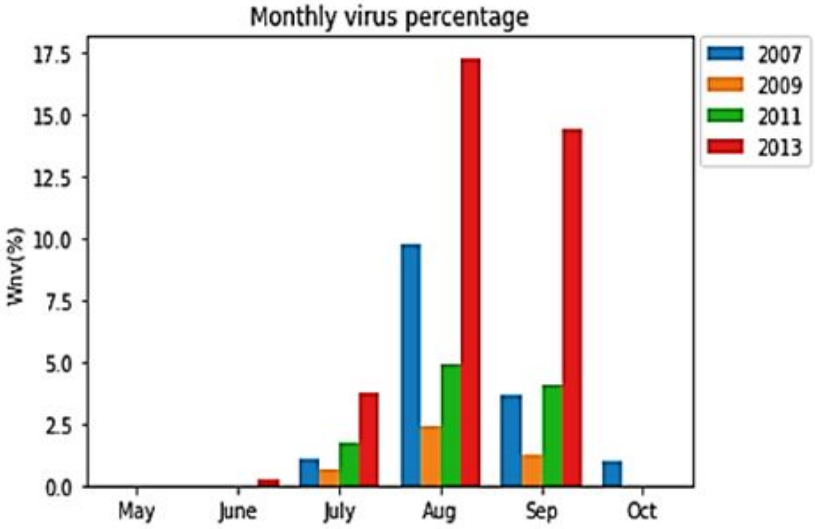
- 7 different species of mosquitoes were observed
- Only 3 species contain the virus
- About 5% of the total sample is infected

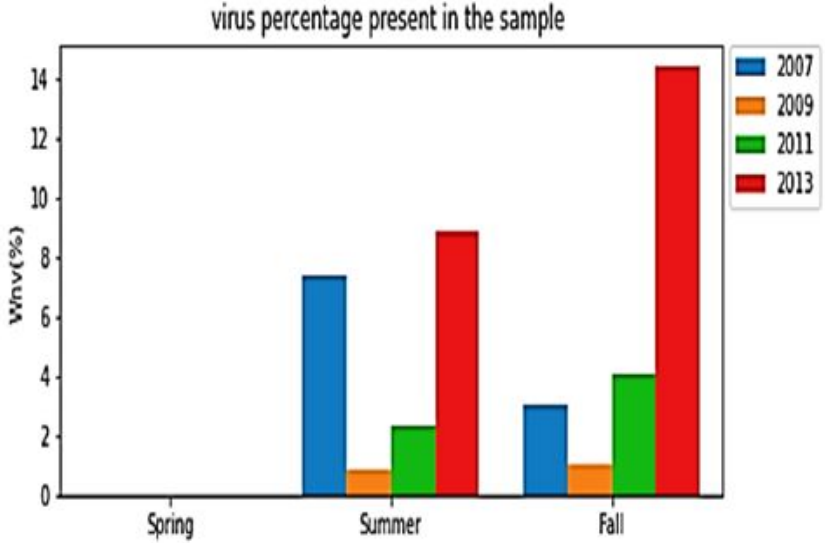




Findings

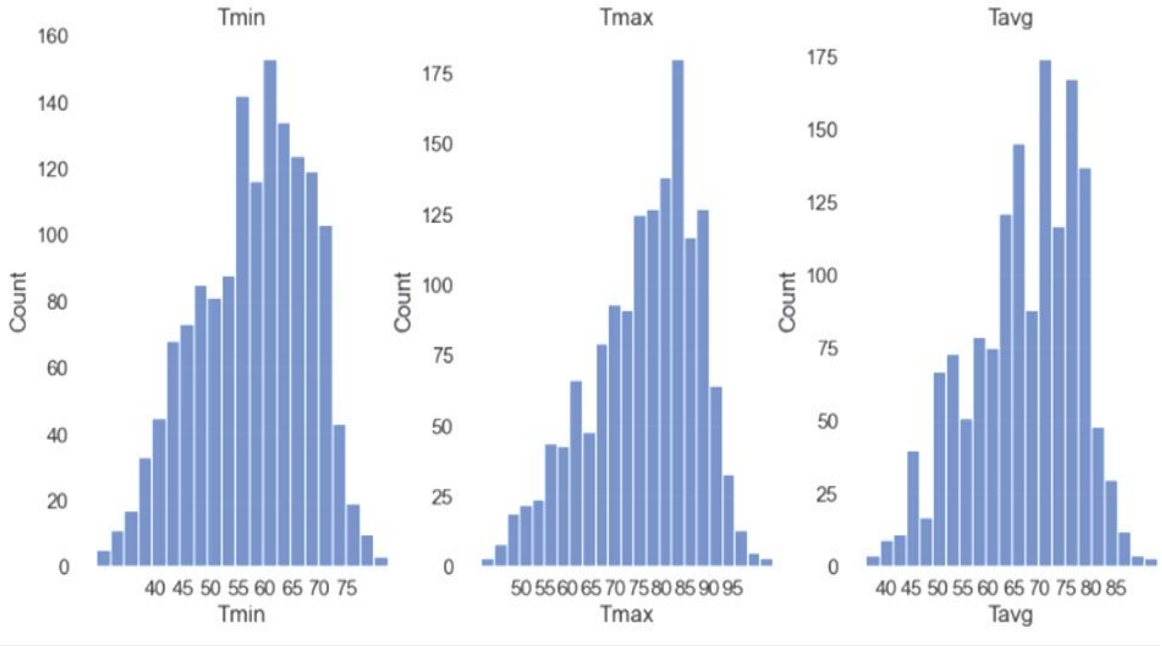
- maximum sample was collected in 2007, however maximum virus was observed in 2013
- virus appears to be active mostly from July to September





Effect of temperature:

- Warmer temperature is associated statistically with higher WNV infection.

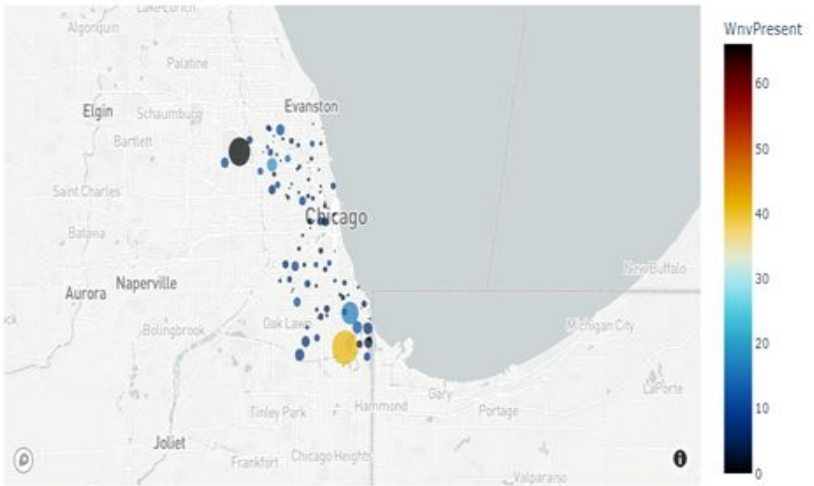


Year	Mean Temperature (F)
2007	75-80
2009	65-70
2011	50-55
2013	75-80

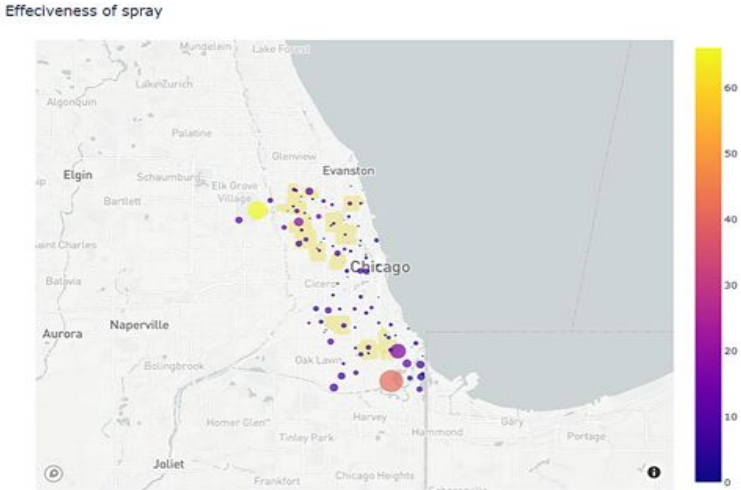
Effectiveness of aerial spray

- **Aerial spraying on infected area is effective as seen in the map below**

Before spray

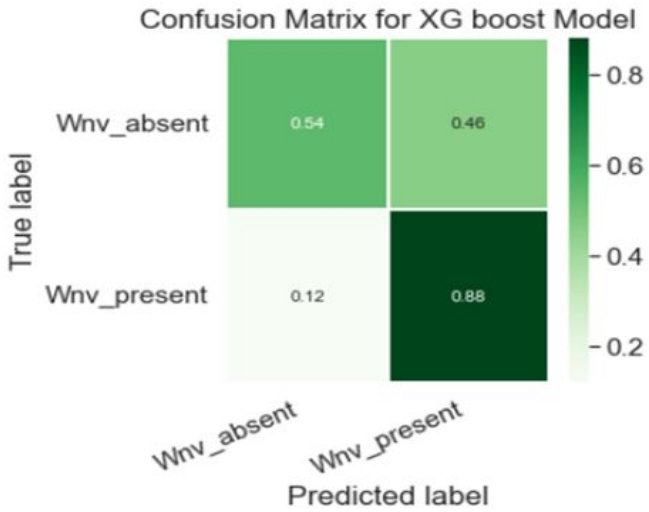


After spray



Machine learning model and it's effectiveness

- Used method: binary classification model
- Information value <0.1 and >0.8 were opted out to minimize bias.
- The confusion matrix predicted the presence of virus with a probability of 0.88 and the absence of virus with 0.54. Thus, the model is efficient/



Conclusion and recommendation

- **Surveillance on mosquitoes species must be increased to collect more sample and to get the better predictions.**
- **Spraying is an effective way to minimize the mitigation.**
- **This information can be used as a guideline to develop threshold for public health safety measures by the Chicago city.**