

## **West Nile Virus Prediction: Project Proposal**

### **Problem Statement**

The City of Chicago and the Chicago Department of Public Health (CDPH) are seeking an improved method to predict when, and where, West Nile virus outbreaks will occur in mosquitoes. A solution will enable resources to be allocated more efficiently and effectively in the effort to reduce the transmission of West Nile virus.

### **Context**

West Nile virus is transmitted to humans via infected mosquitoes. In severe cases, individuals can develop potentially fatal neurological illnesses. After first observing human West Nile virus cases in 2002, the City of Chicago and the CDPH initiated a program in 2004 to monitor mosquito populations and reduce the transmission of West Nile virus. Mosquito traps were established at different locations throughout Chicago and monitored for the presence of West Nile virus. This information was used to determine the location and timing of mosquito spraying efforts. Making use of mosquito trap data, Chicago weather data, and mosquito spray data the City of Chicago and the CDPH would like to improve their ability to predict the presence of West Nile virus in mosquitoes. An improved method of prediction will allow for greater effectiveness, and a more efficient allocation of resources, in the efforts to reduce transmission of West Nile virus.

### **Criteria for Success**

1. The solution improves upon the current method used by the City of Chicago and the CDPH, in its ability to predict the presence of West Nile virus in mosquito populations.
2. The solution will be ready to use prior to the upcoming mosquito season (beginning in May).

### **Scope of Solution Space**

Mosquito trap data, Chicago weather data, and mosquito spray data, from May through October for the years 2007, 2009, 2011, and 2013, will be used to predict the presence of West Nile virus at different trap locations in the Chicago area throughout mosquito season.

### **Constraints Within Solution Space**

- The annual Chicago weather data is provided for May through October. Therefore, it will not be possible to determine the impact of winter and early spring weather conditions on mosquito numbers or the presence of West Nile virus in the mosquito population.
- It is only known whether or not West Nile virus was found within a cohort of trapped mosquitoes. The actual number of West Nile positive mosquitoes within a trap was not tracked. An inability to identify the prevalence of West Nile virus among trapped

mosquitoes may result in a reduced ability to accurately predict the location(s) of West Nile outbreaks in mosquito populations.

- It is possible that mosquito population and West Nile virus trends from prior years will not remain constant in the future. Therefore, any predictive model that is developed may become ineffective in the future.

### **Stakeholders**

- City of Chicago
- Chicago Department of Public Health (CDPH)

### **Key Data Sources**

- Mosquito trap data (trap location, mosquito count, mosquito species, West Nile virus presence)
- Chicago weather data (weather data from two City of Chicago weather stations: Chicago O'Hare International Airport and Chicago Midway International Airport)
- Mosquito spray data (date and location of mosquito spraying)