**West Nile Virus Prediction**

Introduction

This project is engaged with the spread of West Nile virus (WNV) in Chicago, USA.

WNV first arrived in the Western Hemisphere in 1999 (1) and during the summer and fall of 2002, an epidemic (223 cases) and epizootic of WNV infections occurred in Chicago (2). It is most commonly spread to people by the bite of an infected mosquito. Cases of WNV occur during mosquito season, which starts in the summer and continues through fall. There are no vaccines to prevent or medications to treat WNV in people. Fortunately, most people infected with WNV do not feel sick. Yet about 1 out of 150 infected people develop a serious, sometimes fatal, illness (3).

**Transmission**

Mosquitoes become infected when they feed on infected birds, which circulate the virus in their blood for a few days. During later blood meals (when mosquitoes bite), the virus may be injected into humans and animals, where it can multiply and possibly cause illness.

The virus may also be transmitted through contact with other infected animals, their blood, or other tissues (4).

**Symptoms**

Most people infected with WNV do not develop any symptoms (80%). About 20% of the infected people will develop a fever with other symptoms such as headache, body aches, joint pains, vomiting, diarrhea, or rash. Most people will recover completely, but fatigue and weakness can last for weeks or months. However about 1 in 150 people who are infected will develop a severe illness affecting the central nervous system. The severe illness symptoms are characterized with neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. Severe illness can occur in people of any age; however, people over 60 years of age are at greater risk. The highest risk for getting severely ill when infected with WNV is found among immunocompromised people (for example, transplant patients) or other medical conditions(3).

**Diagnosis**

When symptoms as described above appear, in area known or suspected to be infected with WNV it is recommended to see a healthcare provider and to be tested for MNV infection. The diagnosis is generally accomplished by testing of serum or cerebrospinal fluid (CSF) to detect WNV-specific IgM antibodies (3).

**Treatment**

There is no vaccine or specific antiviral treatments for WNV infection.

Clinical management is supportive (3). Patients with severe illness will require close monitoring, pain control and other treatment depending on their symptoms.

**Prevention**

In the absence of a vaccine, prevention of WNV disease depends on community-level mosquito control programs to reduce vector densities, personal protective measures to decrease exposure to infected mosquitoes (3).

**Project Objectives**

This project is aim to predict when and where different species of mosquitos will test positive for WNV in traps found around Chicago, USA in the given years: 2007, 2009, 2011 and 2013.

**Project Overview**

WNV is a disease that can easily become epidemic. It has no cure and can be lethal in certain risk groups. The resources used for fighting WNV should focus on prevention. The prevention in this case is to eradicate mosquitoes, the disease vector.

Prevention efforts can be done on the personal level and on the community level.

* Monitoring infected mosquitos (and birds, see below) can provide an indication to when and where the eradicating efforts should take place, in aim to control the disease spreading.

The spread of mosquitos is highly dependent on weather conditions. Elevated temperature together with the presence of fresh or stagnant water can increase the spread of mosquitoes. For instance, in some mosquitos’ species life cycle can be 14 days at 21° C but will take only 10 days at 27° C (5). An increase in the number of virus spreading mosquitos may occur between 2 weeks after and up to 2 months after a hurricane. Especially in areas that did not flood but received more rainfall than usual (6). On the other hand, strong winds will drive mosquitoes away. For those reasons, much of the analysis in this project is based on weather records.

In this project, no reliable data was found related to reporting dead birds or regarding monitoring infected birds although birds are known to be carrier of WNV. In other geographical areas around the word and later years, dead or infected birds monitoring is a common practice regarding WNV monitoring.

Available records regarding spraying are integrated in the data as well as hospitalization records.