

Center for Health Equity Research

**Southwest Health Equity Research Collaborative  
PILOT PROJECT PROGRAM**

**PI: Joseph Mihaljevic, PhD**

**Assistant Professor, School of Informatics, Computing, and Cyber  
Systems**

**Project Title: Epidemiological modeling to predict spatial disparities  
in West Nile virus infection risk in the Southwest**

**Proposal Abstract:**

Maricopa County annually ranks in the top 10 counties for highest number of West Nile virus (WNV)-positive human cases. WNV is a pathogen that circulates in bird populations and is transmitted by mosquitoes, which can also spread WNV to humans, sometimes leading to fatalities. Because mosquito population densities are sensitive to urban micro-climates, we hypothesize that high heterogeneity in micro-climates across the 9,224 mi<sup>2</sup> county leads to spatial disparities in the risk of WNV to local human populations. Furthermore, we hypothesize that demographic characteristics of local human communities will correlate with environmental features that favor larger or smaller mosquito populations, contributing to health disparities. We will develop an epidemiological model that explains the transmission of WNV among birds, mosquitoes, and humans based on the effects of micro-climate on mosquito populations. With this framework, our model will predict the risk of WNV transmission to humans per zip code per week. We will test our model's predictive power using weekly data on the fraction of WNV-infected mosquitoes in the environment, and the weekly number of WNV cases detected in humans. We will then determine if characteristics of local human communities account for variation in the data that is not explained by our climate-driven model. In other words, we will determine if human demographic patterns can explain disparities in WNV risk that cannot be explained by climate patterns alone. Our long-term goal is to use our modeling framework to understand WNV across the US and to develop more refined mosquito control strategies that are informed by model predictions of WNV risk at small spatial scales.