GIS Applications in Epidemiology

Thursday, December 7th, 2017, 12 – 1 pm
Animal Sciences Building, Room 33

The Centroid's last brown bag of the semester will highlight three epidemiology research projects that made use of geospatial technology:

Foot and Mouth Disease: Modelling potential fomite travel via Feed and Milk trucks in Michigan

David South is a CSU undergrad in Microbiology with a minor in Geography, and currently a contractor for USDA APHIS. He is fascinated by infectious diseases and is working to become an epidemiologist with the CDC.

Using Geospatial Methods to Measure the Risk of Environmental Persistence of Avian Influenza in South Carolina (A Pilot Study)

Chloe Stenkamp-Strahm is a DVM/PhD student whose projects focus on mapping and modeling infectious disease agents. Her projects center on two main hosts and pathogens: E.coli O157 in dairy cattle, and avian influenza virus in wild birds.

Geolocation of livestock premises and their population in Pakistan and Thailand: A simulation process model

Muhammad Usman Zaheer is a veterinarian from Pakistan, and a PhD candidate in epidemiology in CSU’s Department of Clinical Sciences. Before starting his PhD, he obtained his DVM and M.Phil (Epidemiology & Public Health) degrees in Pakistan.
Foot and Mouth Disease: Modelling potential fomite travel via Feed and Milk trucks in Michigan - David South

To aid in computer modelling of the incredibly contagious Foot and Mouth agricultural disease (FMD), this project modeled geospatial routes for feed and milk trucks in Michigan. Since FMD can be transmitted via fomites on mechanical vectors such as delivery trucks going from farm to farm, being able to quantify this effect on transmission is very important.

Using ArcGIS Network Analyst and Python, routes were created based on a series of parameters collected from literature and from individuals knowledgeable to the agricultural industry. Statistics were calculated from the synthesized routes which can be compared to industry values for validation. The methods developed in this project could be applied for various agricultural disease applications and hopefully will help add accuracy to the USDA’s modelling efforts for FMD.

Using Geospatial Methods to Measure the Risk of Environmental Persistence of Avian Influenza in South Carolina (A Pilot Study) - Chloe Stenkamp-Strahm

Avian influenza (AI) is a highly contagious virus affecting wild birds and domesticated poultry. In addition to exposure from wild birds, outbreaks in domestic poultry can be initiated and propagated by exposure to virus surviving in the environment near poultry operations. This study aimed to define areas of South Carolina at heightened risk for environmental presence of the AI virus using geospatial methods. Environmental suitability maps were created using covariate layers and ArcGIS software with the Predictive Analysis tool.

Classifying suitability map values based on World Organization for Animal Health (OIE) risk assessment guidelines, showed the risk of AI persistence and how it varied depending on several variables including season and farm density. These results improve our knowledge of environmental suitability for AI in South Carolina, and may be used to support planning and preparedness efforts to mitigate agricultural outbreaks of AI within the state.

Geolocation of livestock premises and their population in Pakistan and Thailand: A simulation process model - Muhammad Usman Zaheer

Infectious diseases of livestock are responsible for loss of animal productivity, food insecurity, economic losses and trade restrictions. Understanding the spread of these diseases and determining effective mitigation strategies can be very useful for policy making and disease control programs. Simulation models designed for livestock species in the USA cannot be applied to countries such as Pakistan and Thailand due to differences in geography and management practices.

Our aim is to develop a model to simulate the geolocation of livestock premises and their population in Pakistan and Thailand. The output of this model will be one of main inputs needed to simulate FMD spread and determine effective mitigation strategies, subsequently guiding policy making for FMD control in these countries.