Seasonal Healthcare Facility Recommendations for Areas at High Risk of Mosquito-Borne Disease in the US

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Equipping healthcare systems in periods of high risk of disease transmission is critical to the prevention of acute overloading of underprepared systems, reducing the effects of system-stress on patients, providers, and communities. Of particular concern are mosquito-borne diseases, which have rapidly risen in the past two decades in the United States, with mosquito-borne disease epidemics occurring more frequently on a global level with rapidly evolving climate and social change. The vast majority of vector control organizations in the United States do not have the capacity for sufficient prevention and control, making the likelihood for system-overload a significant public health risk in the future. Using Niche Models of ten (10) mosquito species--*Aedes Aegypti*, *Aedes albopictus*, *Aedes Polynesiensis*, *Aedes Vexans*, *Anopheles Claviger*, *Anopheles Messeae*, *Culex Bitaeniorhynchus*, *Culex Quinquefasciatus*, *Culex Tritaeniorhynchus*, *and Mansonia Uniformis*--overlaid with latitude-longitude data of healthcare facilities, nine areas of high healthcare system-overload risk during mosquito seasons in the United States were identified, with four areas being of particularly high-risk for system-unpreparedness. Other cross-determinants were taken into account to place lack of system-presence and severity of overload-risk in geo-socio-economic context. We suggest that seasonal healthcare facilities be established in these regions to reduce risk of overloading-stress on care and providers in times of high mosquito-borne disease-risk.

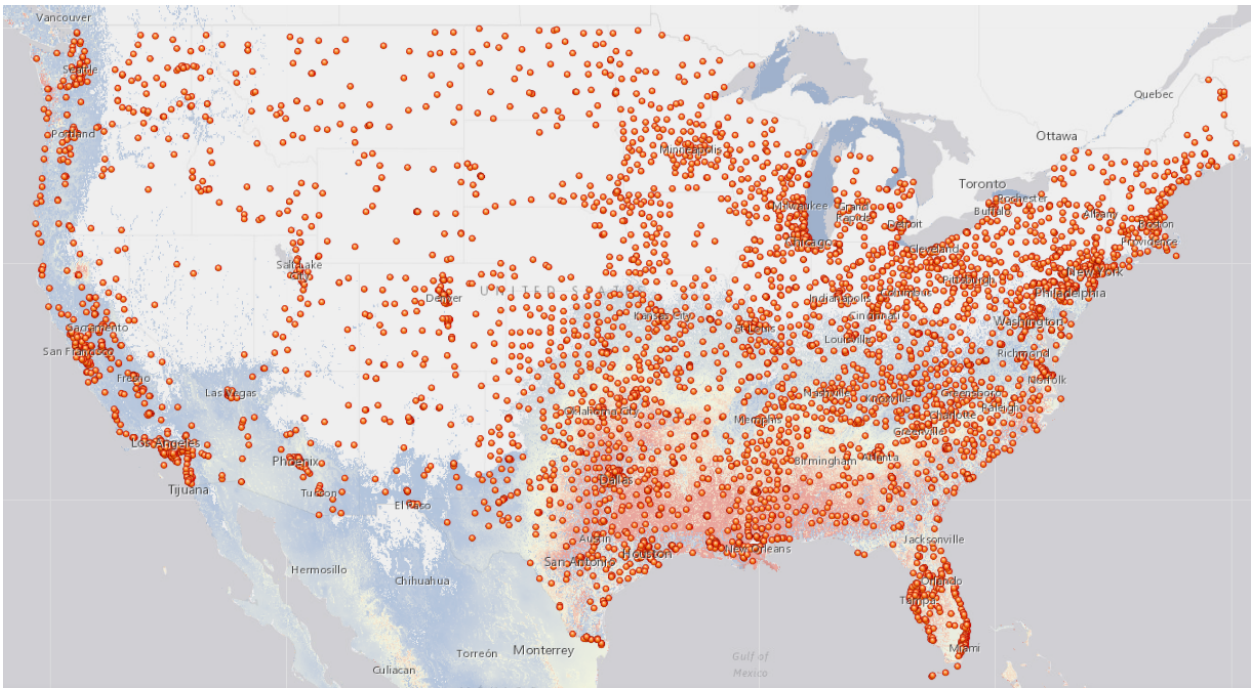
Keywords: *Mosquito-Borne Disease, Healthcare Systems, Determinants of Public Health, Health System-Preparedness, Geo-socio-economics*

Research Methodology

To determine what regions of the US would need more hospitals for mosquito-transmitted diseases, we would need datasets of the hospitals in the US and of the spread of mosquito-transmitted diseases. Using data.world, we were able to find a dataset with over 6,000 hospitals in the US and Puerto Rico, and the dataset was checked for addresses or the longitude and latitude, both of which were included. GLOBE Earth System Explorers Data for MHM and Precipitation data points were also collected. A map for mosquito borne disease-niches was also found through ArcGIS. With the data, a map would be created overlaying the density of hospitals throughout the US with the spread of diseases transmitted by mosquitoes and the GLOBE data.

Data Analysis and Outcomes

The outcome of our research has proved to be beneficial when trying to track down and help stop the spread of mosquito borne diseases especially in the states that are high in mosquito density which are represented by the large groups of red dots mostly surrounding the coast of the United States. Data has shown that some of the most densely mosquito populated states are Northeast Texas, Louisiana, Central and Southern Mississippi, Central and Southern Alabama, Southern Georgia, Florida,and Eastern North Carolina yet hospital-density is low in West Louisiana, South Mississippi, South Alabama, South Georgia. This data has helped us strongly believe that building more hospitals and even temporary hospitals would



help prevent any type of epidemic from the spread of diseases carried by mosquitoes.

These areas are also characterized geologically by a relatively flat landscape, especially compared to Western United States, with year-round warm and limited snow and other obstructive precipitation. However, especially in areas like Florida, high humidity and high wetland-density, precipitation may prevent construction projects. However, these areas still are relatively suitable for construction of new and

alternative healthcare facilities, pointing to other factors, such as local socio-economic conditions as being root causes of lack of system-support and preparedness.

These areas in the US are also characterized by high socioeconomic gaps on class, race, and gender, especially more so than other parts of the US. This may be a obstacle to effective policy-making and implementation of healthcare facilities that are ready to take on increased rates of mosquito-borne disease.

Conclusion

Underprepared areas will find it harder to prevent mosquito-borne disease epidemics and to combat any that occur. Establishing more hospitals in areas of high mosquito density and lower hospital density would be a central factor in preventing epidemics; it would reduce overcrowding and general burden to hospitals in areas with fewer hospitals and allow greater flexibility of healthcare systems to adapt and respond to epidemics.

Resources

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