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Human West Nile Cases in California (2006-2015)

Motivation

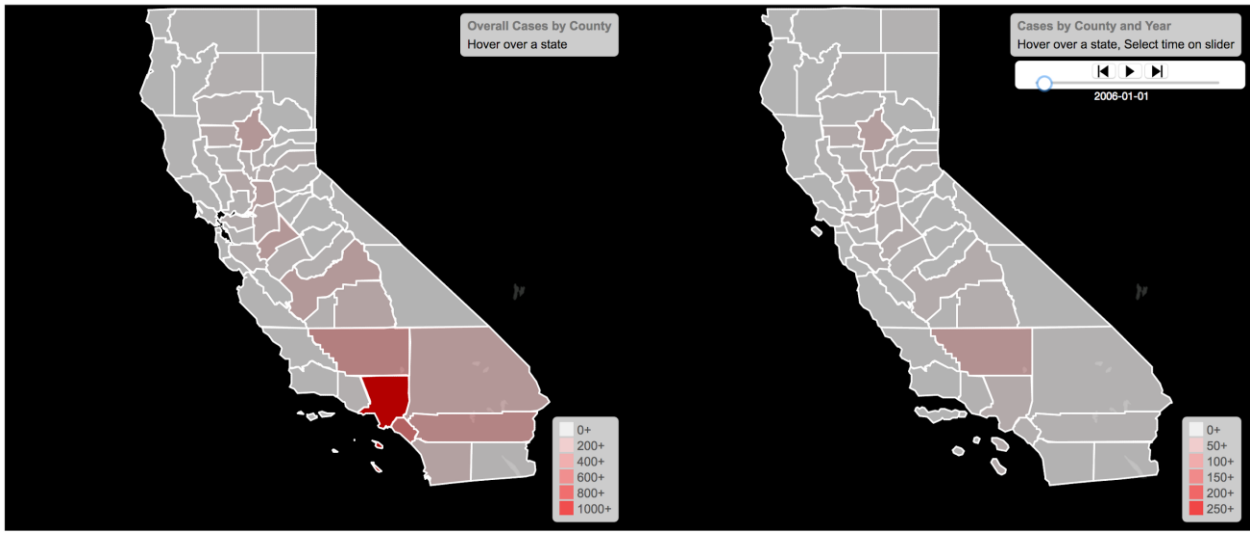
West Nile is a viral disease transmitted by mosquito, with cases occurring during the mosquito season (summer and into fall). In about 75% of infections people have few or no symptoms, about 20% of people develop a fever, headache, vomiting, or other flu-like symptoms, and in less than 1% of infections the individuals develop serious, sometimes fatal illnesses. Individuals in at risk areas should wear insect repellent and long-sleeved shirts and long pants to prevent mosquito bites and reduce the risk of West Nile since unfortunately, there is no vaccine. The California Department of Public Health provides the public an understanding of at risk counties and documents West Nile cases in humans along with dead birds, horses, and other livestock [1]. Still, the California Department of Public Health do not show the overall human cases across several years, in order to understand historically which counties have the highest counts of West Nile for preventative and does not show an animation of West Nile cases overtime to understand if incidents of West Nile have migrated overtime or remained localized within particular counties.

Tasks

The dataset provided consists of West Nile infections reported in humans from 2006 to 2015 per week per county. Furthermore, a geojson file consisting of the geometries of California counties was acquired in order to construct geographic-based visualizations. Coupled with the California Department of Public Health's analysis, our visualization can provide additional information for preventative efforts in at risk California counties. The developed visualization intends to consider the shortcomings of the California Department of Public Health's analysis by answering the following questions of interest: Historically, which counties have the highest counts of West Nile? Are there any notable trends of West Nile infections overtime? Overtime, has West Nile consistently localized within a particular region or has it been fairly distributed throughout California?

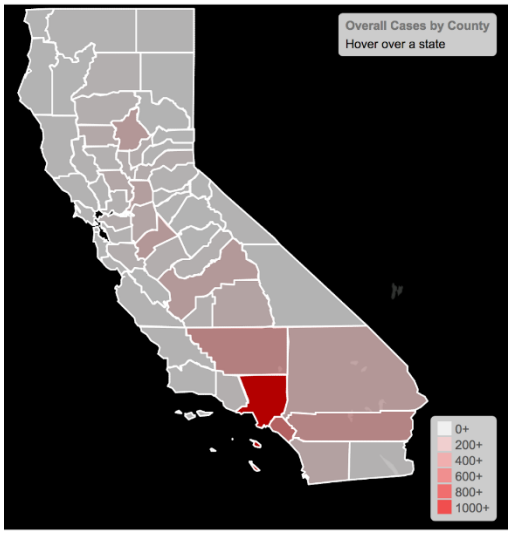
Visualization

Human West Nile Cases in California (2006-2015)



Leaflet.js was used to create these two choropleth maps, where the left map shows the overall West Nile cases by county (static) and the right map shows West Nile cases by county and year as an animation. Choropleth maps show regions as area marks using given geometry (the geometries of California counties), where a quantitative attribute (West Nile case count) is encoded with color [2, pg. 181]. The most effective channel used is spatial region, since geographic distributions of West Nile can be associated with particular counties across California. The color saturation channel is also used to easily show which counties have the lowest (white) and highest (red) cases of West Nile. Furthermore, in the right choropleth map depicting the cases by county and year, the motion channel is utilized. At default, both the right and left choropleth maps are static as to provide the user with an understanding of visual context. The user must interact with the right choropleth maps by either playing the animation or scrolling along the timeline to view the distribution of West Nile for a particular time point. The legends for both choropleth maps follow the same color saturation color scheme (lowest for white and highest for red) and do not share the same ranges, but a side by side view of both pieces of information provide the user with a full understanding of overall cases and time based trends of West Nile. Furthermore, instructions for the user are made apparent and clear in order for the user to understand the means in visual interaction. When hovering over any of the states, the case count of West Nile is known. Aesthetically, the intention of this visualization is to clearly place California counties as the focus, meaning external geographic marks such as roads, county names, bordering states, etc. were removed by making a custom Mapbox map.

Historically, which counties have the highest counts of West Nile?



In the left choropleth map, it can be immediately seen that the number of cases in Southern California vastly outnumber the ones in Northern California. Specifically Los Angeles County and Orange County were hit the hardest with many of the surrounding areas also heavily affected. However, outside of these two and San Diego County, all other majorly affected areas are inland and not coastal regions. From what is known about mosquitoes, they prefer warmer climates and open water for breeding [3]. Consistently, the visualization shows a higher number of cases towards the south. Although the data is not considered here, higher overall cases of West Nile can be associated with larger populations.

Are there any notable trends of West Nile infections overtime? Overtime, has West Nile consistently localized within a particular region or has it been fairly distributed throughout California?

By playing the animation or scrolling through the timeline, we can see there are two distinct massive breakouts in infections. The first is between 2006-2008 followed by a couple years of calm from 2009-2011 and then the second (and larger) breakout from 2011-2015, although it is unknown when the second breakout finishes as the data collection ends there. We also see two areas which consistently contain infections: Butte County and Kern County. Both of these counties consistently reported a nonzero number of infections in the timeline, highlighting them as regions where the populace should stay informed and aware of potential infections. Additionally, these two regions also seem to be somewhat of prognostic

indicators of the next big breakout. Right before other areas become heavily affected, these two counties see an increase in West Nile infections. Whether this is a true phenomenon or just coincidence remains to be seen and will require additional research.

Sources

[1] http://westnile.ca.gov/
[2] Munzner, Tamara. *Visualization Analysis and Design*. CRC Press, 2014
[3] "Higher Temperatures Make Zika Mosquito Spread Disease More." The Weather Channel, Associated Press, 3 Feb. 2016, weather.com/science/news/warm-temperatures-allow-zika-spreading.