Analysis of Lyme Disease Infection in the United States

Team

Daniel Eduardo Duran (12301739), Diwash Shrestha (12203784)

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1. Introduction

- illness caused by the bacterium Borrelia burgdorferi,
- Transmitted to humans through the bite of infected black-legged ticks
- Skin rash called *erythema migrans* are sign of Lyme
- Use the data from Project Tycho to gain insights about lyme disease in USA
- Review the temporal and geographical patterns

2. Objectives

- Identify the temporal and geographical patterns of Lyme disease in the United States
- Understanding the factors influence Lyme Disease

3. Findings

- Temporal Analysis
- Geographical Analysis
- Temperature and Lyme Cases

3.1 Temporal Analysis

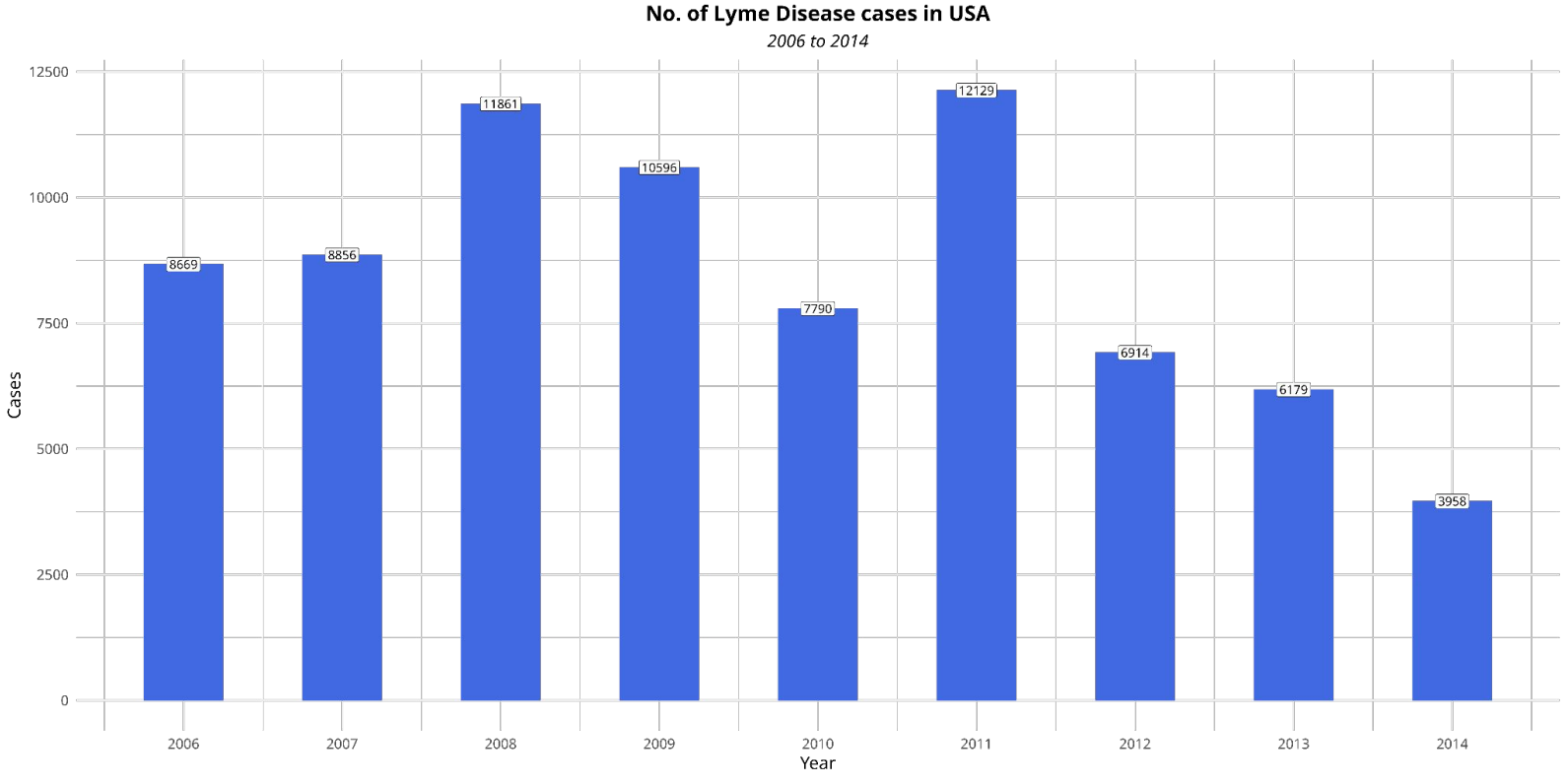
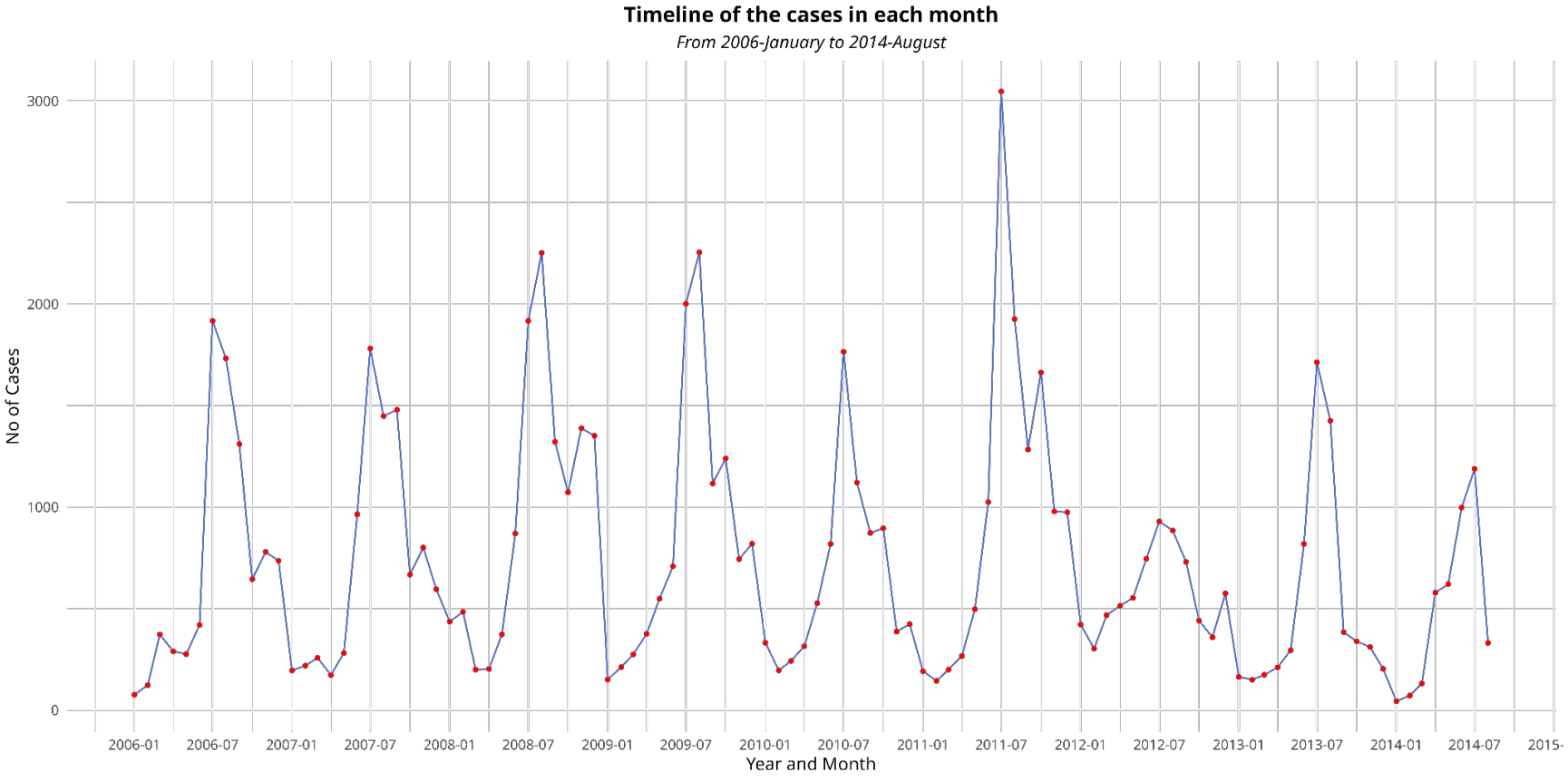


Fig1: Yearly cases trend



- Line plot shows the lyme disease has a seasonality pattern
- Increase of cases starting from March until August followed by an acute decline of cases from October to February.

3.2 Geographical Analysis

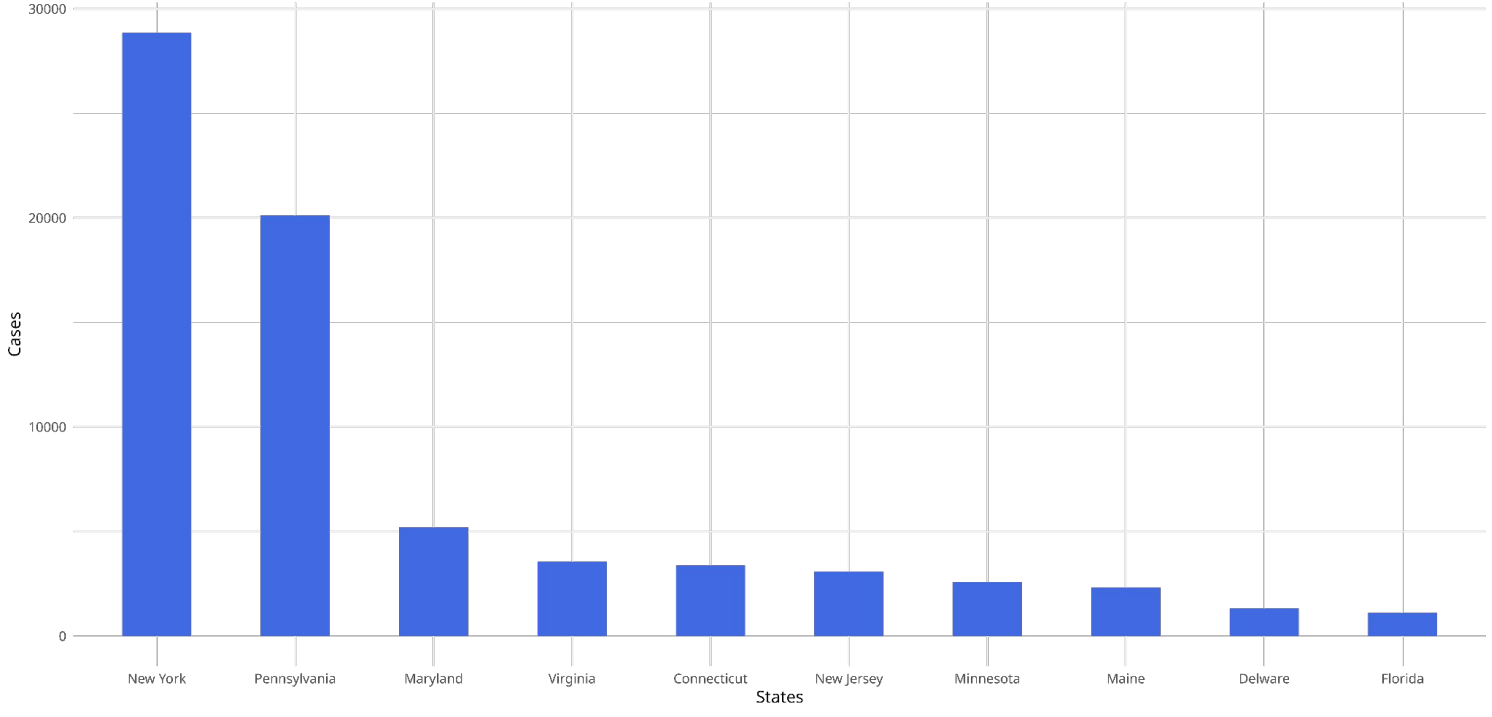
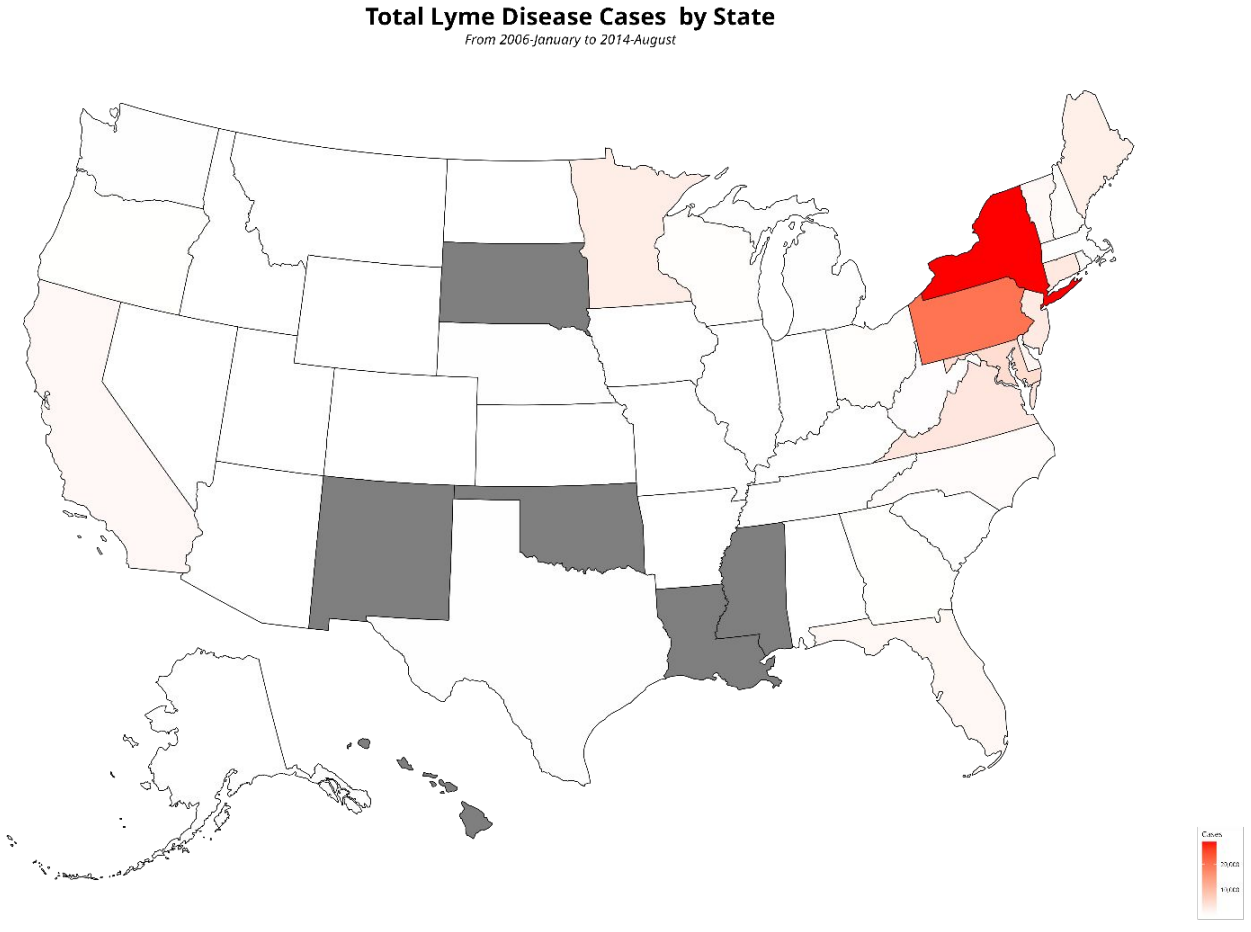
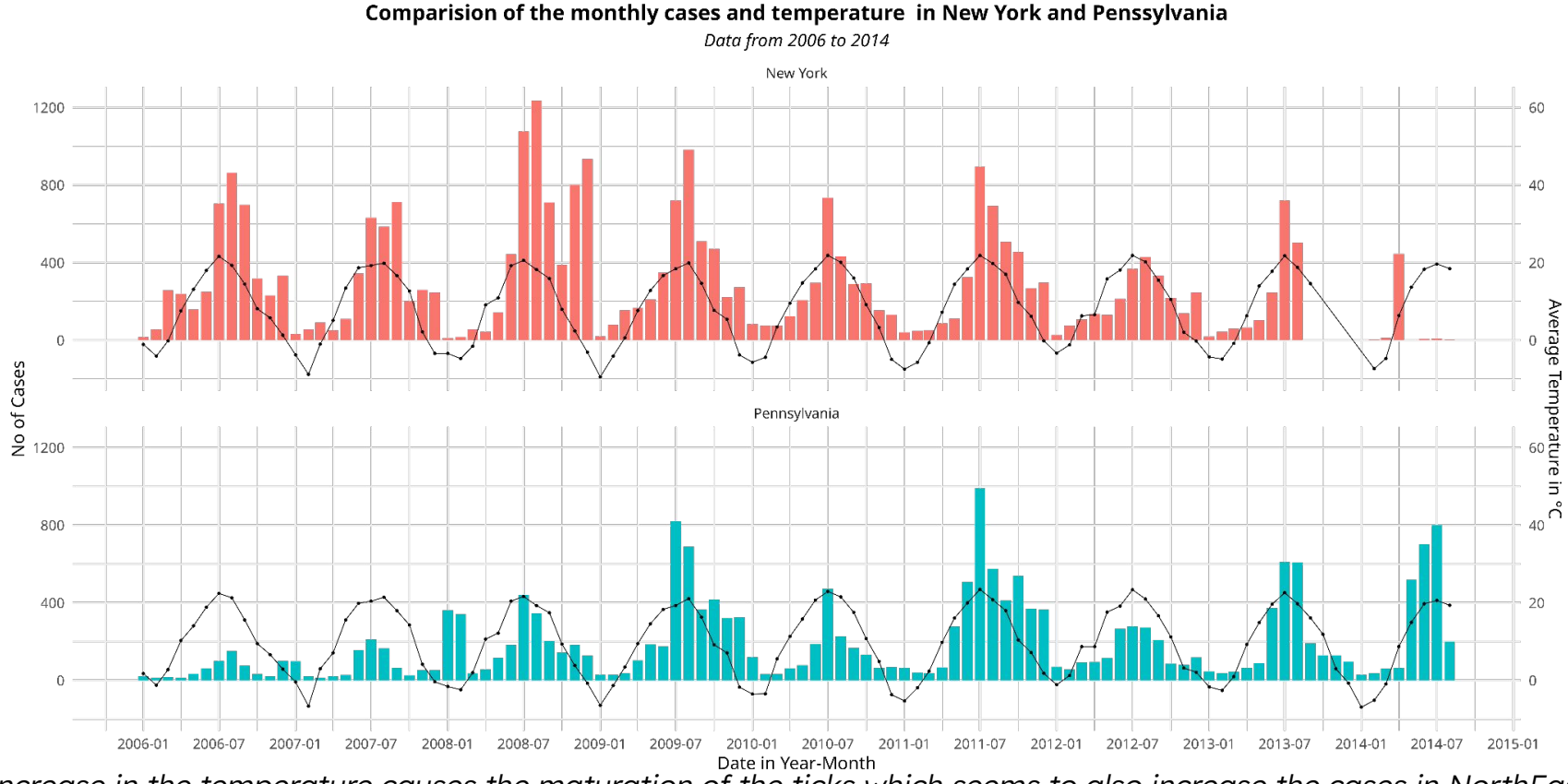


Fig: Top 10 states with highest lyme cases



Spatial analysis shows that Lyme Disease is concentrated in the northeast of the united states, especially in the states of New York and Pennsylvania

3.3 Temperature and Lyme Cases



Increase in the temperature causes the maturation of the ticks which seems to also increase the cases in NorthEastern State of New York and Pennsylvania

4. Conclusion

- Spatial Analysis showed the northeastern states are the most effected region
- New York and Pennsylvania states has highest number of cases
- Lyme disease shows seasonal pattern as cases rise from march till august
- Northeastern region are better suited for the ticks due to rising temeprature

5. Bibliography

Daniel Jernigan. (2023, January 20). *Lyme Disease Trasmission*. https://www.cdc.gov/lyme/transmission/index.html. Accessed 28 Jun 2023

Dong, Y., Huang, Z., Zhang, Y., Wang, Y. X. G., & La, Y. (2020). Comparing the climatic and landscape risk factors for lyme disease cases in the upper midwest and Northeast United States. *International Journal of Environmental Research and Public Health*, *17*(5). https://doi.org/10.3390/ijerph17051548

Elbaum-Garfinkle, S. (2011). Close to home: a history of Yale and Lyme disease. *The Yale Journal of Biology and Medicine*, *84*, 103–108.

Ginsberg, H. S., Hickling, G. J., Burke, R. L., Ogden, N. H., Beati, L., LeBrun, R. A., Arsnoe, I. M., Gerhold, R., Han, S., Jackson, K., Maestas, L., Moody, T., Pang, G., Ross, B., Rulison, E. L., & Tsao, J. I. (2021). Why Lyme disease is common in the northern US, but rare in the south: The roles of host choice, host-seeking behavior, and tick density. *PLoS Biology*, *19*(1). https://doi.org/10.1371/journal.pbio.3001066

NOAA National Centers for Environmental Information. (2023, June 30). *Climate at a Glance: Statewide Time Series*. Https://Www.Ncei.Noaa.Gov/Access/Monitoring/Climate-at-a-Glance/Statewide/Time-Series. Accessed 30 Jun 2023

VanAcker, M. C., Little, E. A. H., Molaei, G., Bajwa, W. I., & Diuk-Wasser, M. A. (2019). Enhancement of risk for lyme disease by landscape connectivity, New York, New York, USA. *Emerging Infectious Diseases*, *25*(6), 1136–1143. https://doi.org/10.3201/eid2506.181741