GEO-TEMPORAL ANALYSIS OF THE EFFECTS OF URBANIZATION ON LYME DISEASE RATES IN THE UNITED STATES, 2008 - 2020

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ABSTRACT

- Lyme disease (LD) is transmitted through the bite of infected ticks. In the US, an estimated 476,000 people are diagnosed each year.
- Urbanization has been posited as a contributor to LD risk and could be a factor in the geographic spread over time.
- The goal of this research is to identify trends in LD rates as compared to urbanization indicators between 2008 and 2020.
- Through a space-time Poisson analysis of LD rates, counties designated as ‘large metro’ comprised the largest percentage of significant clusters.
- Through stratified analysis only ‘non-metro’ counties indicated an increasing trend.

METHODS

- Publicly available data were collected from the following sources:
  - Rural-Urban Continuum Codes, USDA ERS.
  - Population Estimates, NCI SEER.
  - Metro and Micro Statistical Areas, OMB.
  - LD Case Numbers, CDC.
- The data were aggregated by county for every year from 2008 to 2020 and merged in Excel and a SQLite database.
- The Rural-Urban Continuum code definitions and Metropolitan and Micropolitan Statistical Areas were adapted and the codes re-distributed for every county in the US from 2008 to 2020.
- SaTScan™ was utilized to conduct a space-time Poisson analysis for LD case rates from 2008 to 2020, through which geographic clusters of high rates were identified.
- The percentage of counties by urbanization classification determined to be a part of a statistically significant cluster through a SaTScan™ space-time analysis of LD case rates.
- The overall trend of national LD case rates showed a slight positive trend from 2008 to 2019 with a sharp dip in 2020, likely due to COVID-19 lockdowns and limited access to care.

RESULTS

- 14% (n = 5850) of the counties were identified as being in a cluster.
- Of the clustered counties, ‘large metro’ counties accounted for the largest proportion of counties represented, with 31% of them being in a cluster.
- The change in county LD case rates from 2008 to 2019 as grouped by the counties’ urbanization classification.
- Stratified analysis indicated an increasing trend in the ‘non-metro’ counties and a slightly decreasing trend in the ‘metro’ counties.

CONCLUSION

- While this research is still in progress, there is so far mixed indications of urbanization effect on LD rate.
- Clusters of high rates include the most ‘large metro’ counties, however only ‘non-metro’ counties showed an increasing trend.
- Data may be limited by outliers, underreported cases, and changes in clinical understanding of LD over time.
- Future work will utilize satellite imagery of land use change over time as an additional measure of urbanization.

CITATIONS

6) Kulfendorf. SaTScan 2022.
7) USDA ERS. Rural-Urban Continuum Codes. 2020.
9) OMB. Metropolitan and Micropolitan Statistical Areas. 2022.