Evaluation of Hospitalizations for Tick-Borne Diseases in the United States from 2002 to 2021: Trends, Demographics, and Geographic Variation

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INTRODUCTION

- Tick-borne diseases (TBDs) are a growing public health threat in the United States, particularly in certain regions and seasons.
- While many TBDs are managed in outpatient settings, severe cases requiring hospitalization provide a unique opportunity to assess the burden and epidemiologic trends of these infections.
- This study analyzes hospitalizations with TBDs across the U.S. from 2002 to 2021, evaluating geographic distribution, seasonal patterns, co-infections, and demographic disparities.
- Understanding hospitalization trends is critical for tailoring public health interventions, provider education, and diagnostic strategies..

METHODS

- Data Source: HCUP Nationwide Inpatient Sample (NIS), 2002-2021.
- Study Population: All inpatient hospitalizations with a primary or secondary diagnosis of a tick-borne disease (ICD codes for Lyme disease, babesiosis, ehrlichiosis/anaplasmosis, tularemia, Rickettsial fevers, and other TBDs).
- Analysis:
  - Temporal trends in hospitalization rates.
  - Seasonal patterns by month and year.
  - Geographic distribution across the Northeast, Midwest, South, and West.
  - Demographics (age, sex, race/ethnicity, rural vs. urban residence, income quartiles).
  - Co-infection patterns across TBD pairs.
- Statistical Approach:
  - Descriptive statistics and weighted frequencies to account for the NIS survey design.

RESULTS

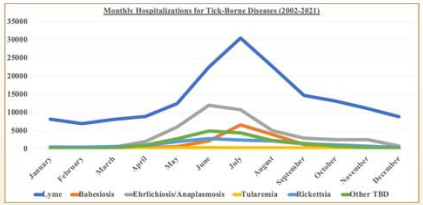

Figure 1: Overall monthly hospitalizations for Tick-Borne Diseases between 2002-2021

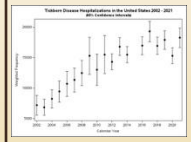

Figure 2: Incidence of all Tick-Borne Disease

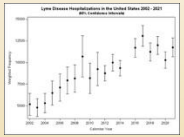

Figure 3: Incidence of all Lyme Disease

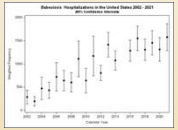

Figure 4: Incidence of all Babesiosis

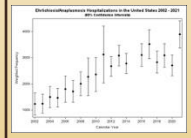

Figure 5: Incidence of Ehrlichiosis/Anaplasmosis

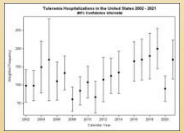

Figure 6: Incidence of Tularemia

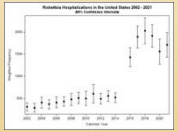

Figure 7: Incidence of Rickettsia

- **Lyme disease** accounted for the largest proportion of hospitalizations, with clear summer peaks (June-August) and highest hospitalization rates in the **Northeast**, followed by the Midwest.
- **Babesiosis** cases were concentrated almost exclusively in the **Northeast**, also peaking in the summer months, with notable increases in recent years.
- **Ehrlichiosis** and **Anaplasmosis** showed **broader geographic distribution**, with increasing hospitalization rates in the South and Midwest, peaking in May-July.
- **Rickettsia fevers** were predominantly found in the South, with a distinct summer peak, particularly in May-July.
- **Tularemia** hospitalizations were sparse, with small clusters in the Midwest and South, mostly peaking in the early summer.
- **Co-infections** were common, particularly for **Babesiosis** and **Lyme** disease, where up to **36%** of Babesiosis hospitalizations were associated with at least one other TBD.

Demographic Highlights

- Hospitalizations more common in middle-aged, white males.
- Urban residents had higher hospitalization rates than rural residents.
- Higher-income quartiles were associated with greater hospitalization rates.

Key Trends

- Overall increasing trend in TBD hospitalizations, particularly for Lyme disease, ehrlichiosis/anaplasmosis, and babesiosis.
- Expanding geographic footprint, especially for ehrlichiosis and anaplasmosis moving into the Midwest and South.

CONCLUSION

- TBD hospitalizations are increasingly affecting non-traditional areas (Midwest, South) and show increasing co-infection rates, particularly with babesiosis.
- Higher hospitalization rates among wealthier, urban, middle-aged white males challenge traditional TBD risk paradigms.
- Results suggest changing risk profiles, climate change, and evolving regional endemicity, and a growing need for expanded testing panels in hospitalized patients with suspected TBDs.
- Targeted public health messaging and tailored prevention strategies and surveillance are critical, particularly in emerging areas.
- Currently tick-borne disease reporting is lacking, our study highlights more information on the incidence.

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