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Ultrasound Usage Disparities and Associated Socioeconomic Factors

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Purpose

This work aims to conduct a geospatial analysis of recent ultrasound access and usage within the United States, with a particular focus on disparities between rural and urban areas.

Methods

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- Multiple public datasets were merged on a county level, including US Department of Agriculture economic metrics and CMS data using the most recent years available (2015-2019).
- From these databases, 39 total variables encompassing the socioeconomic, health, and ultrasound characteristics of each county were obtained.
- CPT codes incorporated included ultrasound-guided procedures and diagnostic exams. 3011 counties were included.

Methods

- The combined dataset was then exported to GeoDa for network-based analysis and to produce map visualizations.
- To identify statistically significant ($p < 0.05$) hotspots and coldspots in POCUS prevalence, Moran's I was used.
- Choropleth maps were created for visualization.
- ANOVA was run across the four Moran's I groups for each of 39 variables of interest.

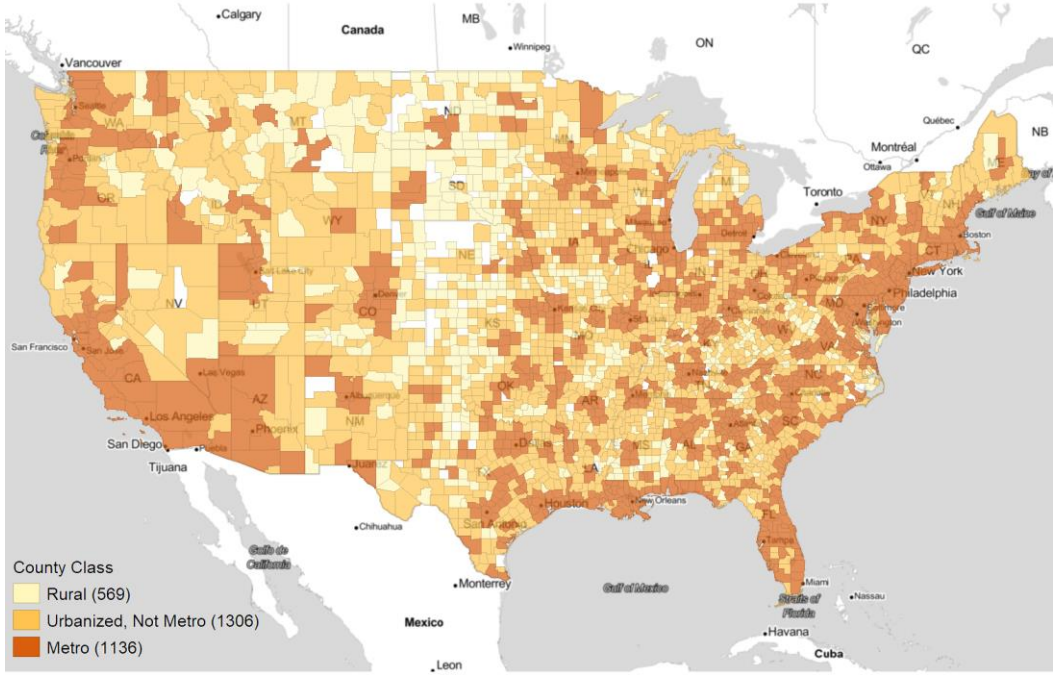

Figure 1: Categorical choropleth map of Rural, Urbanized, and Metro Counties. Categories were derived from Rural-Urban Continuum classifications of counties: Metro = 1-3 RUC, Urbanized, Not Metro = 4-7 RUC, Rural = 8-9 RUC. Counties excluded from analysis are in white.

Results

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- A total of 30,135,085 ultrasound-related CPT codes were billed to Medicare over 2015-2019, with 26.55% of codes being ultrasound-guided procedures and 73.45% being diagnostic exams.
- 38.84% of rural counties had access to POC ultrasound compared to 88.56% of metro counties and 74.19% of counties overall.
- Hotspots of POCUS were in Southern California and the Eastern US (average of 1,441 per 10k Medicare members per year).
- Coldspot areas were seen in the Great Plains and Midwest (average of 7.43 per 10k Medicare members per year).

Results

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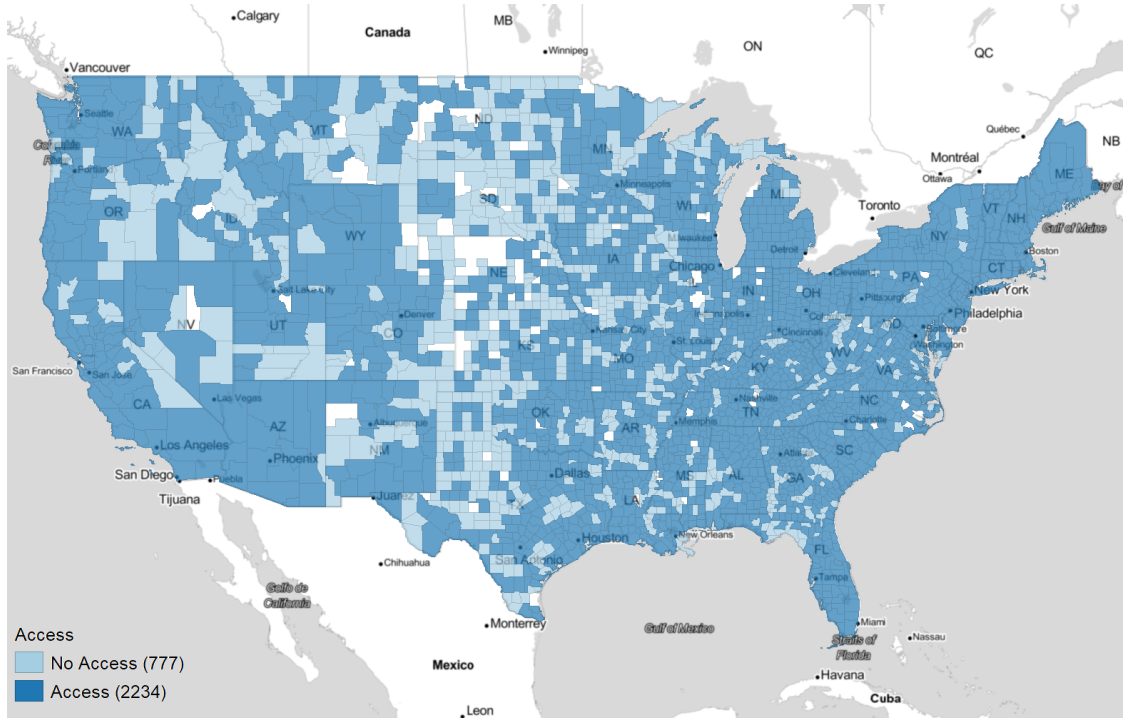

Figure 2: Binary choropleth map of ultrasound access. Access is defined per county as having at least one ultrasound procedure billed to Medicare in 2015-2019. Counties excluded from analysis are in white.

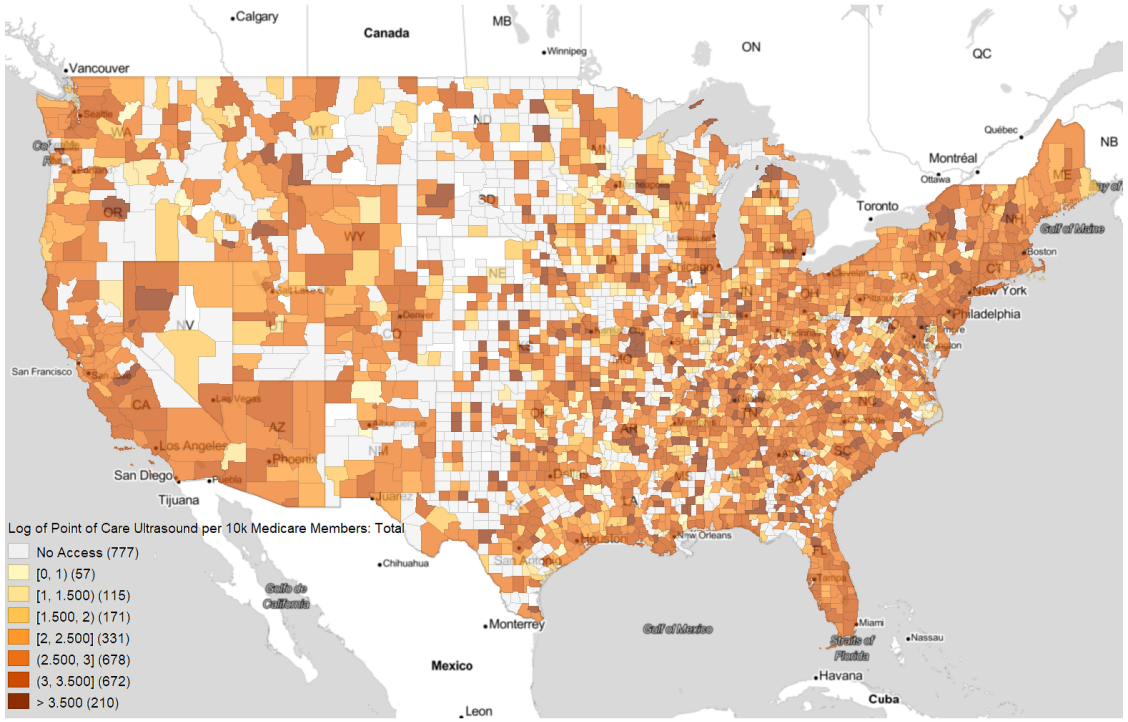

Figure 3: Choropleth map of log-scaled average yearly point of care ultrasound uses per 10k Medicare members. Counties without access are in gray. Counties excluded from analysis are in white.

Results

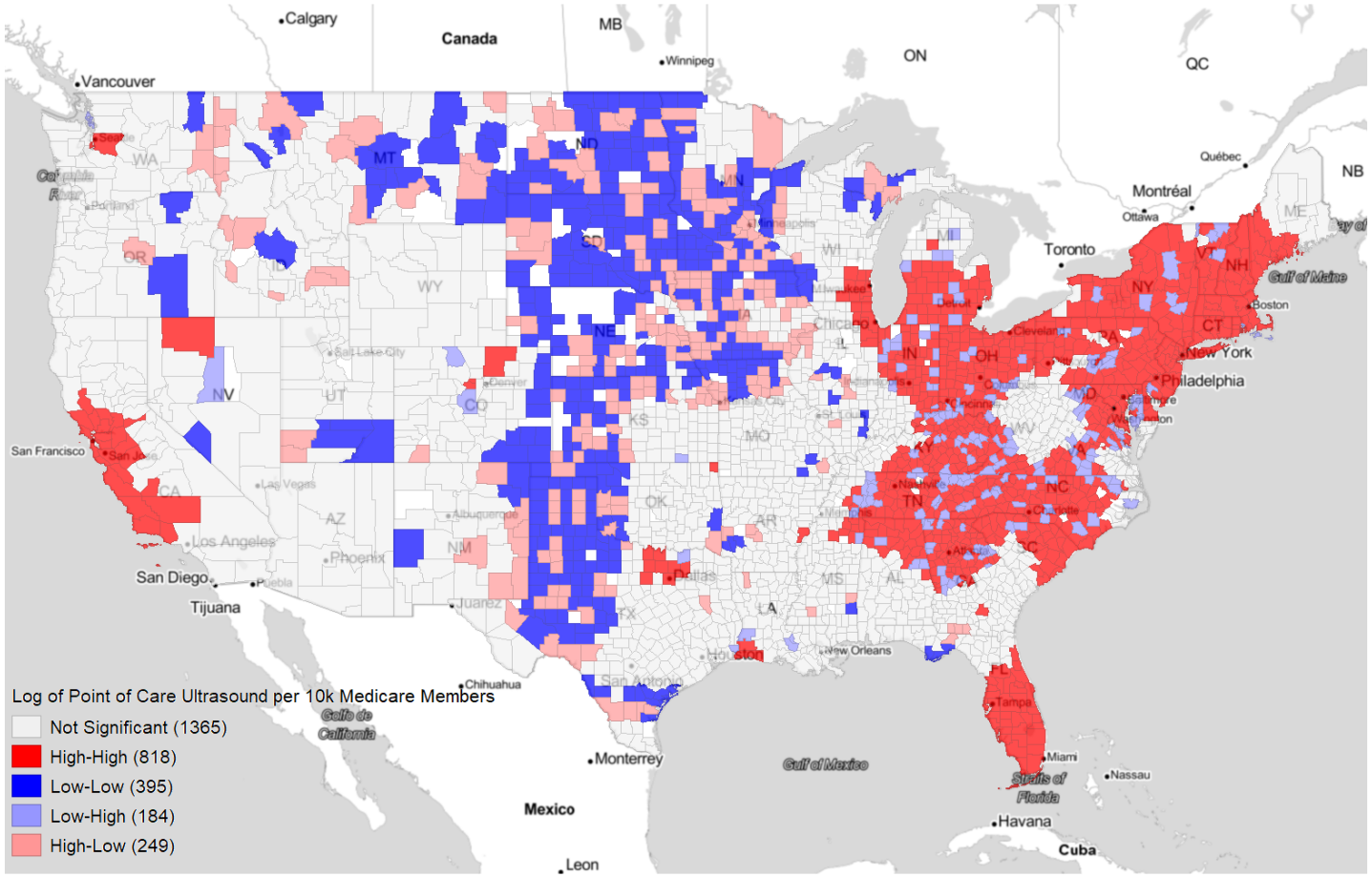

Figure 4: Moran's I plot of Log-transformed POC ultrasounds per 10k Medicare members per year. Counties excluded from analysis are in white.

Results

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- Hotspot clusters, when compared to coldspot clusters, were significantly ($p < 0.001$):
  - more dense (703.6 to 14.9 people per square mile)
  - more urbanized (3.5 to 7.1 RUC)
  - more college educated (25.1% to 20.0%)
  - more likely to have an ED visit (725.8 to 616.9 visits per 1k Medicare members)
  - more likely to be obese (19.0% to 12.9%)
  - less likely to be uninsured (10.1% to 13.0%)
  - more Black representation (8.5% to 3.4%)
  - less Hispanic representation (2.6% to 5.5%).

Summary

Ultrasound access and usage demonstrate significant geospatial trends across the United States. Hotspot and coldspot counties differ on several key sociodemographic and economic variables.

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Thank you

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