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

• 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

• 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

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

• 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.
References

Thank you

Please contact with any questions: bkaptur2@illinois.edu