

Geographic Access to MRI Machines and the Role of Mobile Imaging

Units Across Michigan Counties

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Background

- 27.1% of Michigan lives in a rural area compared to 20.4% in the entire United States¹
- People in rural areas face increased risk of poor health outcomes due to rural health disparities driven by geographical access to medical care, transportation limitations, and structural and policy factors influencing infrastructure placement
- In rural areas, longer driving distance to an MRI machine combined with limited access to personal or public transportation may restrict access to advanced imaging
- Michigan is one of 37 states with a certificate of need (CON) program restricting opening of a new MRI machine without first gaining approval from the Michigan Department of Health and Human Services²
- Mobile MRI units are a semi-trailer containing diagnostic imaging equipment that travel between communities aiming to reach underserved populations

Methods

- **Data sources:** All hospital based, outpatient facility, and mobile MRI units in Michigan were extracted from the 2024 MRI Service Utilization Lists posted by Michigan Health and Human Services. County population centers were obtained from the U.S Census Bureau
- **Distance Measure:** County population centers were used as travel origin points to calculate the average driving distance to the nearest MRI machine using QGIS
- **Infrastructure Classification:** Counties were categorized by MRI access (No MRI, mobile MRI only, fixed MRI, or both)
- **Distance Stratification:** Counties were categorized into long distance (>9.44 miles) and short distance (<9.44 miles) to nearest fixed MRI (in-hospital or outpatient center) based on whether the distance was greater or less than the median distance for the state
- **Analysis:** Association between long or short distance and mobile MRI availability were assessed using chi-square analysis ($p < 0.05$)

Results

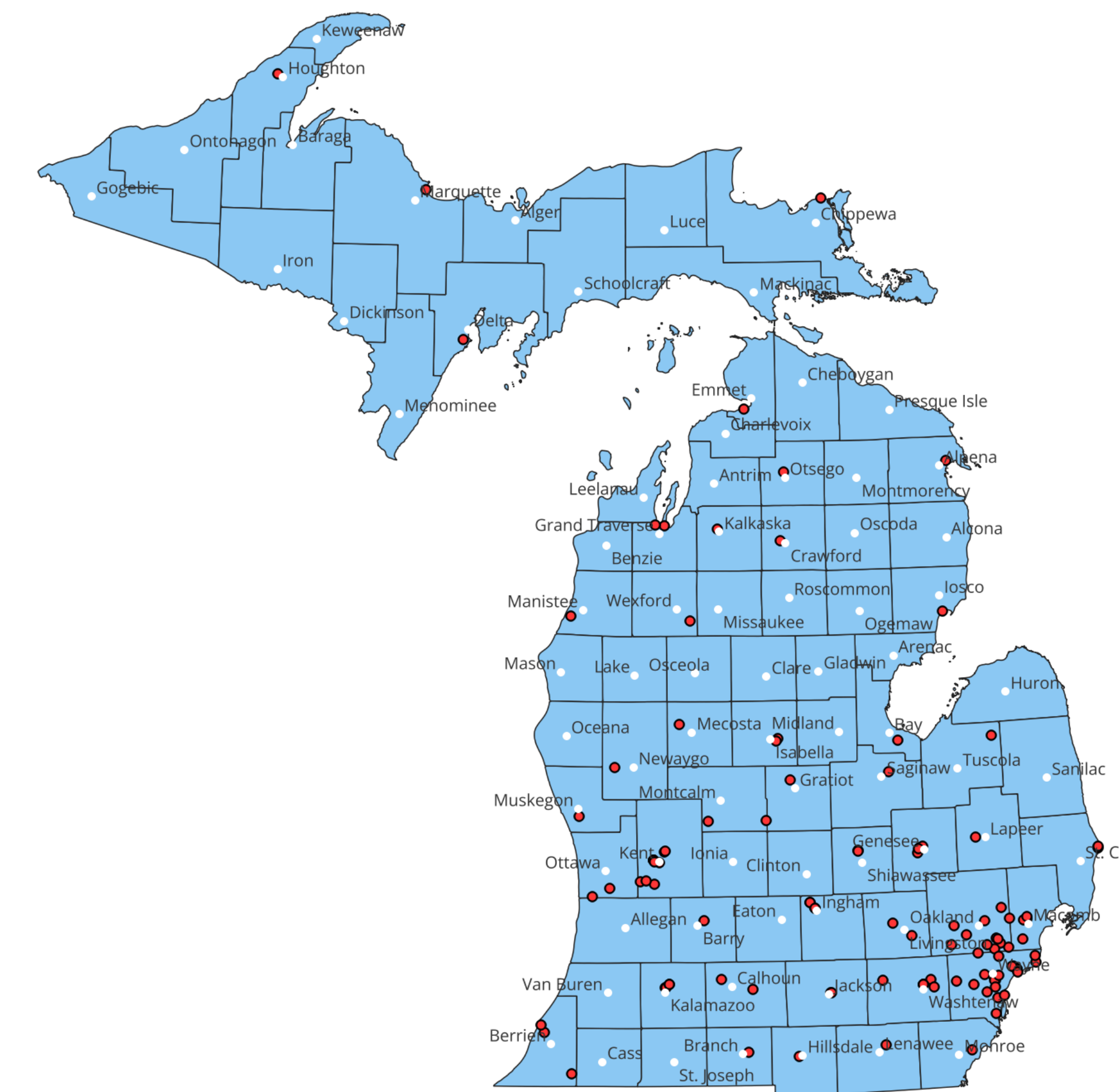


Figure 1. County population centers mapped in white and fixed hospital and outpatient MRI units in red

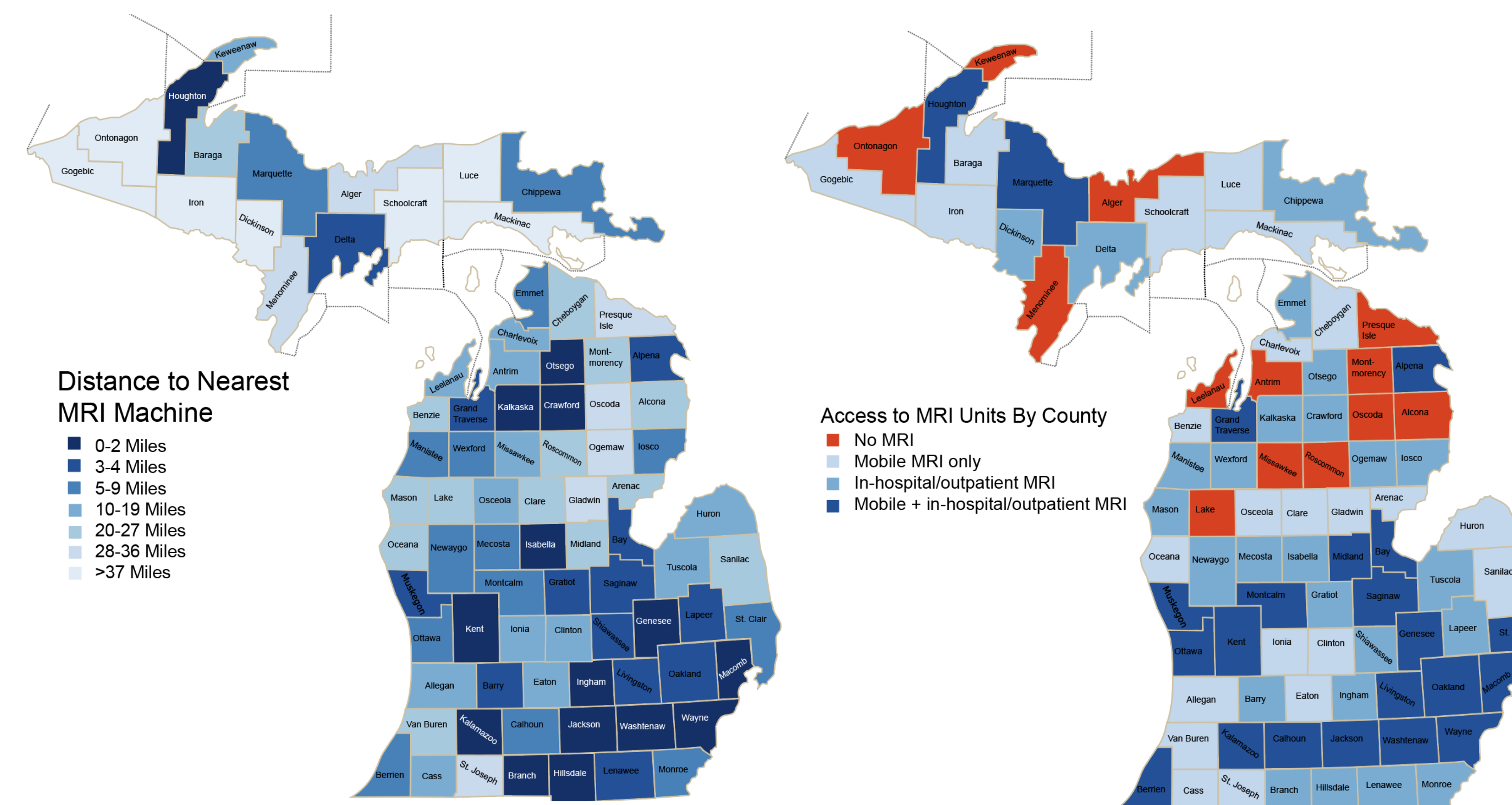


Figure 2. Average distance from county population centers to the nearest fixed hospital or outpatient MRI machine

Figure 3. County level infrastructure of MRI machines showing distribution of mobile imaging units

Discussion

- Rural counties in northern Michigan and the Upper Peninsula exhibited the longest average distance to a fixed MRI
- In Gogebic County, the nearest MRI machine is 82.2 miles away
- All 13 counties without a fixed or mobile MRI are classified as rural
- Mobile MRI units were present in 56.09% of counties with long drives to the nearest fixed MRI compared to 50.00% in counties with shorter drives
- There was no statistically significant association between county-level distance to the nearest fixed MRI and the presence of mobile MRI units (χ^2 test, $p = 0.58$)
- Average population of counties without MRI access is 14,641 compared to 45,218 for counties with mobile MRI only and 341,407 for counties with fixed and mobile MRI
- Future efforts to improve imaging equity may require targeted initiatives related to travel burden to ensure adequate MRI access in rural Michigan

Conclusion

Despite rural counties in northern Michigan and the upper peninsula experiencing geographic barriers to MRI access, mobile unit deployment does not appear to preferentially target these counties requiring greater travel distances to MRI imaging. This suggests additional policy or infrastructure changes are needed to address imaging inequality in rural Michigan.

References

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2. Stratmann T. Are Certificate-of-Need Laws Barriers to Entry? How They Affect Access to Mri, Ct, and Pet Scans. *SSRN Electron J.* Published online 2018. doi:10.2139/ssrn.3191452