Defining geographic regions with commuter data

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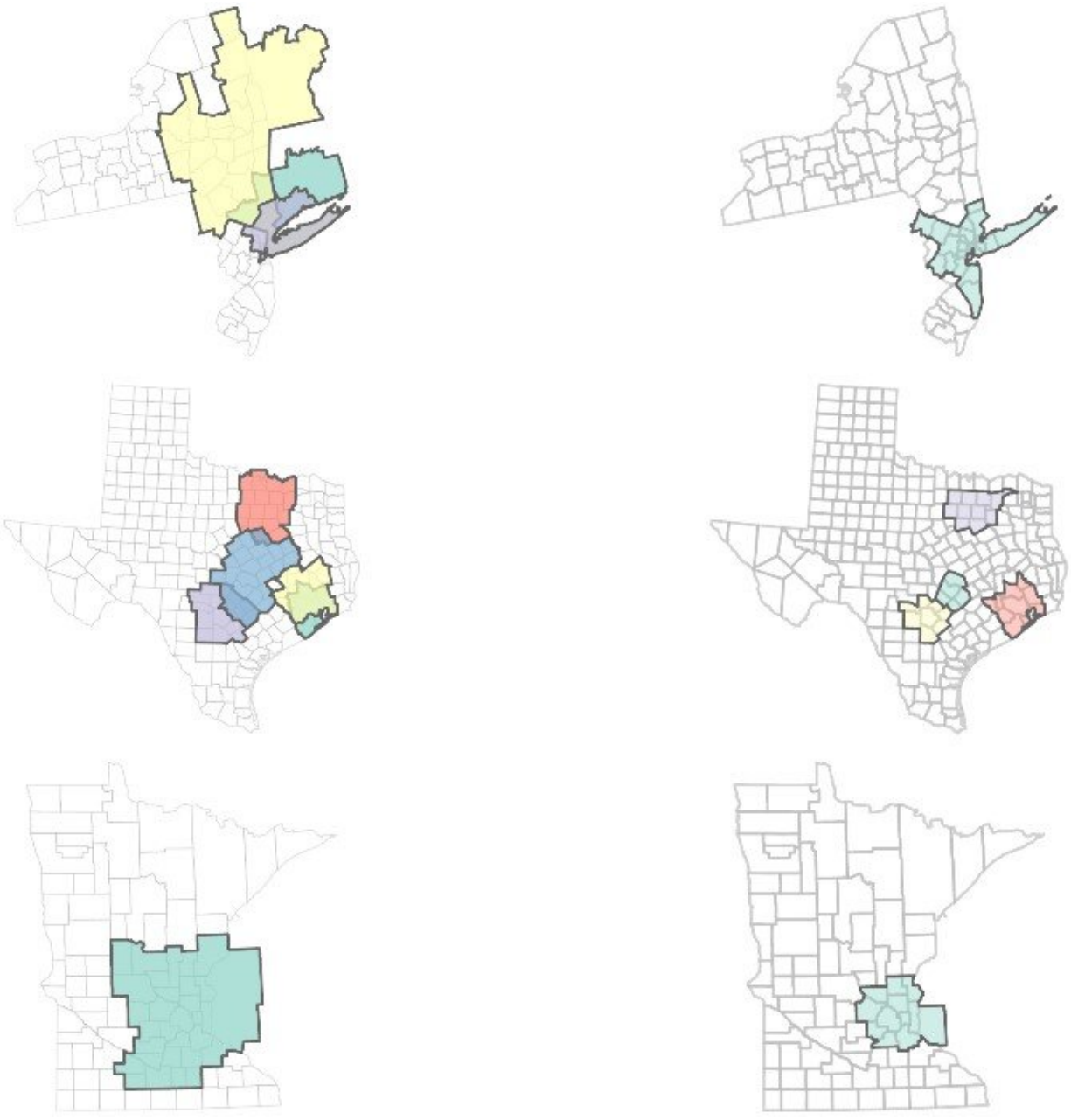

Comparison of MSAs of New York City region, major Texas cities, and Minneapolis (left) with their associated communities (right) in fairly populous regions. Credit: He et al, 2020 (PLOS ONE, CC BY)

A new mathematical approach uses data on people's commutes between and within U.S. counties to identify important geographic regions. Mark He of the University of North Carolina at Chapel Hill and colleagues present this work in the open-access journal *PLOS ONE* on April 29, 2020.

Defining the boundaries that separate metropolitan areas has major implications for research, governance, and economic development. For instance, such boundaries can influence allocation of infrastructure funding or housing subsidies. However, traditional methods to define metropolitan regions often hamper meaningful understanding of communities' characteristics and needs.

Drawing on methodologies from network science, He and colleagues have now developed a new method of defining metropolitan areas according to census commuter data. They organized all 3,091 counties in the contiguous United States into an interconnected network, with the number of commuters who cross county lines determining the strength of connections between counties. Notably, unlike other studies that have used commuter data to define metropolitan regions, they also accounted for within-county commuting.

Using the new method, the researchers identified 182 clusters of counties which together accounted for more than 90 percent of commuters. 14 clusters were characterized by a high number of commuters to a central node county, while 78 clusters lacked a strong

central node. They found 90 counties, including Los Angeles County, that stood alone because of high levels of within-county commuting. In contrast, 20 clusters, mostly centered around large cities, included 50 or more counties and spanned several states.

Generally, the clusters identified by the new method were larger than existing regions defined by traditional methods, suggesting the existence of important connections extending much farther than expected. (It's important to note that the authors permitted geographic regions to overlap in order for a richer and more nuanced characterization of geographic areas.)

While further work is needed to refine this new method, it could enable a more nuanced understanding of meaningful metropolitan boundaries and relationships in the U.S.

The authors add: "Results from community detection suggest that traditional regional delineations that rely on ad hoc thresholds do not account for important and pervasive connections that extend far beyond expected metropolitan boundaries or megaregions."

More information: Mark He et al, Demarcating geographic regions using community detection in commuting networks with significant self-loops, *PLOS ONE* (2020). DOI: 10.1371/journal.pone.0230941

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