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Using Geographically Weighted Regression to Explore the Relationship between Homicide and Suicide in the United States

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Homicide and suicide are the twin pillars of intentional unnatural death, yet the relationship between them remains unclear. Prior research has shown positive, negative, and null relationships between suicide and homicide depending on the study area, spatial support, and time period. However, most of these studies used non-spatial statistics to analyze the data, ignoring the potential influence of non-stationarity. This paper analyzes the spatially varying relationship between suicide and homicide in the United States (1999-2019) at the county level by using geographically weighted regression (GWR).

An initial exploratory OLS model indicates no significant linear relationship between suicide and homicide in this dataset. However, the GWR model returned moderately strong results (R^2=.708). By allowing the relationship between variables to fluctuate across space, GWR reveals new clues to regional patterns of violence.

Suicide and homicide have the strongest relationships (R^2>.600) in the northeast and eastern states, especially in the Great Plains. However, the form of these relationships varies. In the Mountain West, Appalachia, and upper New England, the relationship is positive. High suicide rates predict high homicide rates. This supports the idea of violent places, and suggests suicide and homicide should be studied together as two parts of a whole. In contrast, negative relationships dominate central California and most of the eastern half of the US, supporting previous literature on the "opposite but equal" nature of suicide and homicide. These results can be used to dig deeper into the causes of violent behavior, which are notoriously difficult to model spatially.

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