Quantifying Census Tract Level COVID-19 Vulnerability and Risk Using Computational Methods

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The COVID-19 pandemic has had a major impact on people across the world. In the United States, the initial shortage of pandemic response supplies such as PPE, COVID-19 test kits, and ventilators led to a large number of deaths. This research aims to identify the most vulnerable US communities based on the COVID-19 so the distribution of limited resources can be prioritized to improve the effectiveness of pandemic response and reduce the number of cases and deaths. Data was scraped from the Centers for Disease Control's (CDC) COVID-19 Public Use Dataset, United States Census Bureau - Census 2010 Tract Demographic Data, United States Census Bureau - Census 2010 County Demographic Data, and Johns Hopkins University - COVID-19 Case and Death Data. A computational model was developed using Python to determine the COVID-19 death risk of all demographic groups at the Census 2010 Tract level. A map illustrating the COVID-19 risk for each tract was published with ArcGIS Online. The model was tested on Census 2010 County data and the prediction was compared with CDC's actual COVID-19 case and death data. The results show that the model is about 86% accurate nationwide, demonstrating that the model is a viable option for use by state and local health authorities when creating plans to distribute critical medical supplies. ArcGIS Pro was used to publish maps for high risk tracts, high risk counties, predicted death rate and the accuracy of the prediction.

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