Report

"Analysis Report: Spatial Patterns of Very Healthy People in Manchester"

Project Scope

The main focus of this report is on the distribution and clustering of "very good health" percentages across different places in Manchester for the study of health patterns in space. The main goals are to look at how health measures are spread out in space, find important groups of high or low health percentages, and get ideas for how local governments can help fix health disparities. The main dataset, "manchester\_data\_very," has health and demographic data for Manchester at a local spatial resolution. Moran's I is used for spatial correlations, DBSCAN is used for clustering (but fails), and Quadrat Analysis is used for point pattern distribution. However, there are some problems, such as possible biases in the data collection and the limited spatial detail that is available. As part of the methods, spatial data is changed into forms that can be used, like centroids. Moran's I is used to test spatial autocorrelation, and Quadrat Analysis is used to test point pattern distribution.

Reading and Transforming Data

The main dataset was brought into R, and the data were read to make it work with current spatial tools. The dataset was then turned into a sf object. To make spatial grouping and adjacency analysis easier, polygons' centers were found. Importing data with st\_read and turning it into a sf object with "st\_as\_sf" were two of the change steps. Then, "st\_centroid" was used to find the center of each circle, and "st\_coordinates" was used to get the coordinates of these centers into a data frame for further processing.

Wrangling Data

Data wrangling combined demographic and spatial geometries to include all necessary factors in one dataset. We chose density and geometry columns to narrow the research. This ensured the dataset was clean and suitable for the study.

Preparing Data for Analysis

To ensure space accuracy and compatibility with different methods, the data was checked and structured before analysis. To conduct autocorrelation studies, the coordinates were converted to a data frame and the dataset's integrity checked. Quadrat Analysis uses a grid framework to evaluate spatial distribution patterns.

Analysis

To determine health indicator distribution, this study uses three spatial methods. DBSCAN clustering was used to find groups with high very good health rates. Too many points made it difficult to set the eps and minPts parameters to meaningful amounts, so the method failed. We may need to try different clustering methods or get more data. Second, Moran's I autocorrelation examined health percentage changes over time. It found significant groups of high health percentages in central and southern Manchester and low health percentages in the city's edges. Third, Quadrat Analysis was used to see if the numbers of people who were in very good health were spread out in a random, regular, or clustered way. By splitting the study area into a grid of quadrats, the analysis showed that the data was not spread out randomly. There were clear clustering patterns that supported Moran's I results.

Outputs

The Local Moran's I map shows patterns of spatial autocorrelation, showing high-health clusters in the center and southern areas and low-health clusters in the edges. In addition to showing how the health percentages are spread out in space, the Quadrat Analysis result also shows clear clustering in the middle areas and some randomness in the edges, which supports Moran's I.

Conclusions

The study shows that health percentages are not spread out evenly across Manchester. There are large groups of places with high and low health measures. DBSCAN failed because of problems with data density and parameter tuning. Moran's I confirmed patterns of spatial autocorrelation, and Quadrat Analysis showed patterns of non-random distribution. But limits, like low data resolution, need to be thought about. To fix health disparities, policymakers should focus on low-health clusters on the edges of cities. To make the study more precise and accurate, socio-economic and environmental factors should be added. This all-around method will give us useful information for making sure that everyone in Manchester has the same health outcomes.