Modelling the Impacts of COVID-19 on Cities' Evolution by using Crowd-Sourced Data

An analysis of OpenStreetMap

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Goal and Purpose
Key objectives

- Quantifying the undergoing changes of cities over time and determine the impact that COVID-19 crisis brought to them

- Modelling the relationship between the cities' evolution and associated geo-demographic factors before and after the outbreak of the pandemic

- Analysing how the impacts varied across different geography

- Predict the trend of future activities within cities to provide insights to city dwellers and urban planers to stay resilient under potential crisis
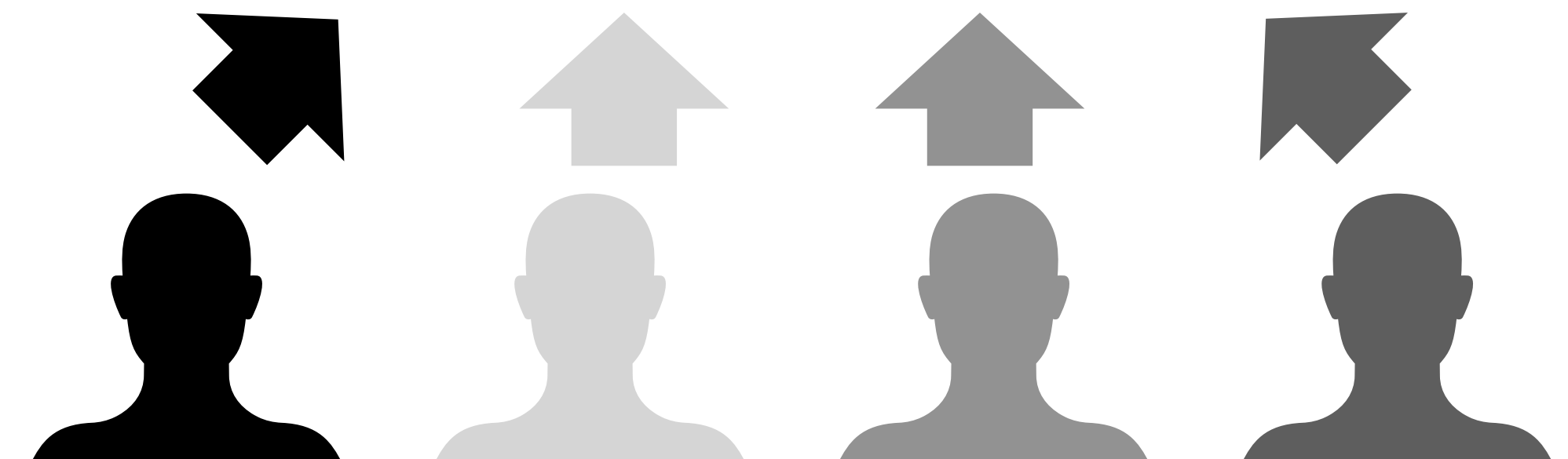
Data

OpenStreetMap

- Provides entire edit history of every point-of-interest (POI) within cities

- Contributed by city dwellers to reflect the timely and accurate changes happening around the cities

- Previous studies has ensured its accuracy, coverage and completeness within European Cities
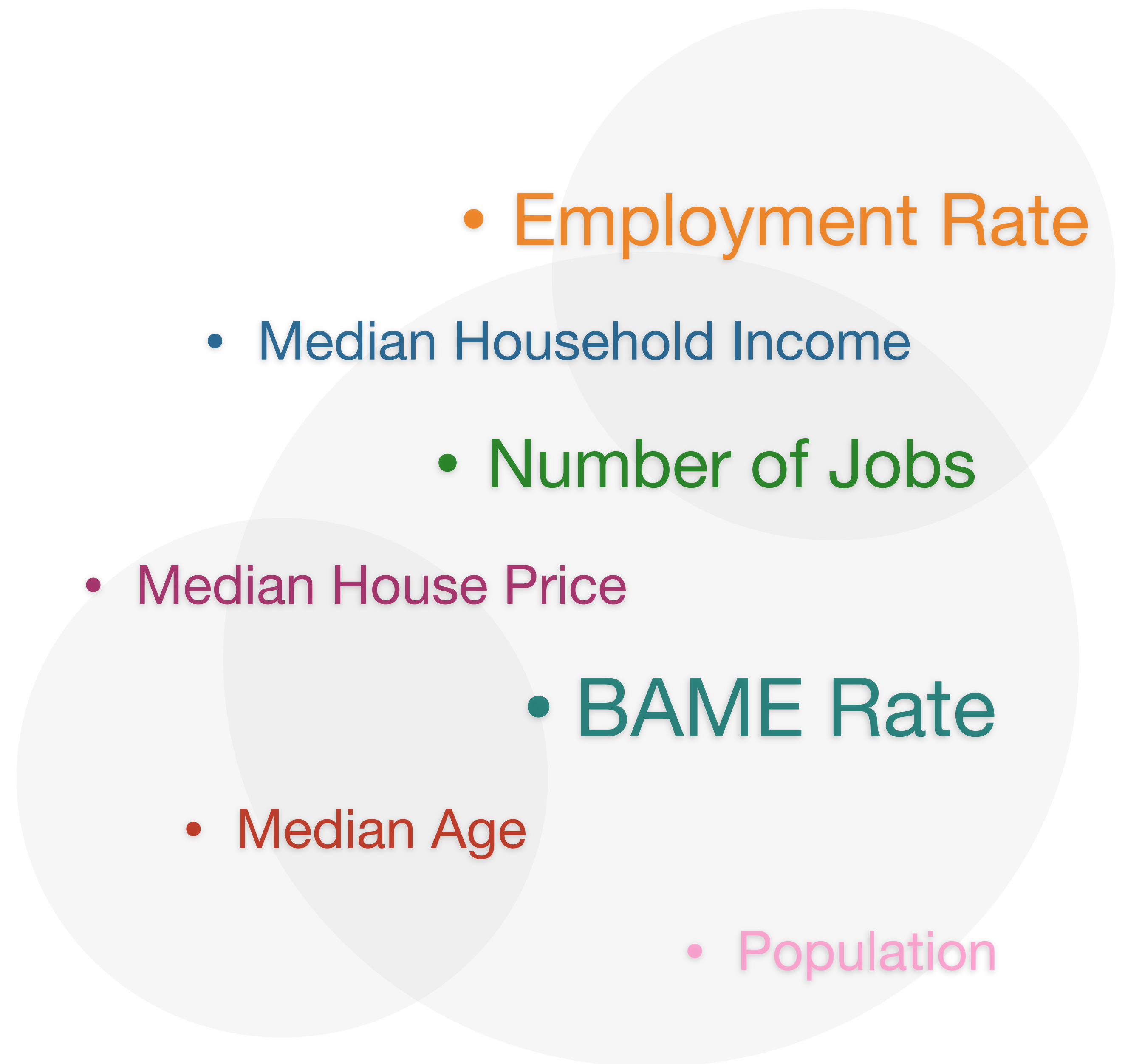

OpenStreetMap
The Free Wiki World Map

Data
Census and IMD

- Measures little part of cities through different lenses

- Provides information about the economic situation as well as associated social-demographic factors of the city at a granular level

- Employment Rate

- Median Household Income

- Number of Jobs

- Median House Price

- BAME Rate

- Median Age

- Population

Data
Transformation and Normalisation

id	Version	TS	Lat	Lon	amenity
8715968899	1	2021-05-09 23:14:56+00:00	51.550761	-0.135600	public_bookcase
4084848391	2	2021-05-09 22:33:59+00:00	51.442328	0.003322	car_wash
8715684127	1	2021-05-09 22:33:59+00:00	51.442595	0.003546	cafe
685605310	2	2021-05-09 22:20:15+00:00	51.465670	-0.010825	pub
8715844301	1	2021-05-09 22:18:54+00:00	51.499988	-0.315300	taxi

Classify
- **New Openings**
- **Closure**
- **Updates**

Transform

Group

Normalise

Acquire

OpenStreetMap
The Free Wiki World Map
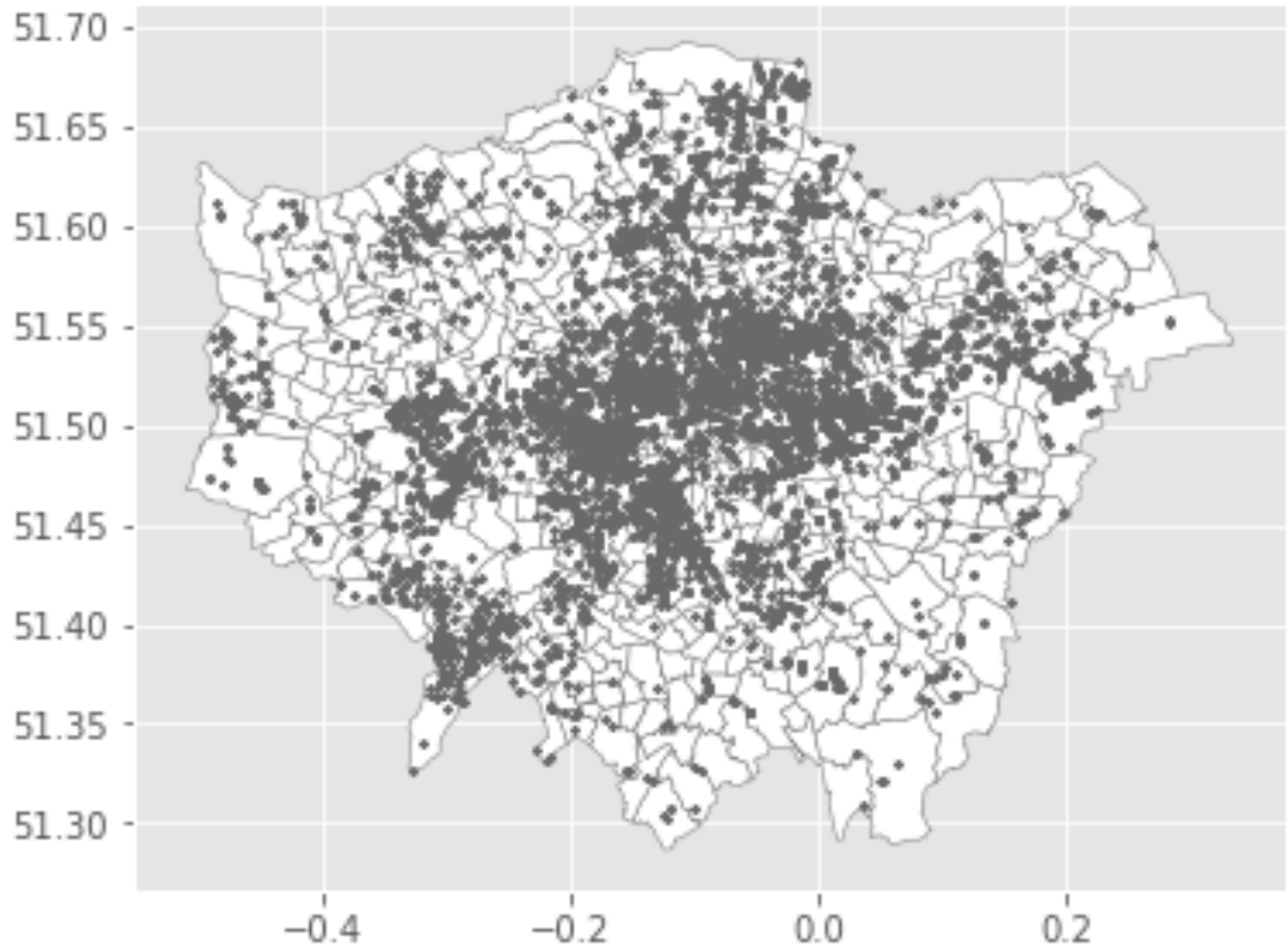
Analysis
Evaluation Metrics
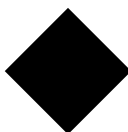
Pre-Covid
2019/04/01 - 2020/03/31

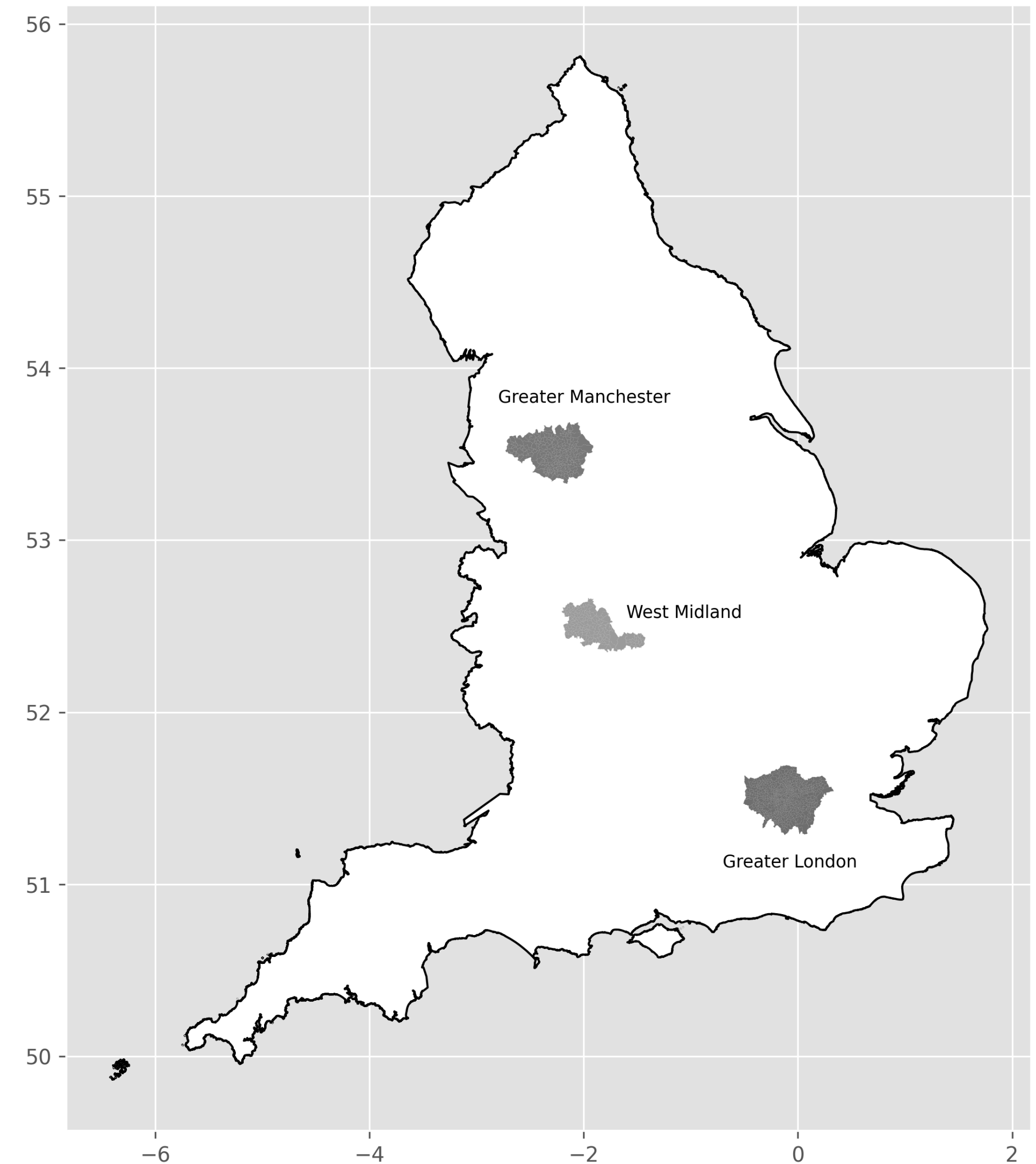◆ **Cut-Off Date**
2020/04/01
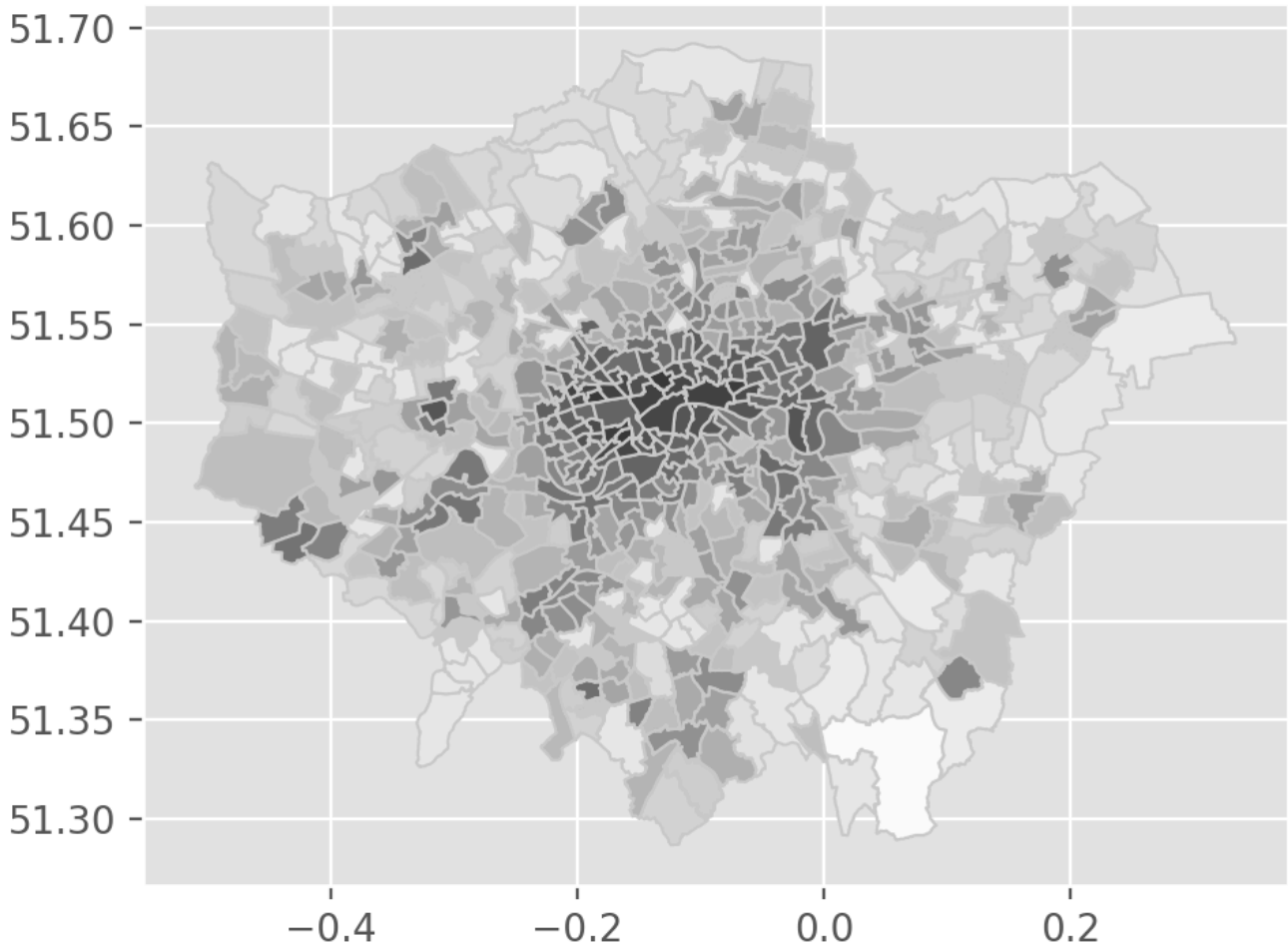
Post-Covid
2020/04/01 - 2021/03/31

Analysis
Area Under Study

- The COVID-19 crisis impacted the cities in various extends

- The dominating factors in their relationships with the cities' developments differed across the geography during different time periods
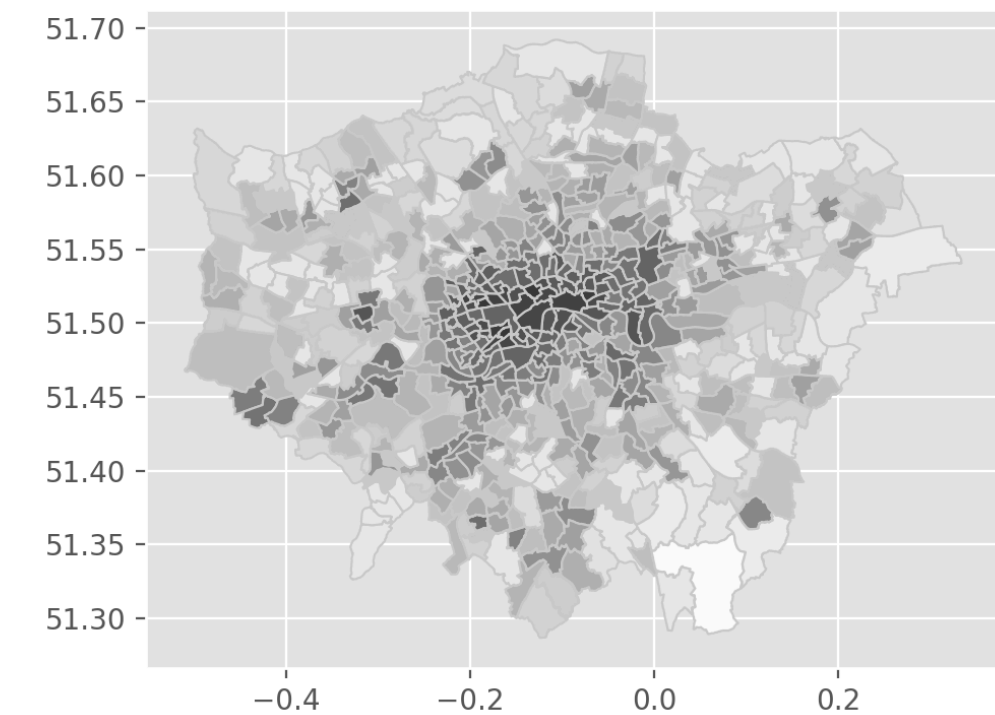
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Analysis
Trends and Geo-demographic Factors

- The new business tends to spread into the **suburbs** that surrounds the city centre after the outbreak of COVID-19

- The new business tends to clustered within the areas that **young** people gathered

- Amount of adjustment to business has **increased by 30%** since the outbreak of the pandemic

Pre-Covid

Post-Covid

Predictions
Statistical Modelling

- Multiple Regression Model

- Cellular Automata Model

- Artificial Neural Network