1. COVID-19 Vaccination Data:

* Primary source: HSE's COVID-19 Open Data Hub
* Link: <https://covid-19.geohive.ie/pages/vaccinations>
* Note: You may need to request historical data through their data request form

1. Healthcare Location Data:

A. Pharmacy Locations:

* PSI (Pharmaceutical Society of Ireland) Register
* Link: <http://www.thepsi.ie/gns/registration/public-registers/retail-pharmacy-businesses.aspx>
* Alternative: HSE's list of participating vaccination pharmacies Link: <https://www2.hse.ie/services/covid-19-vaccination-centres/>

B. GP Practice Locations:

* Primary source: HSE's GP Finder
* Link: <https://www2.hse.ie/services/find-a-gp/>
* Alternative: Medical Council of Ireland's register Link: <https://www.medicalcouncil.ie/public-information/check-the-register/>

1. Administrative Boundaries:

A. LEA (Local Electoral Area) Boundaries:

* Source: OSi (Ordnance Survey Ireland) Administrative Boundaries
* Link: <https://data.gov.ie/dataset/local-electoral-areas-2019>
* Format: Available in multiple formats including shapefile and GeoJSON

B. Additional Boundary Data:

* Central Statistics Office (CSO) Small Area Population Statistics (SAPS)
* Link: <https://data.cso.ie/>
* Includes: Population data, demographic information, and administrative boundaries

1. Supporting Datasets:

A. Population Data:

* CSO Census Data
* Link: <https://data.cso.ie/>
* Latest available census data with demographic breakdowns by LEA

B. NUTS Regions:

* Eurostat NUTS Classification
* Link: <https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/nuts>

Data Processing Tips:

1. The CSO provides most spatial data in Irish Grid (TM65) or ITM projection systems
2. You'll likely need to reproject some datasets to WGS84 (EPSG:4326) for web mapping
3. Some datasets might require an account creation or email registration to download

Additional Resources for Data:

1. All-Island Research Observatory (AIRO):

* Link: <http://airo.maynoothuniversity.ie/>
* Provides mapped census data and other spatial datasets

1. OpenData.ie:

* Link: <https://data.gov.ie/>
* Ireland's open data portal with various governmental datasets

1. OpenStreetMap Ireland:

* Link: <https://www.openstreetmap.ie/>
* Good for supplementary healthcare location data

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[Understanding the spatial heterogeneity of COVID-19 vaccination uptake in England | BMC Public Health | Full Text](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-023-15801-w)

***Geographically weighted regression - ?***

Mixed effects models can certainly be used in spatial epidemiology, but there are several specialized spatial models that might be more appropriate depending on your specific research questions. Let me break this down:

Mixed Effects Models in Spatial Epidemiology:

1. Useful when you have:

- Clear hierarchical spatial structures (e.g., individuals nested within neighborhoods within cities)

- Need to account for spatial clustering

- Want to control for both individual and area-level factors

**However, specialized spatial models often provide better alternatives:**

1. Spatial Autoregressive Models (SAR):

- Account for spatial dependence in the response variable

- Better for modeling disease spread patterns

- Handle neighborhood effects explicitly

2. Conditional Autoregressive Models (CAR):

- Popular in disease mapping

- Account for spatial correlation between neighboring areas

- Good for small area estimation problems

3. Bayesian Hierarchical Spatial Models:

- Combine spatial correlation with hierarchical structure

- Handle uncertainty better

- Particularly useful for rare diseases or small counts

4. Spatial Point Process Models:

- Better when exact locations are available

- Can model disease clusters and spatial intensity

- Useful for outbreak detection

The choice depends on:

1. Your spatial data structure (points vs. areas)

2. Scale of analysis

3. Research questions

4. Disease characteristics (rare vs. common, infectious vs. non-infectious)

Clustering at what level?

Do we analyze the accessibility and impact on vaccination rates too?

Proximity to single centers

Visual – vaccination take up rates with electoral areas

Compositional Data Analysis – Age groups within each electoral or neighborhood group that we are looking at.

How is compositional data different from clustered data? - [jds-17-1-1710.pdf](file:///C:\Users\Sivagami%20Nedumaran\Downloads\jds-17-1-1710.pdf)

To Do:

Fix the graph and read about compositional data analysis for regression