
Mapping census data – approaches and issues

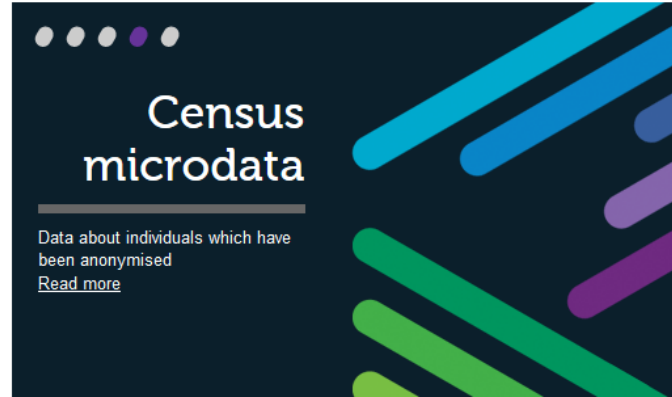
James Crone
Edinburgh University / UK Data Service

An Introduction to Geographical Data
Visualisation

JISC Manchester
Thursday 16th May 2019



Census data available through UKDS



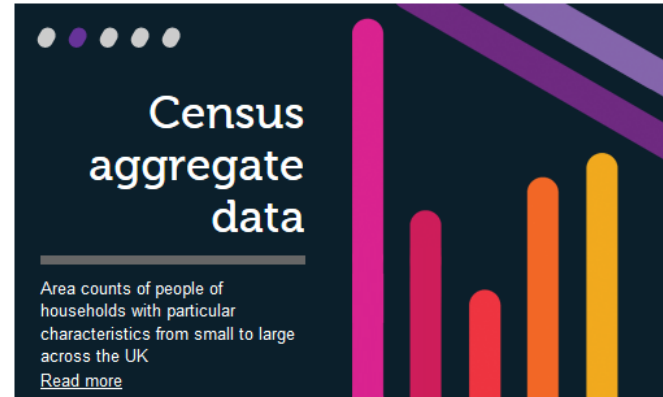
Four small circles in a row, with the fourth one highlighted in purple.

Census microdata

Data about individuals which have been anonymised

[Read more](#)

Decorative background with diagonal bars in cyan, blue, green, and purple.



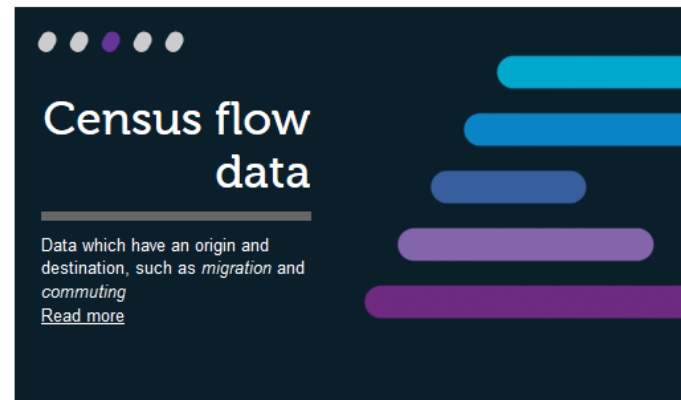
Four small circles in a row, with the first one highlighted in purple.

Census aggregate data

Area counts of people of households with particular characteristics from small to large across the UK

[Read more](#)

Decorative background with a bar chart showing bars of varying heights in pink, red, orange, and yellow, with diagonal bars in purple and blue.



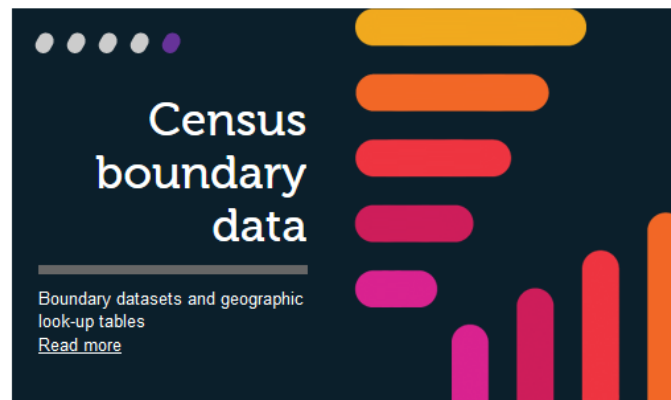
Four small circles in a row, with the second one highlighted in purple.

Census flow data

Data which have an origin and destination, such as *migration* and *commuting*

[Read more](#)

Decorative background with horizontal bars of varying lengths in cyan, blue, purple, and magenta.



Four small circles in a row, with the third one highlighted in purple.

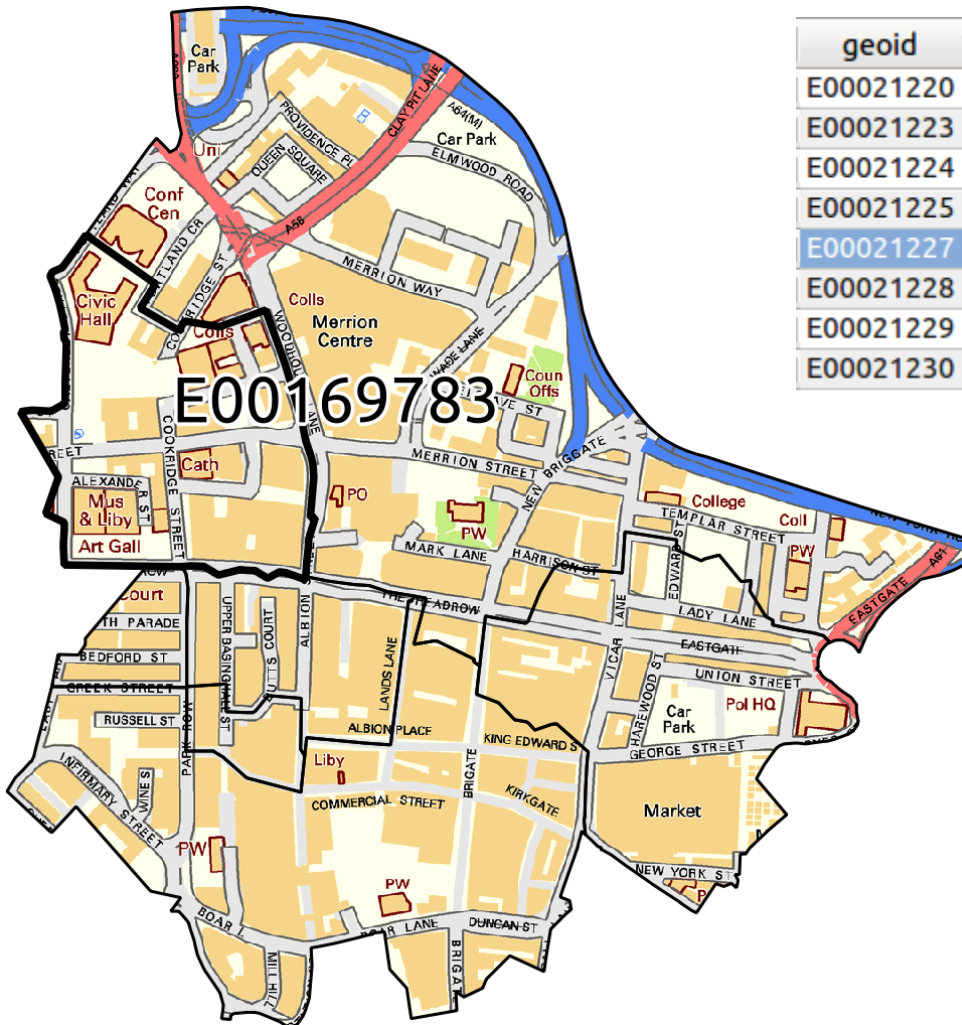
Census boundary data

Boundary datasets and geographic look-up tables

[Read more](#)

Decorative background with horizontal bars of varying lengths in yellow, orange, red, and pink, with vertical bars at the bottom in pink, red, and orange.

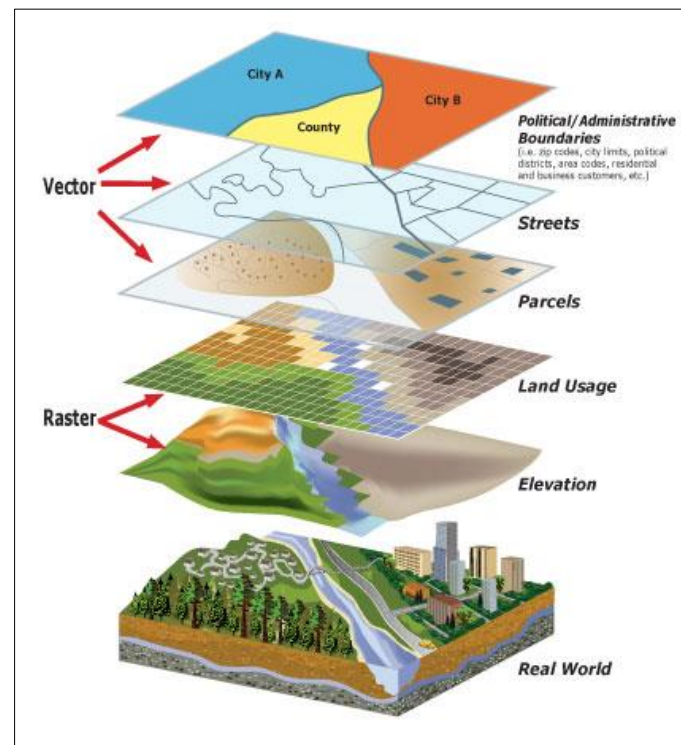
(Small Area) Census aggregate data



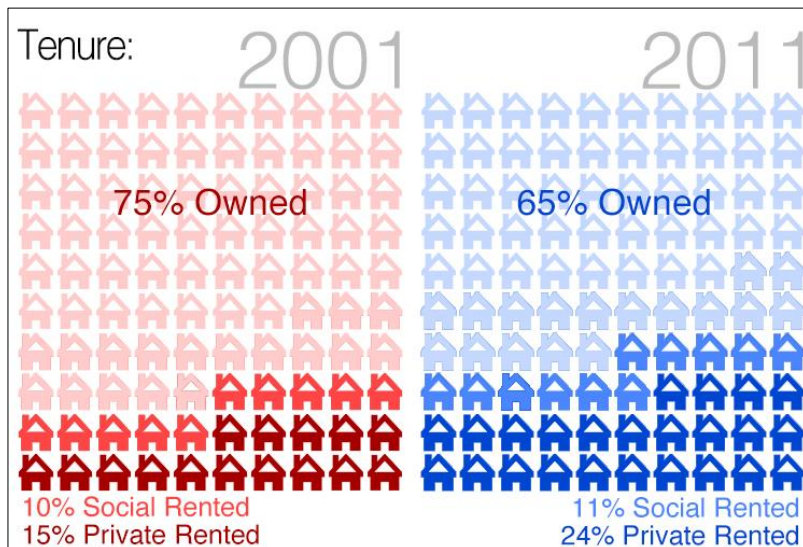
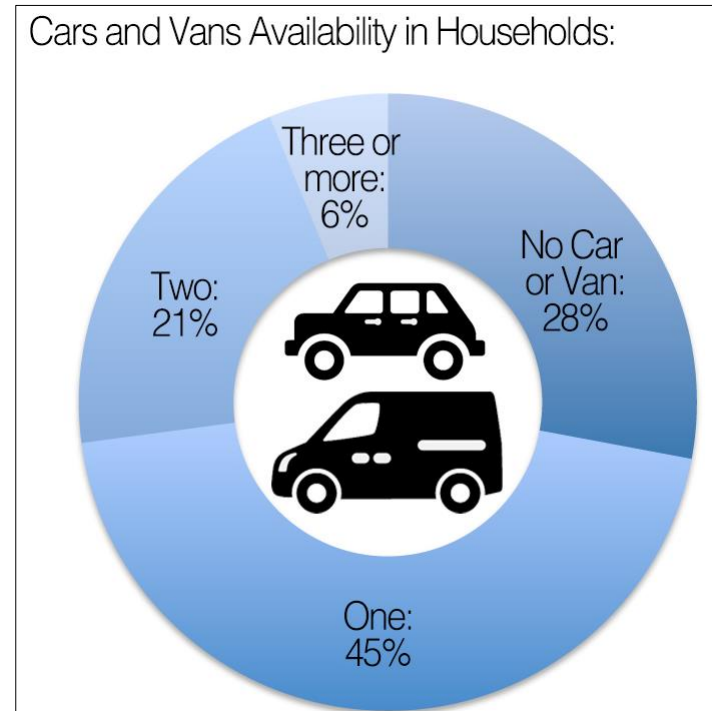
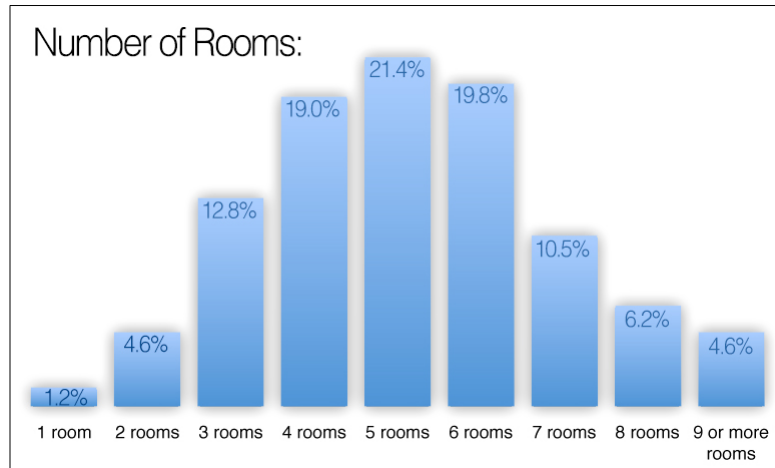
geoid	totpop	m	f
E00021220	348	173	175
E00021223	388	221	167
E00021224	409	227	182
E00021225	292	153	139
E00021227	269	124	145
E00021228	359	172	187
E00021229	309	151	158
E00021230	248	124	124

Geospatial Data / GIS

- GIS is a system designed to capture, store, manipulate, analyse, manage and present geospatial data.
- Geospatial data models some aspect of the real world whether that be the natural, built or socio-economic world
- Raster data models the world as a continuous grid of equally sized cells
- Vector data models the world as point; line or polygon features.
- Mostly when we are dealing with census data we are dealing with vector data although raster data can be used e.g. for population surfaces.

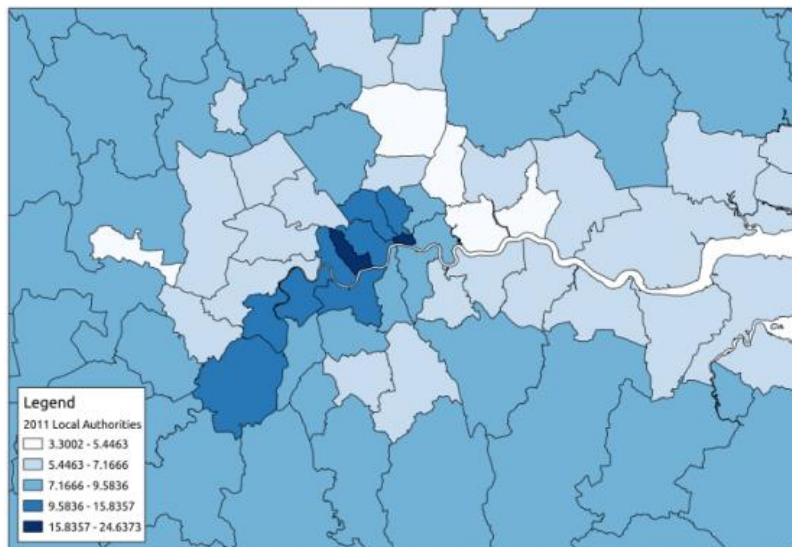


Visualising census data

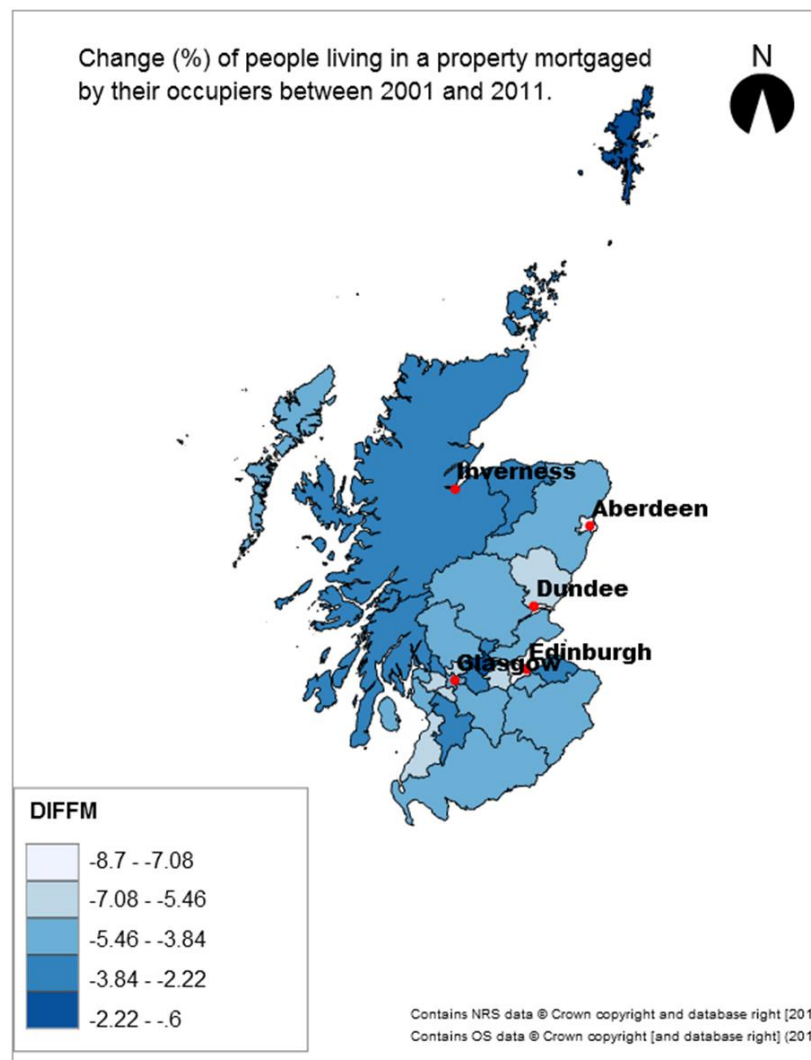


Mapping census data as a Choropleth map

- A thematic map in which areas are shaded or patterned in proportion to the measurement of the statistical variable being displayed on the map.
- Choropleth maps provide an easy way to visualize how a measurement varies across a geographic area or to show the level of variability within a region.



% of people working > 49hrs per week as recorded in the 2011 census



Pick census variable and output Geography

- Small area aggregate census data is available, output at different levels of geography:

Country

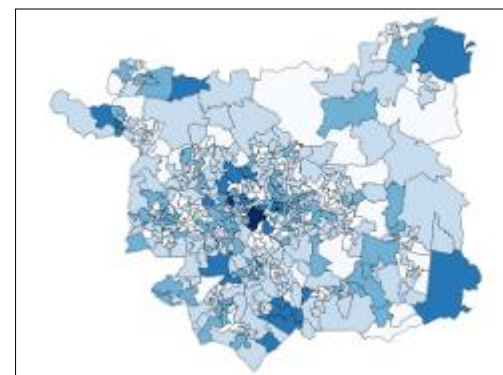
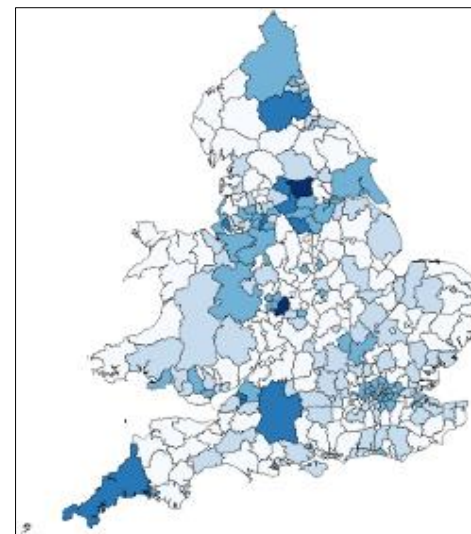
Local Authority

MSOA

LSOA

OA

- Due to disclosure control, some small area aggregate census data is only available at certain levels of geography. Data at Local Authority level may not be available at OA level.
- Where Data is available at different levels of geography, different patterns might be shown depending on the level of geography selected.

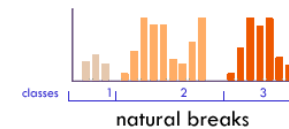
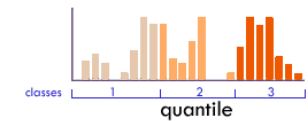
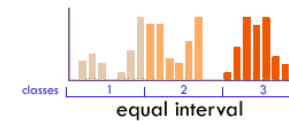
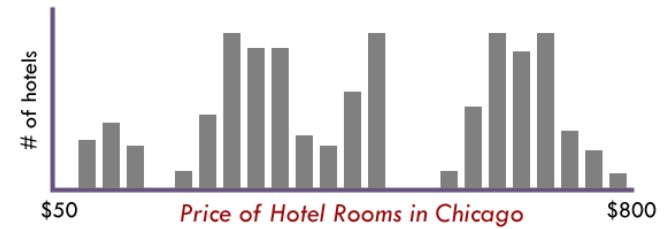


Prepare data for mapping

- When constructing a choropleth map from polygonal census boundaries which are usually of different sizes, displaying raw counts of census variables should be avoided.
- Instead the census variables being displayed should be normalized.
- Option 1 – Normalize the census variable being mapped by dividing it by the total geographic area. This expresses the variable as a density.
- Option 2 – Normalize the census variable being mapped by dividing it by the total population size (people or households) in that area.

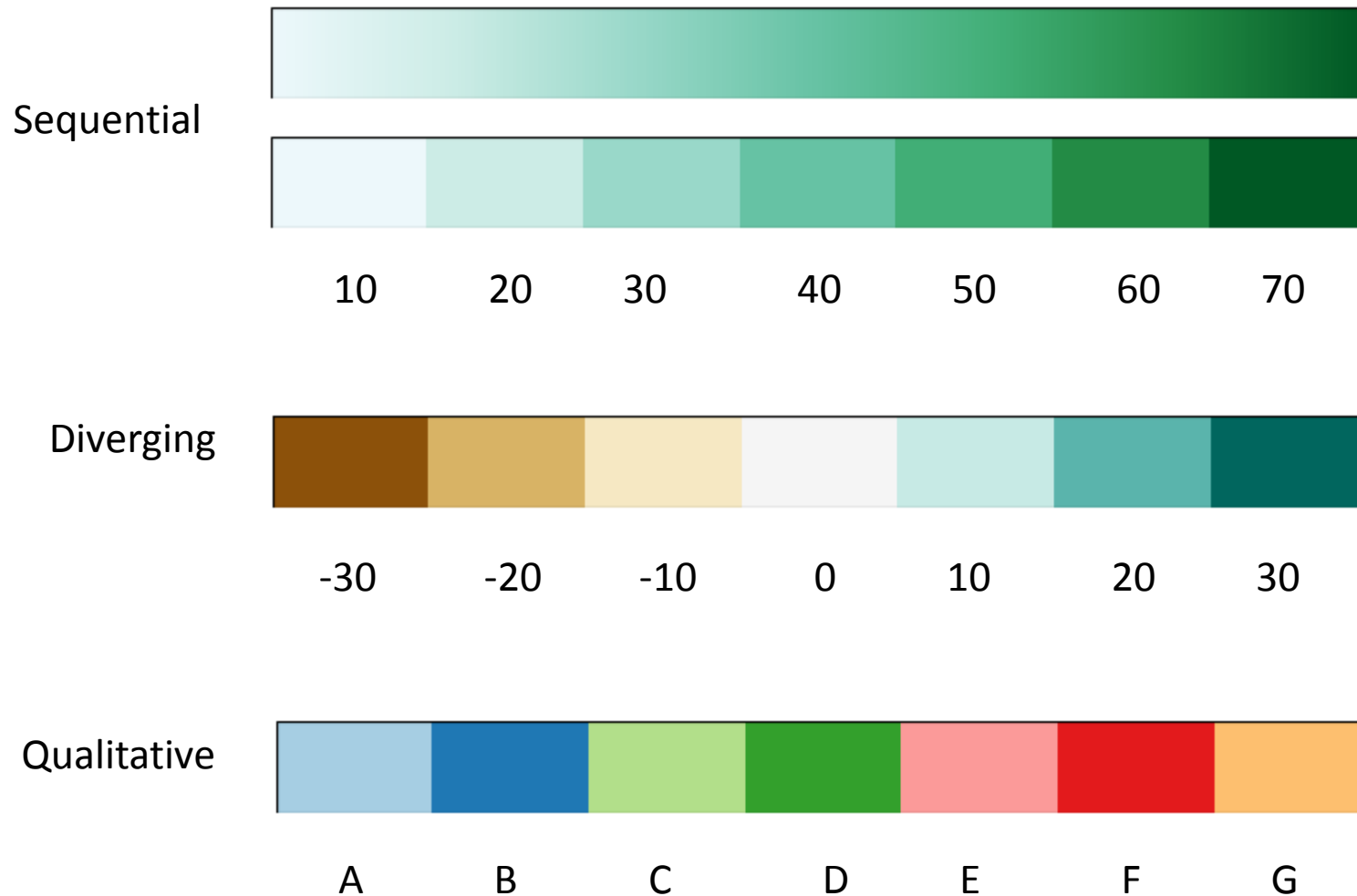
Statistical Classification

- Classification takes a large number of observations and groups them into a smaller number of data ranges or classes.
- This makes it easier to spot patterns and understand the data compared with looking at all the variance of the data at once.
- Different classification methods are available. Some of these include:
 - Equal Interval
 - Quantile
 - Natural Breaks
 - Manual
- No classification method is right or wrong. Choice of classification method should be based on the characteristics of the data.



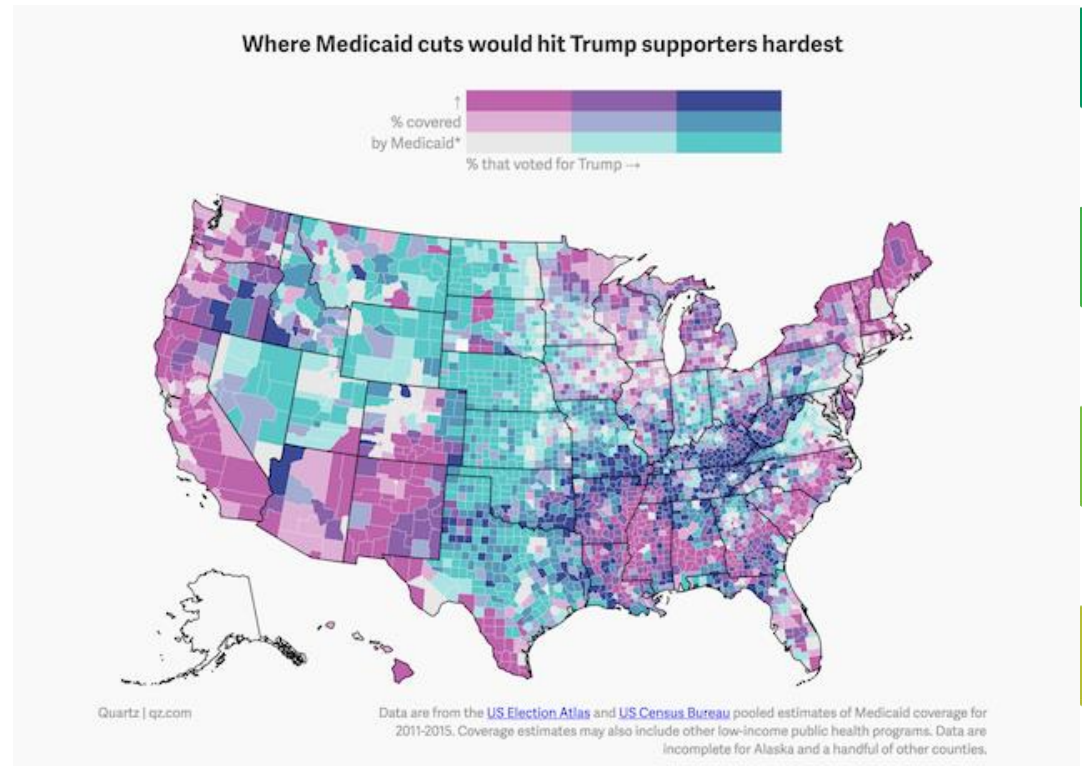
Data Value	Class
3	3 to 20
4	3 to 20
5	3 to 20
18	3 to 20
20	3 to 20
22	21 to 38
30	21 to 38
32	21 to 38
39	39 to 56
53	39 to 56
57	57 to 74
60	57 to 74
61	57 to 74
62	57 to 74
64	57 to 74
64	57 to 74
67	57 to 74
77	75 +
81	75 +
91	75 +
93	75 +

Style the map by applying a colour ramp to classes



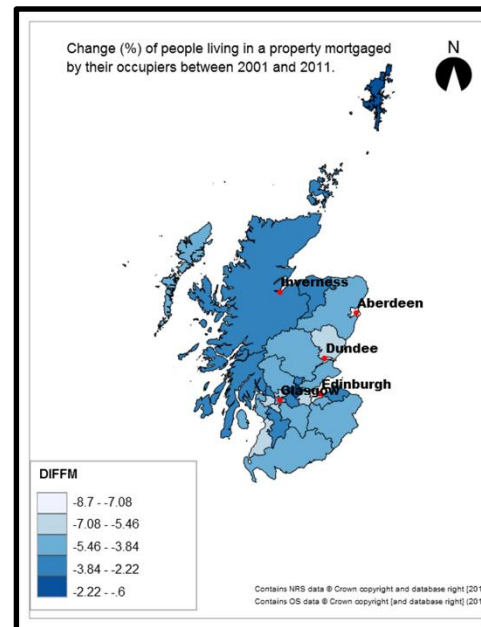
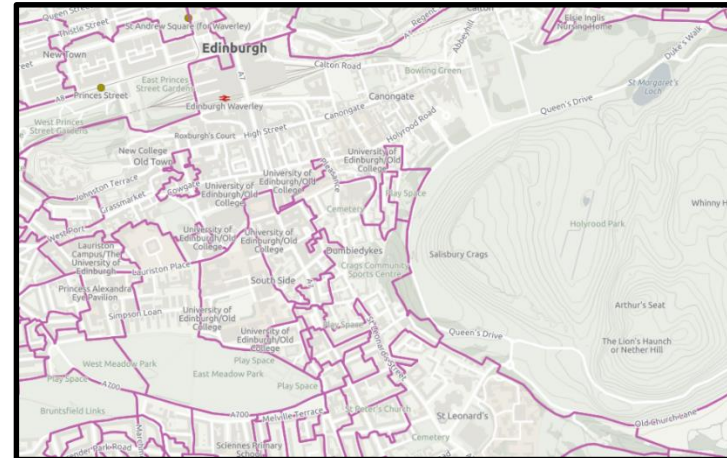
Bivariate Choropleth Maps

- Most Choropleth maps only display a single variable
- A Bivariate Choropleth map combines data from 2 variables at the same time
- Here we can see in a single map BOTH where the vote and access to healthcare was high or low or a mix of the 2 variables.



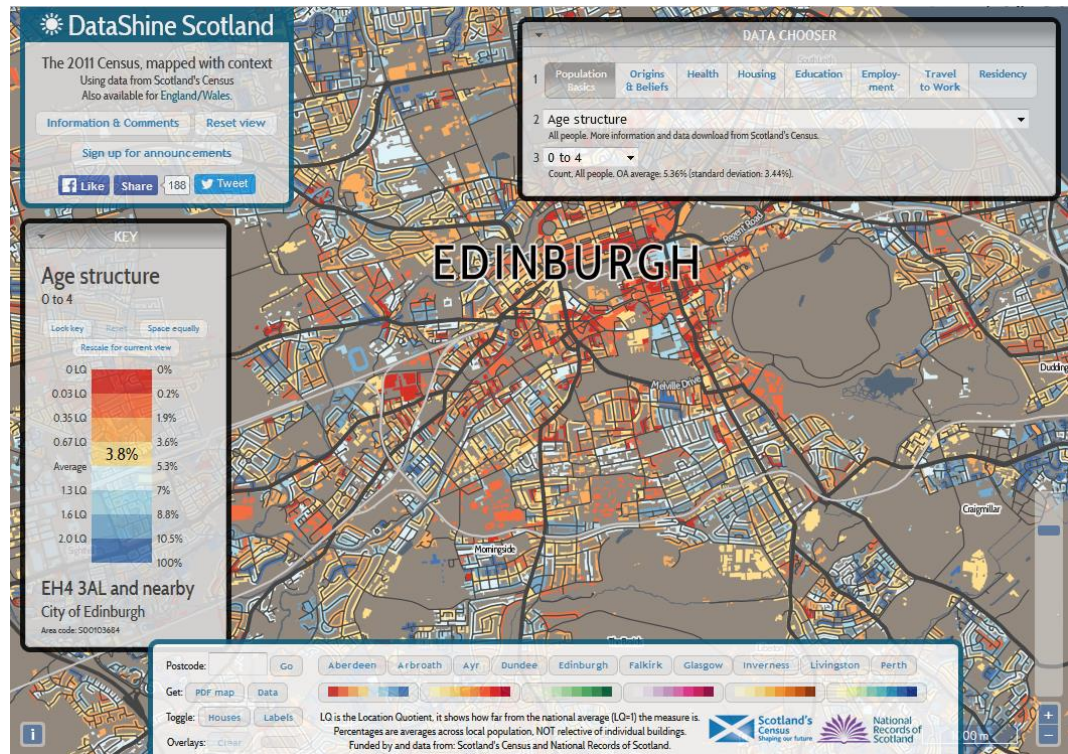
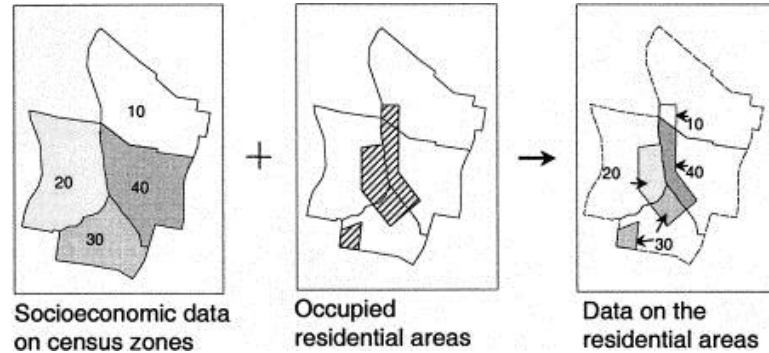
Two limitations of Choropleth Maps

- Choropleth maps imply that the population is distributed uniformly across the extent of the polygon (census zone).
- Small polygons are often hidden by larger areas.
- Alternatives to Choropleth Maps?



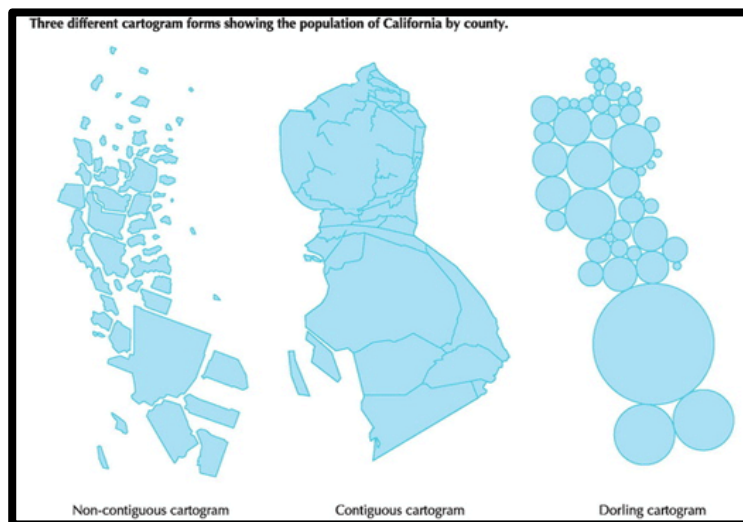
Dasymetric Maps

- Modify existing Choropleth map using additional geospatial data such as residential areas or buildings
- DataShine is a form of Dasymetric map in that area based census data has been redistributed to building features within each census area.
- This helps with the problem of the choropleth implying that population is uniformly distributed across polygons



Cartograms

- In a Cartogram, the polygon geometry is distorted or reshaped according to the variable being mapped (rather than being shaped according to the land area of the geography being shown)



- This helps with the problem of small areas being hidden by larger areas.

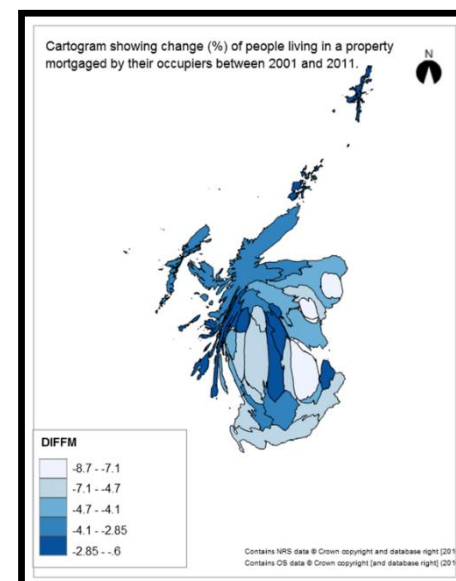
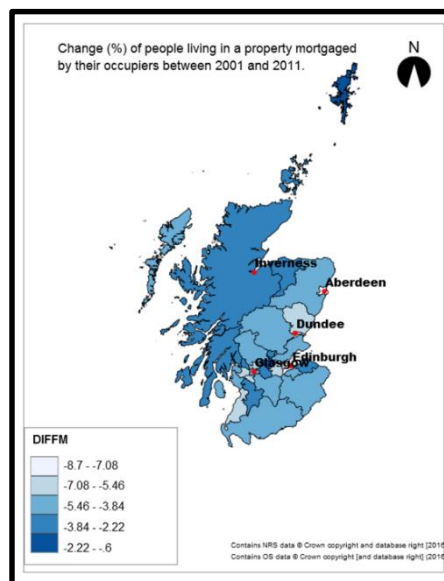
- Cartograms are a form of map projection

- Types of Cartogram:

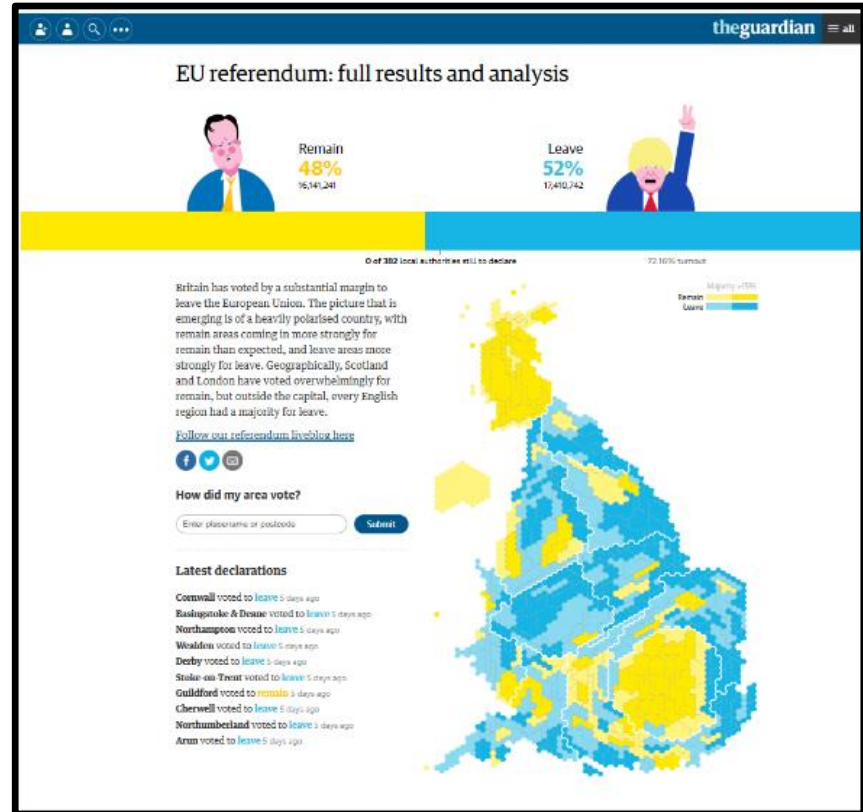
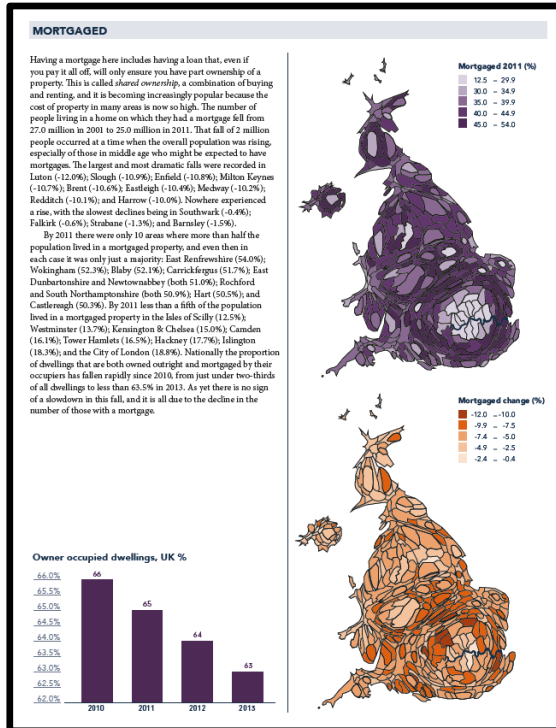
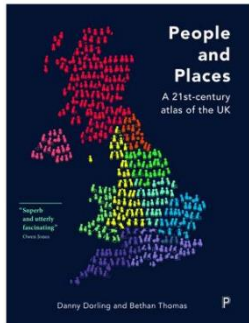
Non-contiguous Cartograms

Contiguous Cartograms

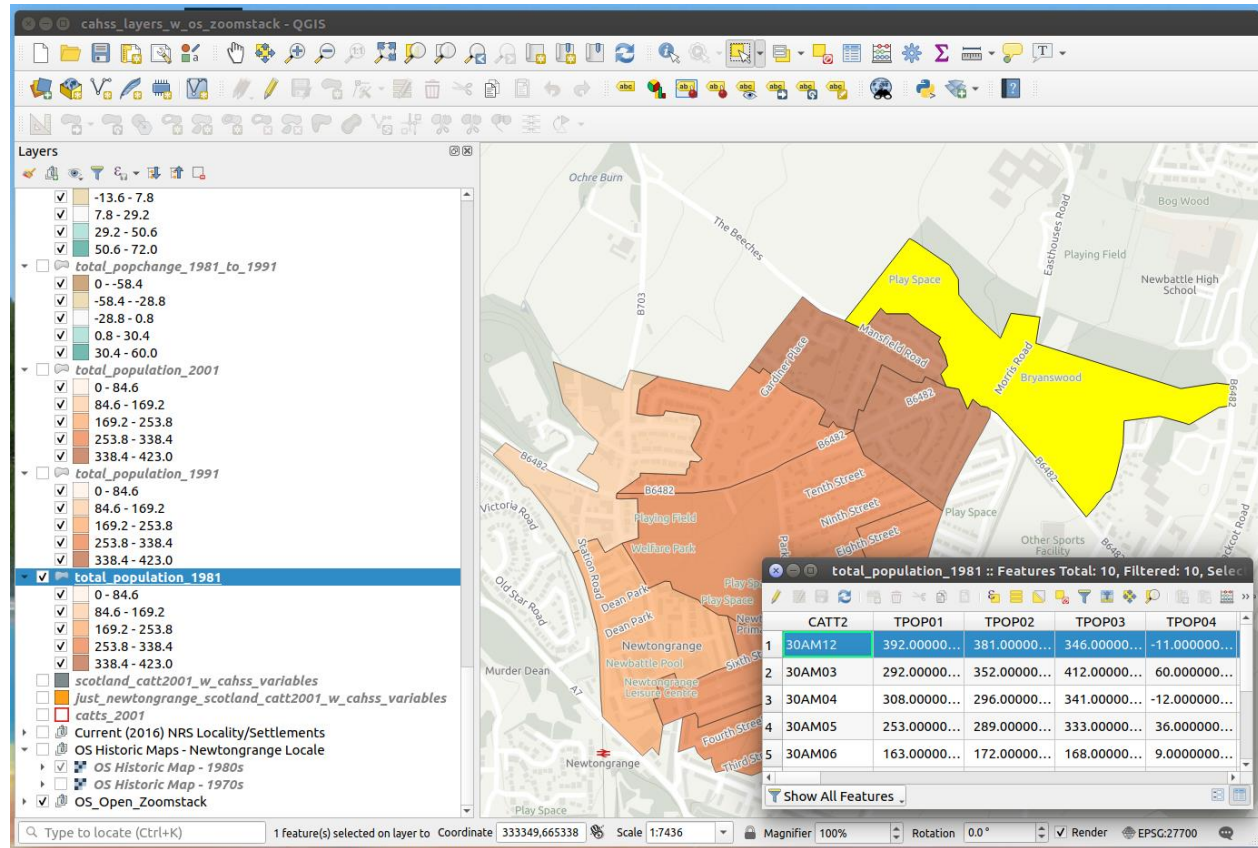
Dorling Cartograms



Use of Cartograms



QGIS Desktop GIS Application

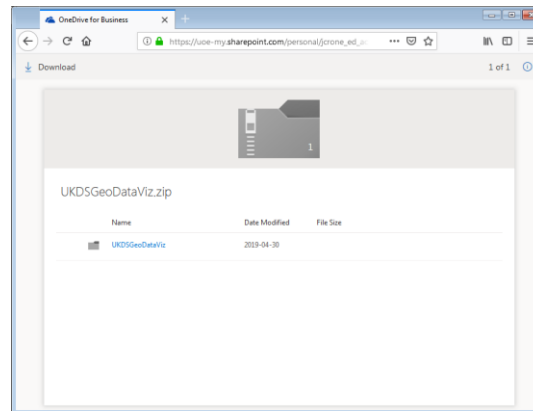


<https://www.qgis.org>

Use QGIS to map data Exercises

- Use QGIS to:
 - Exercise 1: Create a Choropleth map
 - Exercise 2: Create a Bivariate Choropleth map
 - Exercise 3: Create a Contiguous Cartogram
- Exercise 2 and 3 require additional data to be downloaded, go to:

<https://bit.ly/2VE9bem>



and download the **UKDSGeoDataViz.zip** file to your working folder.

- Unzip the contents of the UKDSGeoDataViz.zip file
- Start with Exercise 1. If / when you finish Exercise 1, take a look at Exercise 2 or 3 (or both!)
- If you get stuck / have questions put your hand up