

Effective maps in official statistics

Guidance for producers

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Maps

Thematic maps are a powerful way of visualising geographical variation in official statistics. Before you start mapping, think about whether a map is the right tool for displaying your data. Maps are there to reveal geographical patterns. Success depends on the input data, the geographical areas that are relevant to your message and the level of granularity that you require.

Choropleth maps

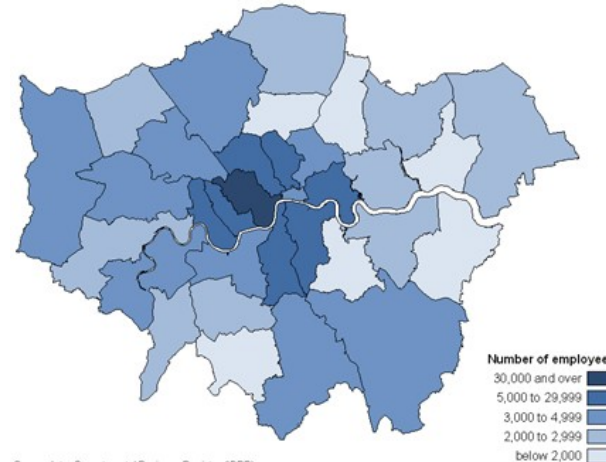
Choropleth maps are the most common type of statistical map and the “go to” option in most cases. Statistics are linked to predefined geographical areas and values are represented by shading those areas in different colours.

Choropleth maps are appropriate for:

- Data that follow geographical boundaries.
- Continuous or categorical data.
- Standardised rates, percentages or densities, rather than counts or totals. Counts usually increase with area size, which can overstate their importance.

Number of employees in SMEs, London, 2012

Accommodation and Food Service Activities only



Source: Inter Departmental Business Register (IDBR)

Contains Ordnance Survey data © Crown copyright and database right 2013

The level of geographical aggregation may impact on the message because aggregation can smooth out differences. The position of boundaries can also affect the message (a property that is abused in ‘gerrymandering’).

- Try the map at different levels of geographical aggregation to assess the impact on the patterns you see.
- Check that you have enough data for your chosen geographical breakdown - ensure that patterns are not just noise.

- Use appropriate measures. For example, if the distribution within each area is skewed, use the median rather than the mean for averages.
- Explore other demographic data at your chosen geographic level to check how this may affect the patterns seen. For example, a map of cancer incidence may look very different once rates have been age-adjusted.
- Qualify your conclusions. Be clear about the geographical level used and the limitations associated with this. This flags to users that different trends may appear at other levels of aggregation.



Maps

Categorising the values

How many categories?

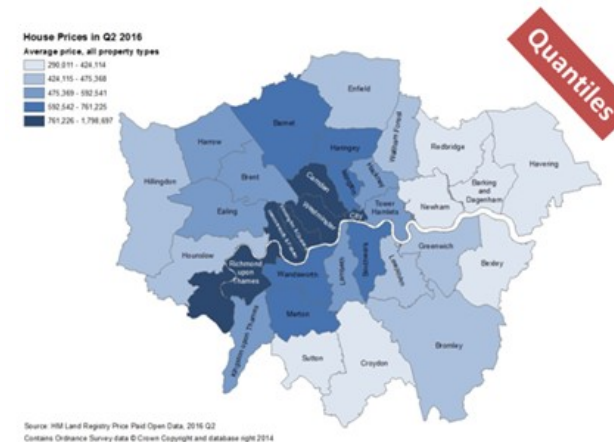
Aim to group your values into no more than six non-overlapping categories. It may be difficult to distinguish between colours if there are more.

Where should the breaks be?

This depends on the distribution of your data. Examine the distribution and consider the patterns you see and what works best to convey the important messages in your data.

Equal intervals divide the data into equal class sizes. Use it with normally distributed data, or to highlight the differences between a small number of areas and the rest. It is not very effective for representing skewed data.

Quantiles assign an equal number of observations per class. This produces a more balanced map for non-uniformly distributed data and works well in most cases. However, categories may have very different ranges and different values may be grouped together. Check that tied values are assigned to the same category.



Natural breaks minimise within-class difference and maximise variation between classes. Results are usually good, but be aware that class intervals are unlikely to be consistent across a series of maps.

Standard deviation measures distance from the mean. It is best used with data that are normally distributed, although the median and suitable quantiles can be used to build a more robust alternative.

Manual adjustments can make intervals more intuitive – but consider the impact on comparability across a series of maps. You might also consider inserting breaks at key target value, to show areas that fall above or below them.

How to deal with outliers?

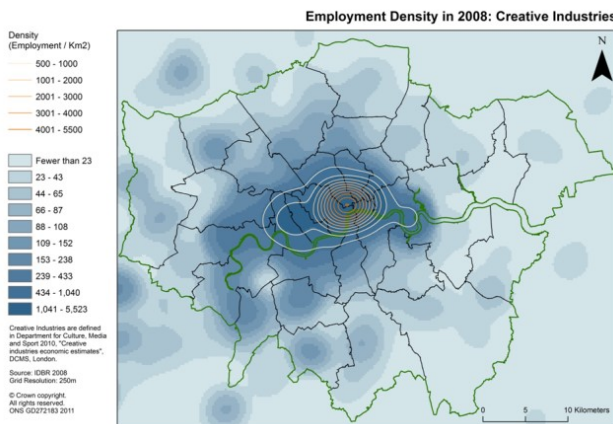
If they are important, outliers should be highlighted in a unique category. If they are simply noise, they can be hidden by widening a range.

Maps

There are other, more specialised mapping options. Here are three common ones.

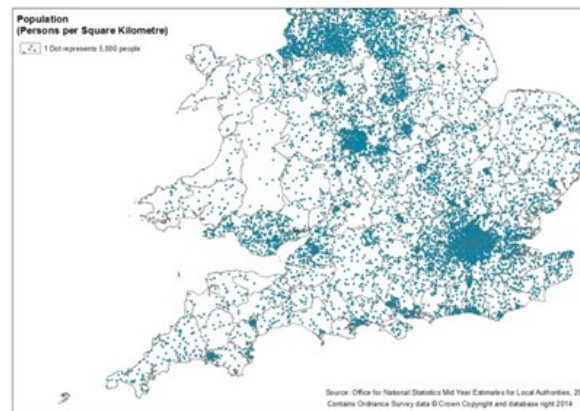
Isolines and grid shading

These maps are designed for visualising measures which vary continuously across space like density, temperature, or rainfall. They are normally based on a surface model built from point measures. They use lines of equal value (“isolines”) or equally sized shaded grid cells to visualise density. The two techniques are sometimes combined to enhance clarity.



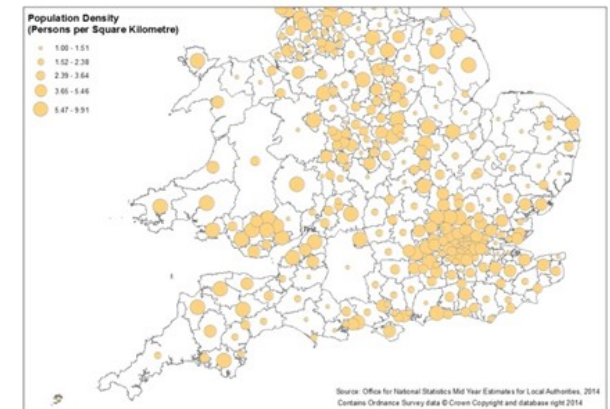
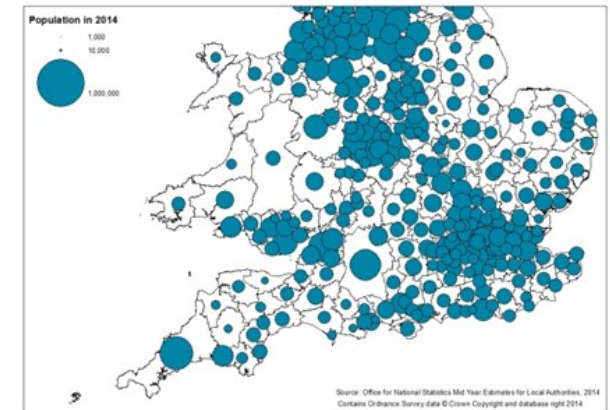
Dot maps

Dot maps can provide a quick visual impression of the density of observations in space. Each dot represents a fixed number of events. Getting this right requires careful experimentation. The size, positioning and number of dots can give very different impressions.



Proportional symbol maps

Here, symbols are placed in each area on the map (or at given data points) and sized according to the variable of interest. A variant (the second map on the right) is the graduated symbol map, where a fixed set of symbols depict the data classes.



Most readers find it hard to compare the relative sizes of proportional symbols, especially circles. Careful legend design can help, but a choropleth map or cartogram is a safer way to convey varying magnitude if your data are area-based.

Maps

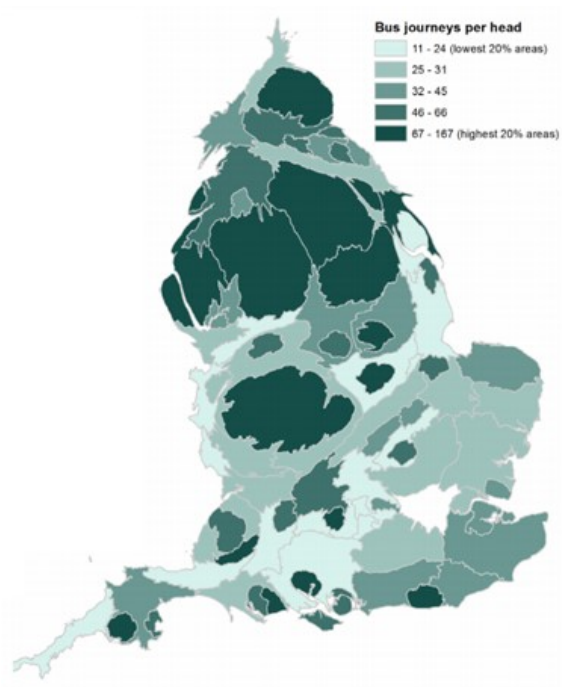
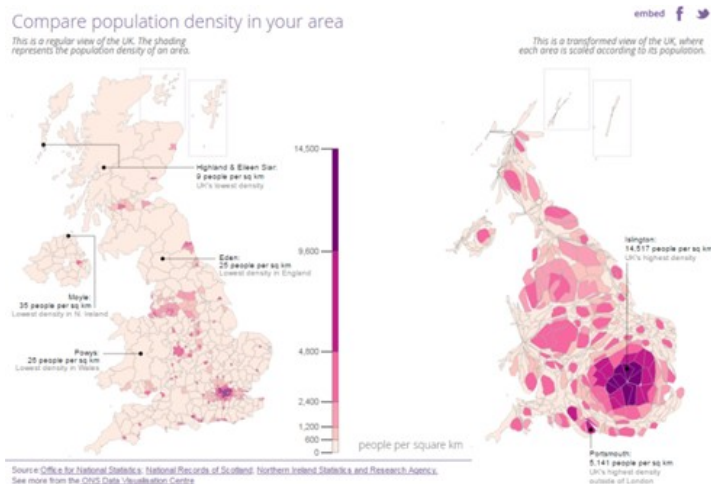
Cartograms

Cartograms distort map geometry to convey a specific message about the data. They can be very effective, especially if displayed interactively alongside a standard map, but are less familiar than other types and will require some supporting explanation.

- Areas on cartograms will not be recognisable by their shape. If they need to be identifiable, use labels.
- A standard choropleth map should normally be displayed for reference alongside the cartogram in a static display.

Area cartograms (where the size of an area is proportional to its value) are useful for highlighting contextual information, particularly in small areas. However they cannot display areas with zero, negative, or missing values. The cartogram below showing bus journeys per head across the country is scaled by the number of journeys in each area. This gives a sense of the overall impact for the whole country.

Equal area cartograms use equally sized units to represent areas. They are useful when areas are very different in size but the land area is irrelevant to the message. Larger areas dominate regular choropleth maps. Equal area cartograms solve this problem, but it is harder to identify specific areas. Appropriate labels may be needed.



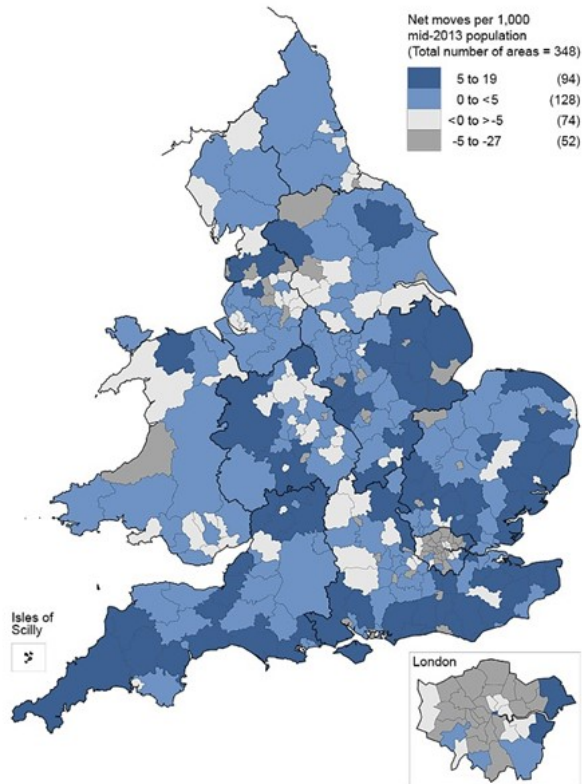
Degree level qualification (%)



Hexagon boundaries kindly supplied by Benjamin Hennig, Oxford University. See more from ONS Digital.

Maps

Net internal migration moves for local authorities in England and Wales, year ending June 2014



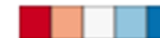
Source: Office for National Statistics licensed under the Open Government Licence v.3.0.
Contains OS data © Crown copyright and database right 2015

Colour on maps

Use a single colour with dark shades for high values and lighter shades for lower values.



Use a diverging colour scale if the purpose is to show deviation from a value, such as a national average.



If there is no natural order to categories, use a different hue for each.



Avoid white as a foreground colour except to represent 0, “no data” or the centre of a diverging scheme.

Check that colours are distinct when viewing on the intended display (see **Colour** section).

Map projections

Map projections affect the size and shape of areas. Maps for printing should use the British National Grid projection and you should also use it when calculating densities or areas.

Legend

Use appropriately rounded numbers.

Show the number of areas contained within each category or include a bar chart or frequency distribution with the key. This is particularly helpful when large areas dominate.

Insets

Use an inset to distinguish small areas, or to highlight details for a particular region or provide context. Insets for Greater London are common, for example.

Labels

Include meaningful titles, footnotes, source statements and annotation, as with tables and graphs. Aim for your map to be self-contained. Include a copyright statement when required, e.g. if the map is based on Ordnance Survey information.