New maps show how neighbourhood deprivation in England can be visualised to avoid misrepresentation

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In September of this year, the latest neighbourhood deprivation statistics were released by The Ministry of Housing, Communities and Local Government. Widely reported by the [BBC](https://www.bbc.co.uk/news/uk-england-49812519), and [The Guardian](https://www.theguardian.com/society/2019/sep/26/wealthy-incomers-changing-profile-of-londons-most-deprived-areas), amongst others, the figures revealed the most deprived areas in England using data from around 33,000 neighbourhoods across the country. Findings reignited long-standing debates about the extent of [regional inequality](https://www.theguardian.com/society/2019/sep/26/wealthy-incomers-changing-profile-of-londons-most-deprived-areas) in England, and the [stability](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/835115/IoD2019_Statistical_Release.pdf) of neighbourhood deprivation over time.

A key method which the media and the government has used to communicate these findings has been [maps](https://imd2019.group.shef.ac.uk). It is easy to see why: maps are a visually appealing, accessible and powerful way to convey complex information to the public. However, even the most beautiful maps, using established techniques and geographically accurate data, can introduce some degree of misrepresentation. Irregularly sized areas, and large disparities in the size of areas being visualised, can mislead readers, diverting attention away from important information. In the BBC’s [map](https://www.bbc.co.uk/news/uk-england-49812519) of deprivation across Local Authorities, for instance, sparsely populated rural areas dominate a disproportionately large amount of the visual, with urban areas like London, containing millions of people, rendered almost invisible.

[Recent research](https://osf.io/preprints/socarxiv/t6agd/) has shown that people interpret information inaccurately from maps which suffer from such shortcomings. Instead, alternative visualisation techniques can be used which better convey the underlying data. For instance, [cartograms](https://www.tandfonline.com/doi/full/10.1111/j.1467-8306.2004.09401004.x?casa_token=PCQuJ1wUlkoAAAAA:m8aWeOyHWcKv-iL8T1-bXlcunBnzZV2lkAz3-gYAxUtgRCihbAYOIWz8-HJFvSOO8WP4W25tLA) deliberately distort the raw geographic data by scaling areas according to a specified variable, such as the resident population size. [Dorling cartograms](https://www.arcgis.com/home/item.html?id=b686a7679cb747e9825d1d1bb6b26046) take this one step further, by scaling areas according to a specified variable, but also representing each as uniform shapes, such as circles. Other methods achieve uniformity in both size and shape. [Hexograms](http://gisruk.org/ProceedingsGISRUK2018/GISRUK2018_Contribution_023.pdf) and [geogrids](https://github.com/jbaileyh/geogrid) transform the original boundaries to hexagons or squares, which are equally sized, but still aim to preserve the original topology.

In the case of the recent neighbourhood deprivation data release, these alternative methods are especially useful. This is because the government’s definition of ‘neighbourhood’ is a [Lower Super Output Area](https://www.ons.gov.uk/methodology/geography/ukgeographies/censusgeography). These areas are designed to be uniform by population, containing around 1500 residents. A result of this is that highly deprived neighbourhoods, which tend to be densely populated, are quite small when visualised, making them less visible to readers. By contrast, wealthier suburban areas, which are less densely populated and therefore much larger, dominate maps. Consequently, readers might draw inaccurate conclusions about the level of deprivation in any given area. Using Dorling cartograms, scaled by resident population, and regular hexagonal grids, one can minimise the misrepresentation that might occur when using the original data.

Take the example below of Blackpool, which was [ranked](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/835115/IoD2019_Statistical_Release.pdf) the most deprived Local Authority in England. Around 42% of neighbourhoods in Blackpool are in the top 10% most deprived in England (the ‘first decile’) and yet these areas only make up around 29% of Blackpool in terms of area. Using a dorling cartogram scaled by resident population size, neighbourhoods in the first decile increase to 36% of the map, and the larger, less deprived neighbourhoods (in light blue) have been shrunk accordingly, becoming less dominant. With a regular hexagonal geogrid, the proportion of the map consisting of first decile neighbourhoods mimics the underlying data (42%). Variation in the sizes and shapes of Blackpool neighbourhoods no longer divert attention or mislead readers.

These alternative visuals have a similar impact when mapping out deprivation in Burnley and Hartepool, which were ranked amongst the top most deprived Local Authorities. Both areas are characterised by small, highly concentrated neighbourhoods in the first decile (most deprived), surrounded by much larger, and much wealthier suburbs. At a first glance, with no background knowledge of the local area, and without details on resident population sizes, the pervasiveness of deprivation in these Local Authorities, as interpreted by a casual reader, is likely to be drasically understated. Using the Dorling cartogram, again scaled by population, and the regular geogrids, the picture changes.