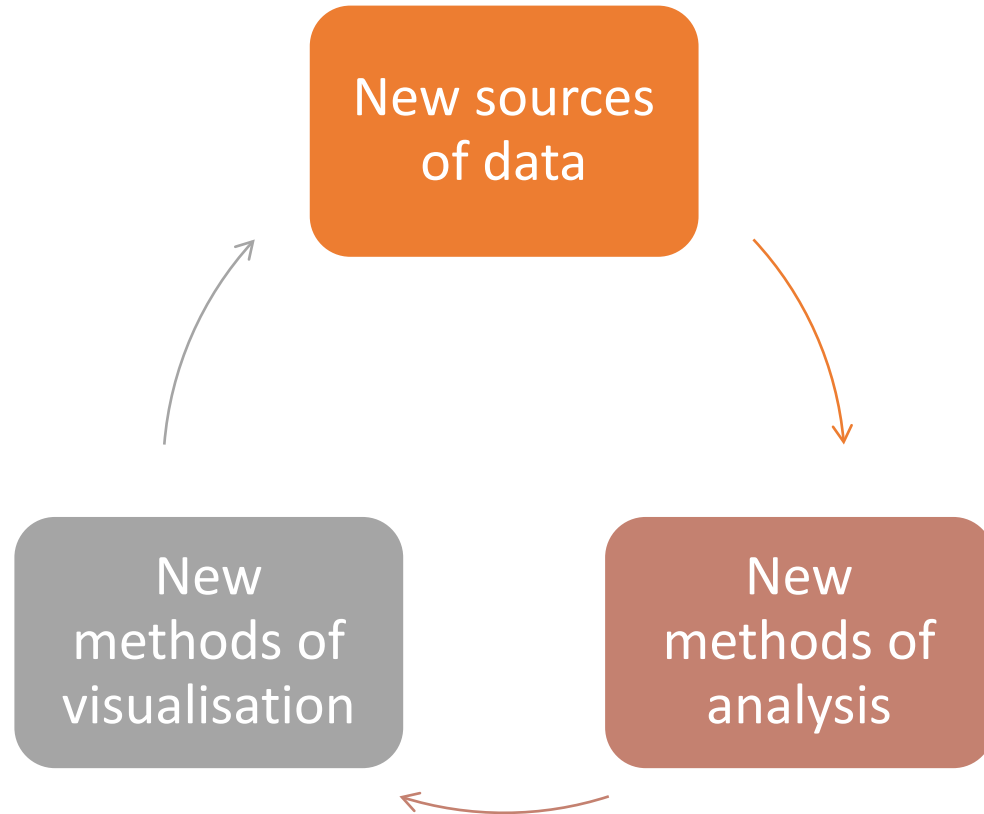# Measuring segregation in schools and other places

Richard Harris,
School of Geographical Sciences,
University of Bristol

See Special issue of Environment and Planning B:
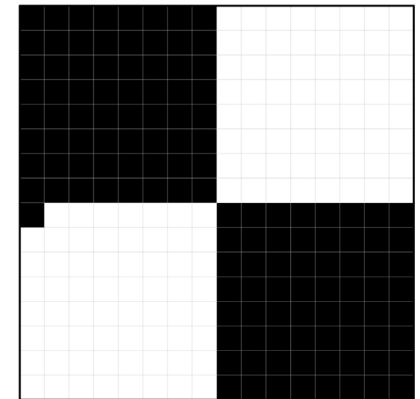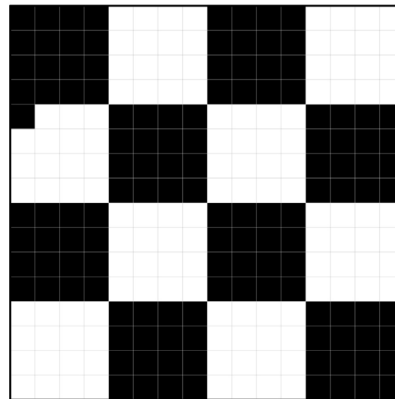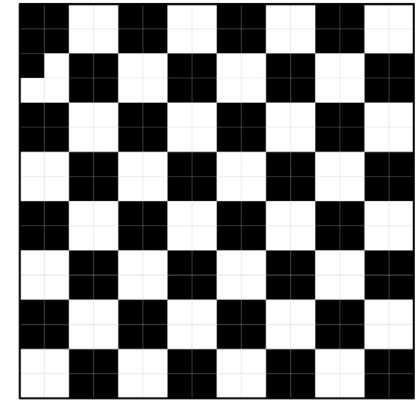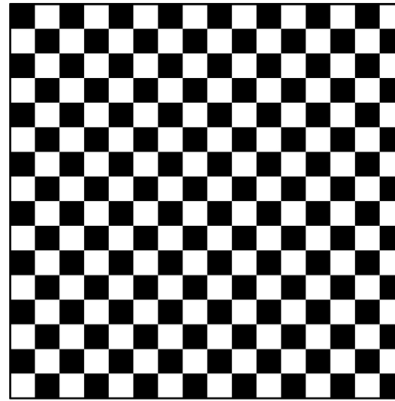Volume 45 Issue 6, November 2018
https://journals.sagepub.com/toc/epbb/45/6

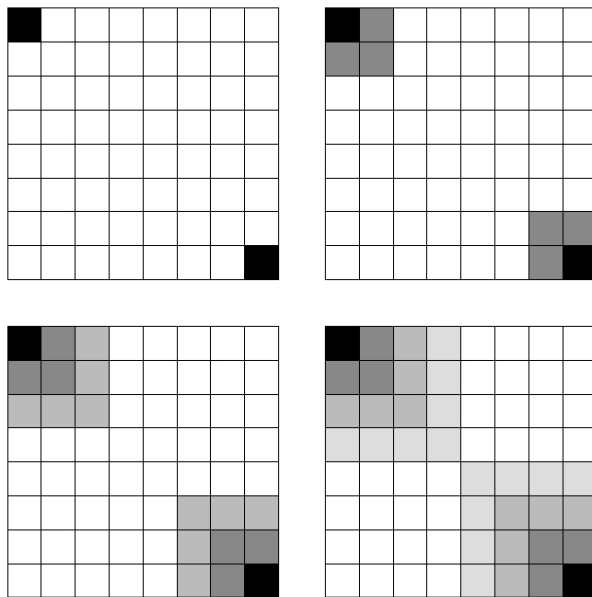# New methods

ESRC Research Methods Festival

Index of Dissimilarity

- Measures spatial unevenness (spatial heterogeneity) and the **numeric scale** of segregation

- But not spatial clustering and the **geographical scale** of segregation

ID =1 in all four cases (the segregation is equal in all cases)

Modelling a process of spatial diffusion with a multilevel index

	TL	TR	BL	BR
ID	1.00	0.875	0.719	0.561
$\sigma_{1 \times 1}$	100%	16.1%	29.5%	22.0%
$\sigma_{2 \times 2}$	0%	83.9%	60.3%	51.4%
$\sigma_{4 \times 4}$	0%	0%	10.2%	26.7%

Two principal dimensions of segregation:
Unevenness and clustering

Overview at UK Data Service Impact & Innovation Lab:
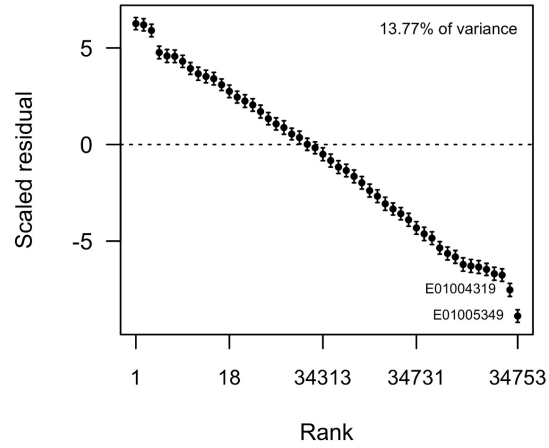http://lab.ukdataservice.ac.uk/2018/10/11/segregation-multilevel-index-of-segregation-to-census-data-in-r/

Implementation

The MLID package for the
open source software, R

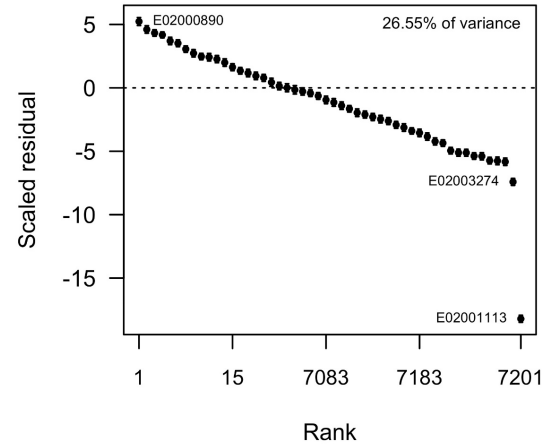# The MLID package for R

```
> model1 <- id(ethnicities,
  c("WhiteBrit","Bangladeshi"),
  levels = c("LSOA", "MSOA",
  "LAD", "RGN"))

> ci <- confint(model1)

> catplot(ci)
```
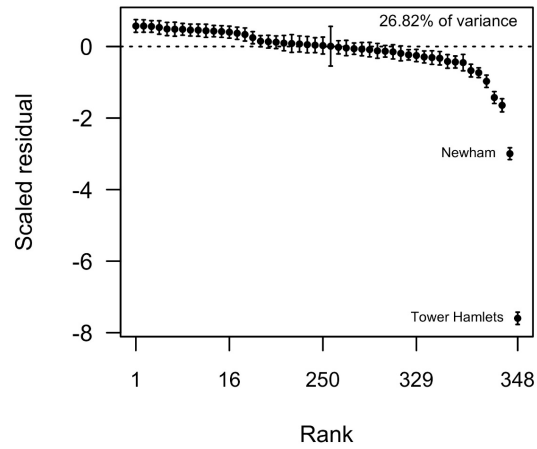
LSOA

13.77% of variance

E01004319

E01005349

Rank

1   18   34313   34731   34753

Scaled residual

MSOA

26.55% of variance

E02000890

E02003274

E02001113

Rank

1   15   7083   7183   7201

Scaled residual

LAD

26.82% of variance

Newham

Tower Hamlets

Rank

1   16   250   329   348

Scaled residual

RGN

4.38% of variance

London

Rank

1   3   5   7   10

Scaled residual
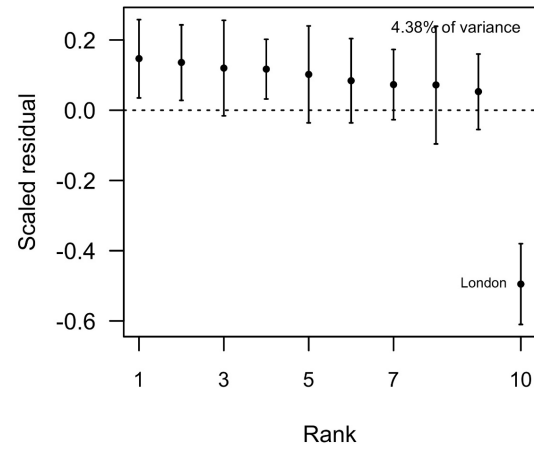
New Data

ESRC Research Methods Festival

https://www.ncrm.ac.uk/RMF2018/programme/session.php?id=E4
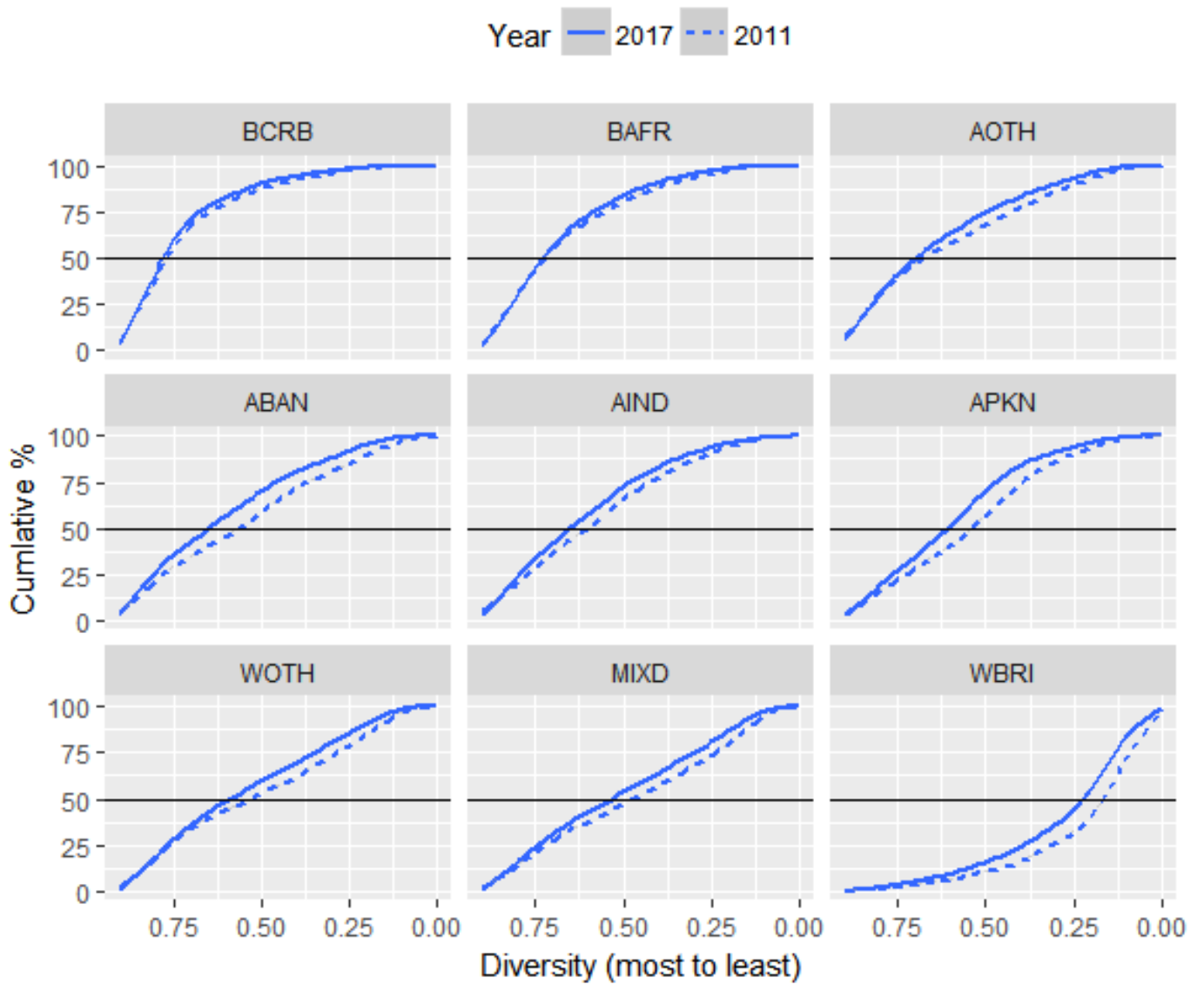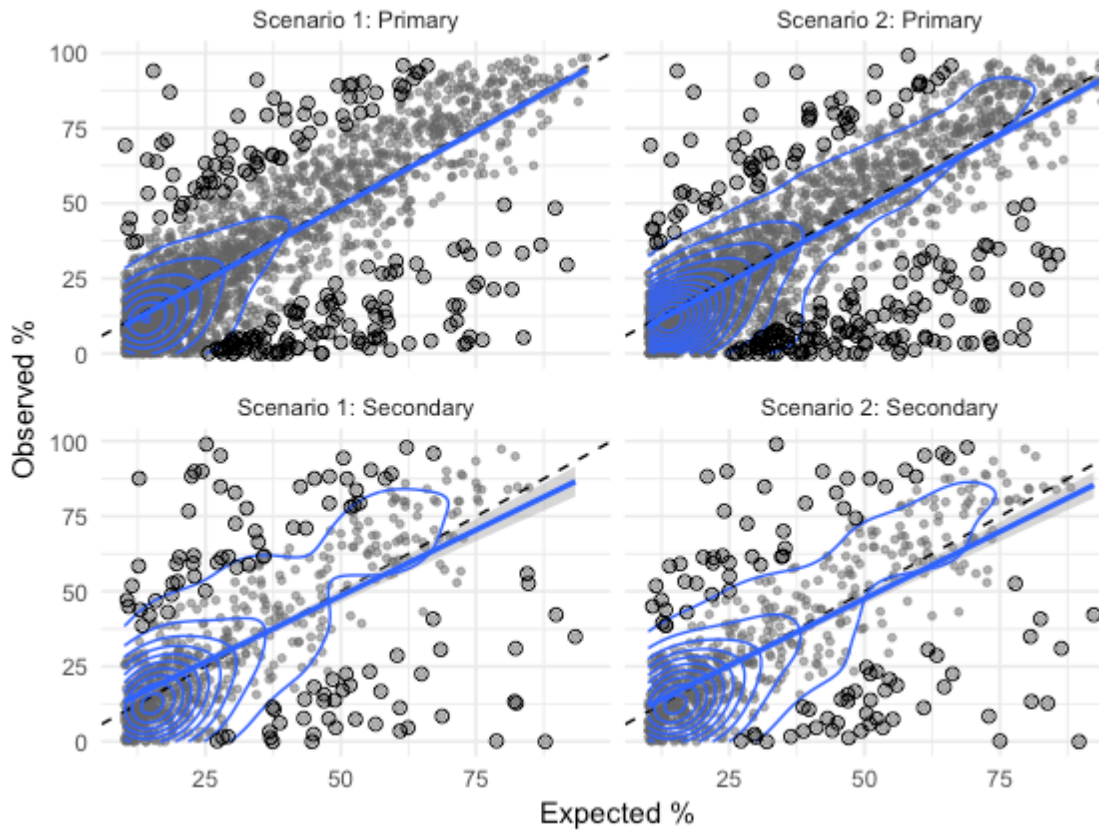
Administrative data

National Pupil Database

Segregation between schools and how it compares to neighbourhoods

Segregation between schools: is it increasing or decreasing in England? Harris & Johnston (Bristol Press, 2019)

The percentage of each group in schools with a diversity greater than or equal to the value shown on the horizontal axes

Shows the total percentage of Bangladeshi, Indian and Pakistani pupils in each state school in 2017, plotted against the expected percentage under the two hypothetical scenarios.

Are Schools more segregated than their surrounding neighbourhoods?

The outliers

- Amongst the 93 primary schools whose pupils, in 2017, were more than 25 percentage points more from the Asian groups than expected under a neighbourhood allocation, 9 are in London, of which 5 are in Tower Hamlets, 6 are in Leeds, 5 in each of Birmingham, Bolton and Kirklees, and 4 in each of Halifax, Leicester, Oldham and Greater Manchester. The majority of the schools (62 of the 93) are community schools or academies but 23 are faith schools, predominantly Anglican but with some being Hindu, Muslim, Sikh and a Jewish school. None is Catholic.
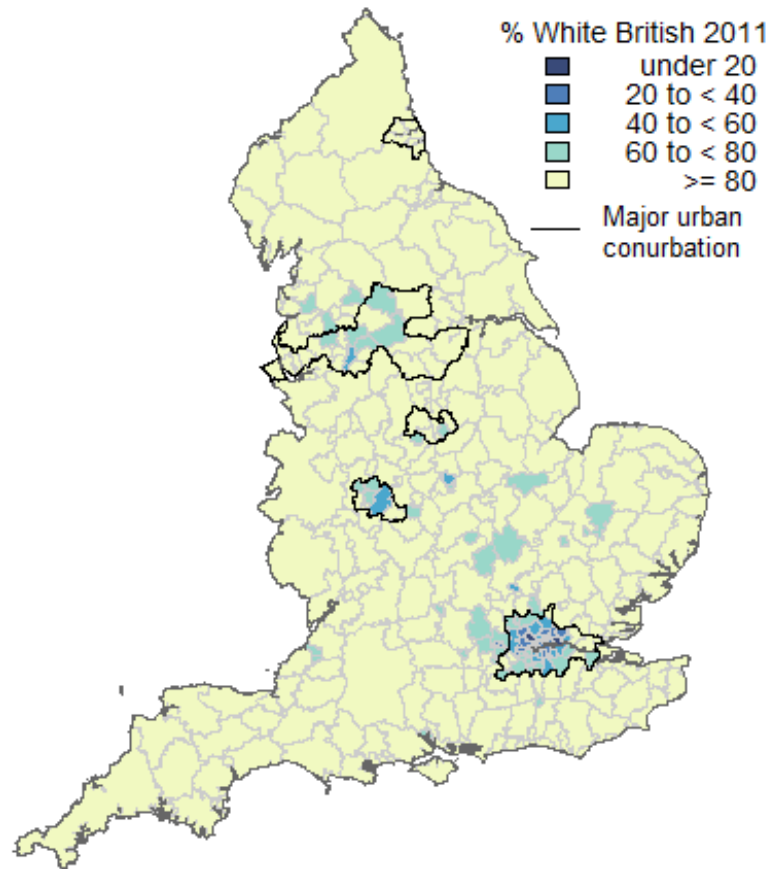
The outliers

- Amongst the 149 with a strong under-representation of the Asian pupils (more than 25 percentage points below expectation), 22 are in London (of which 14 are in Tower Hamlets and 6 in Redbridge), 12 are in Birmingham, 11 are in Lancashire (of which 6 are in Burnley or the nearby town of Nelson), and 8 in Bradford. Of the 149, 127 are faith schools, of which 102 are Catholic. Reflecting this, 95 of the schools are Voluntary Aided; 37 are either Academies or Free schools.
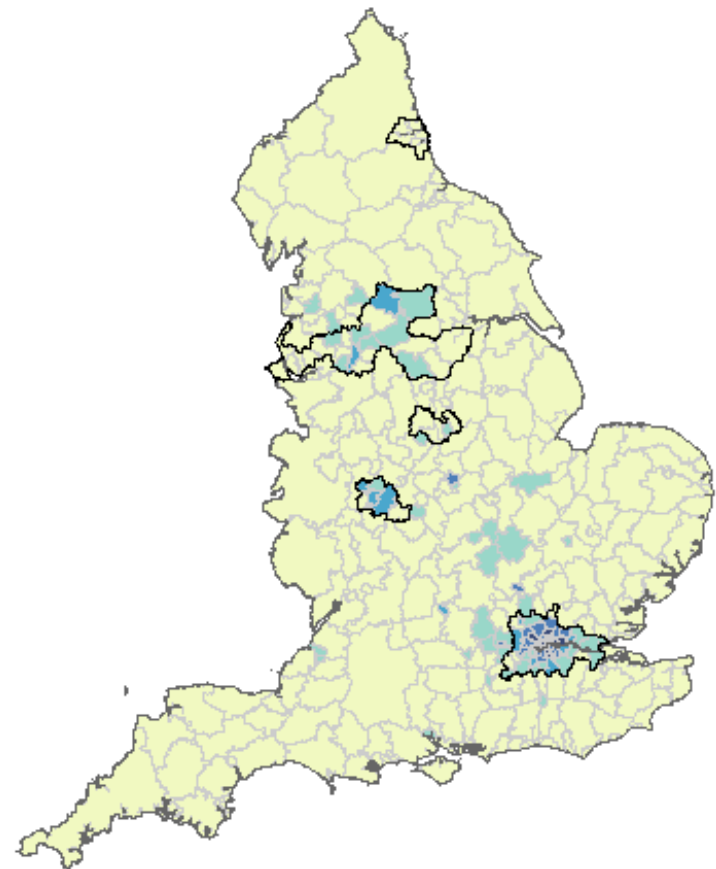
Visualisation

Mapping the changing residential geography of White British secondary school children in England using visually balanced cartograms and hexograms
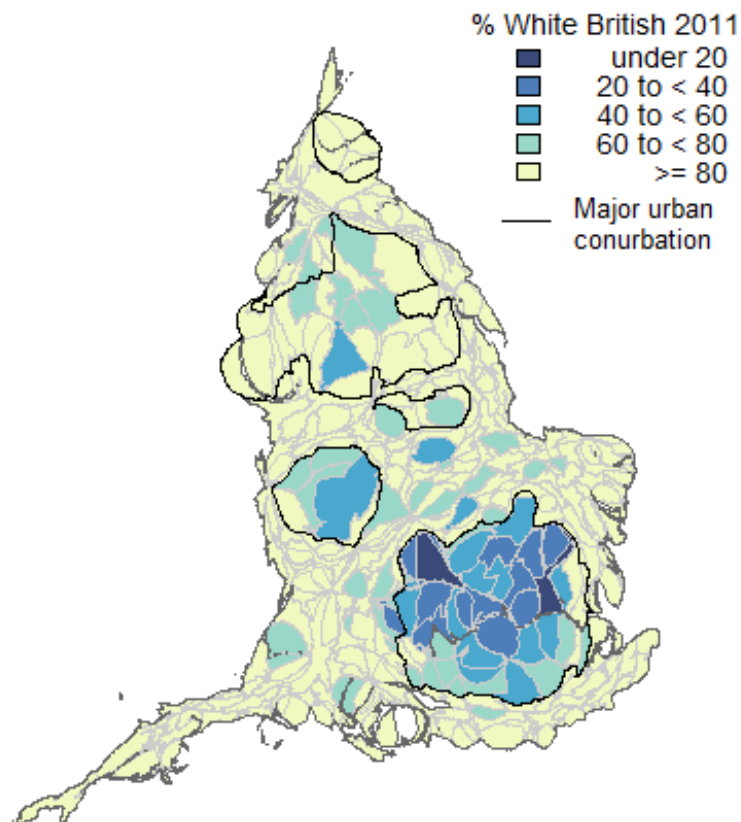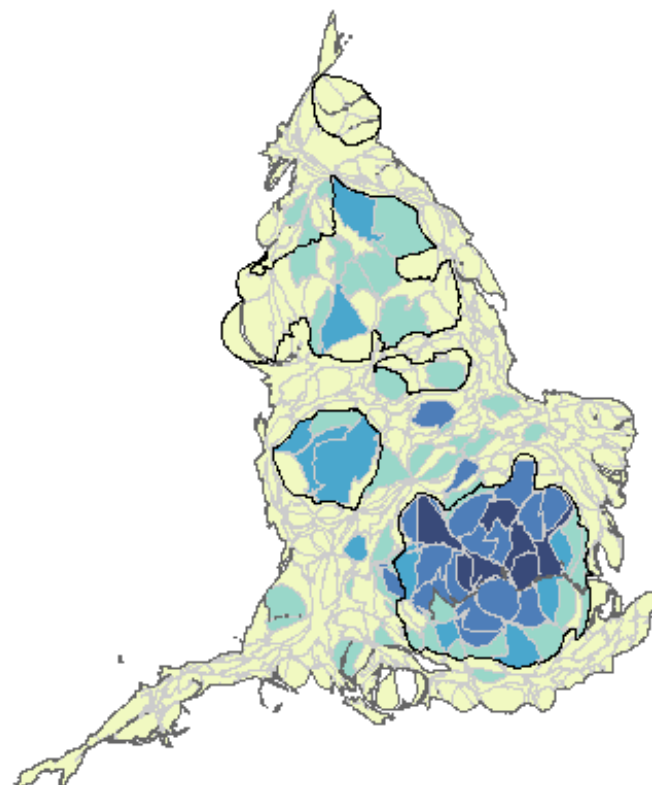
https://www.tandfonline.com/doi/full/10.1080/17445647.2018.1478753

Census data (2011)

National Pupil data (2011)

% White British 2011
- under 20
- 20 to < 40
- 40 to < 60
- 60 to < 80
- >= 80
Major urban conurbation
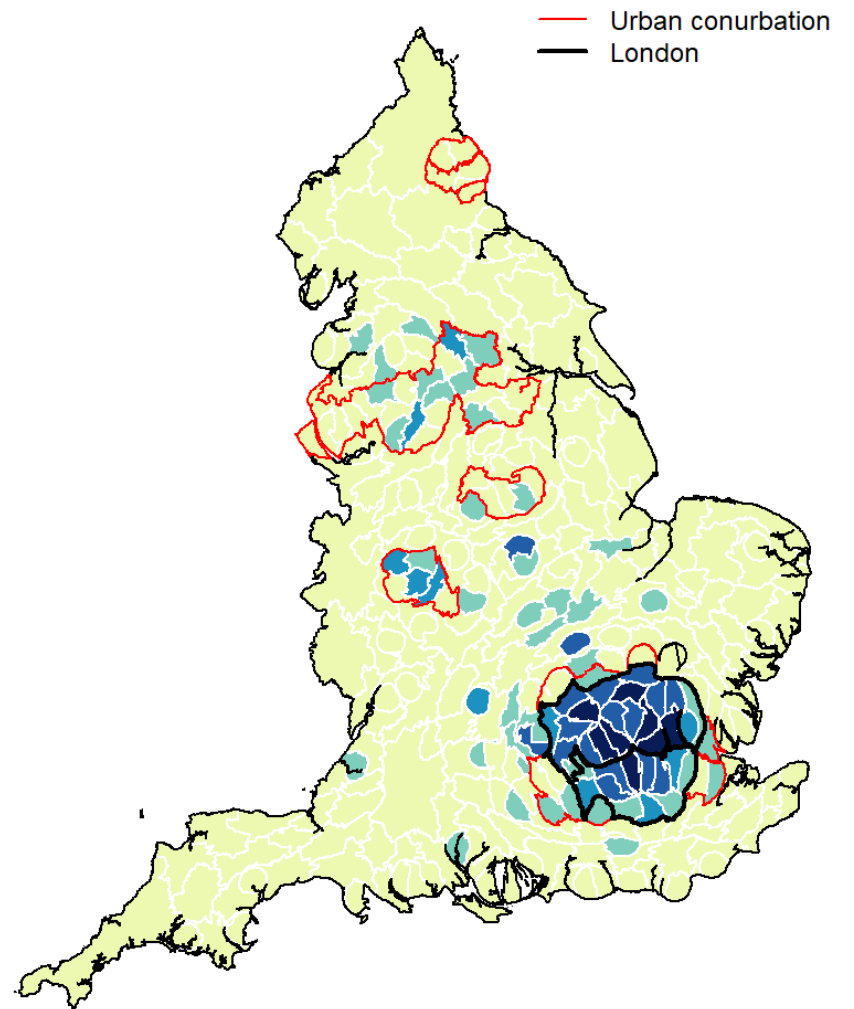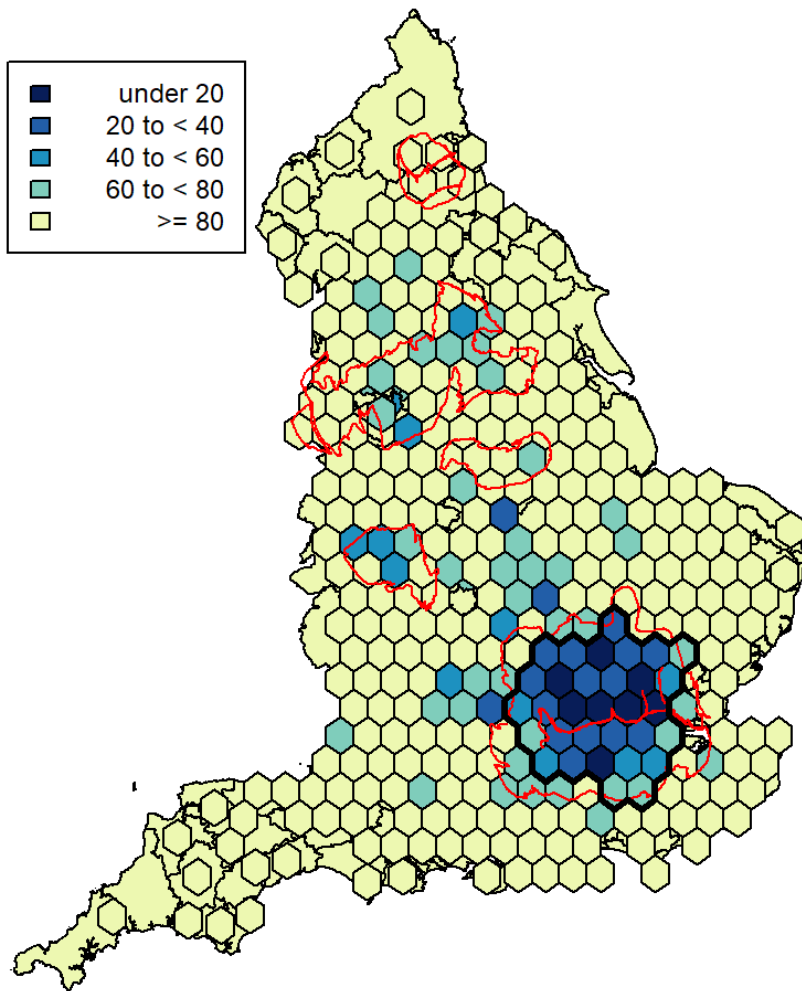
Census data (2011)

National Pupil data (2011)

% White British 2011
- under 20
- 20 to < 40
- 40 to < 60
- 60 to < 80
- >= 80
- Major urban conurbation

Legend (left map):
- under 20
- 20 to < 40
- 40 to < 60
- 60 to < 80
- >= 80

Legend (right map):
- Urban conurbation
- London

Hex 1: Richard Harris open code (29 bins)
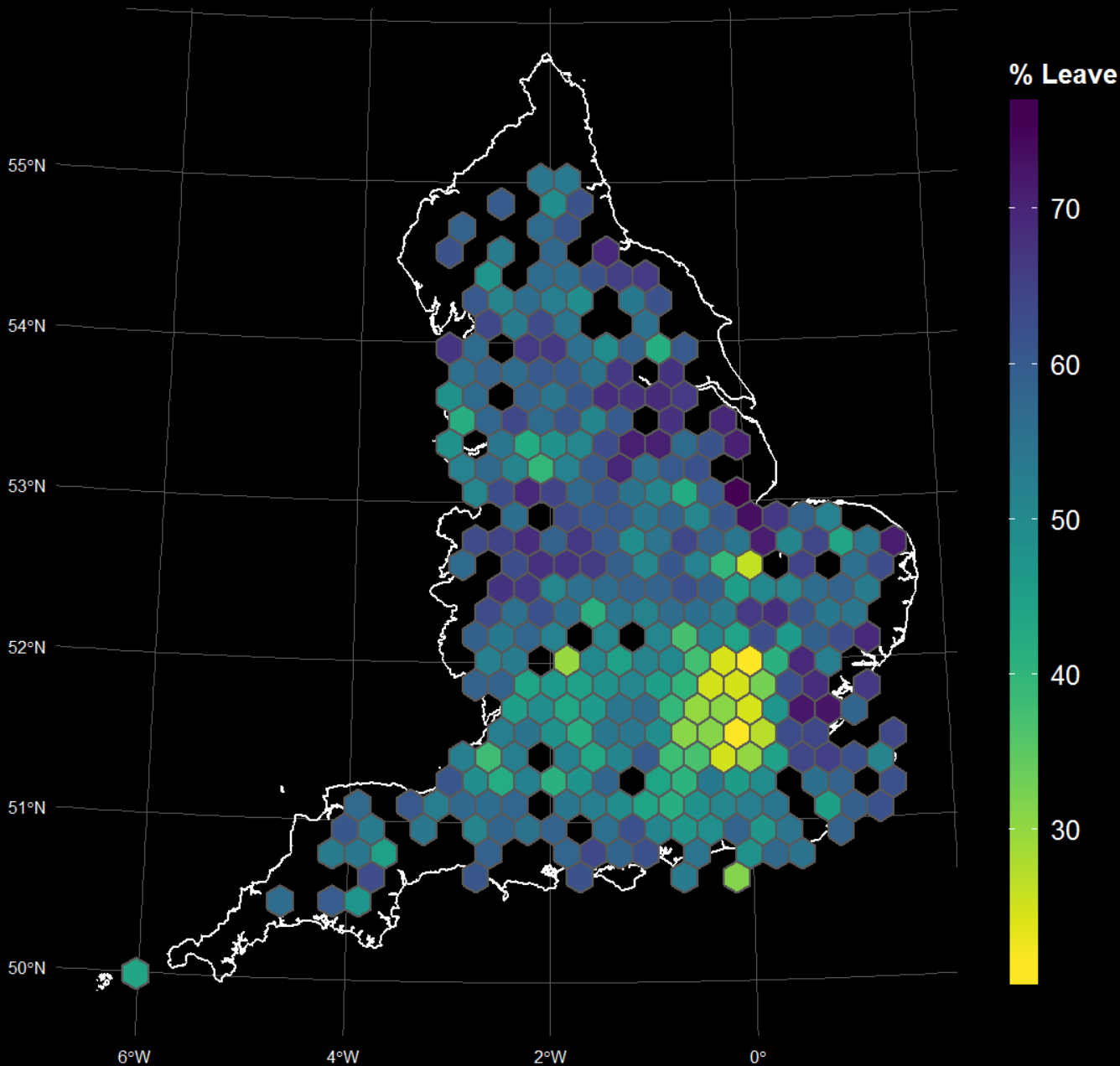
Reproducible examples and open source code
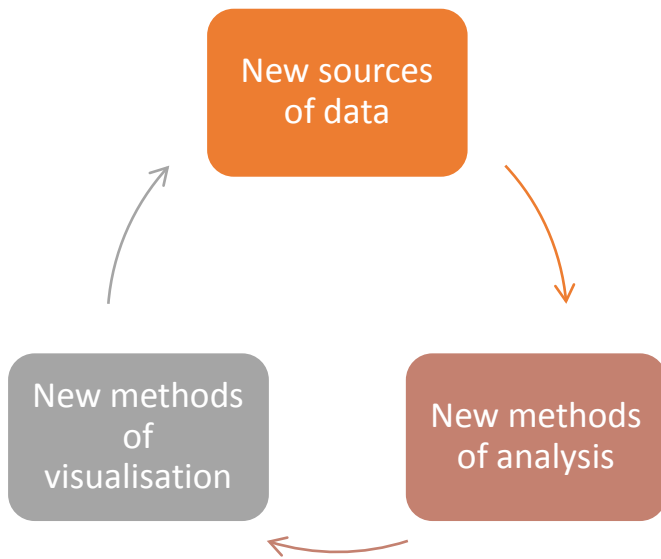
- For the Multilevel Index of Dissimilarity
  - https://cran.r-project.org/web/packages/MLID/vignettes/MLID.html
- For the hexograms
  - https://rpubs.com/profrichharris/hexograms