



# Mapping Welsh neighbourhood types classified using attitudinal data from the national Living in Wales survey

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## Abstract

The paper illustrates the use of contiguous cartograms for mapping the results of a cluster analysis of attitudinal data from the national Living in Wales survey. The analysis and mapping of Welsh national data at small geographical scales is not very common and this is the first time attitudinal data from the Living in Wales survey has been mapped at levels lower than the unitary authority using cartograms. The results demonstrate how Wales can be classified into geographically distinct areas based upon respondents' attitudes towards their neighbours and the neighbourhood within which they live. These areas broadly conform to other metrics used to classify Wales at small scales, such as deprivation indicators, commuting patterns and local housing markets areas. This suggests that people's attitudes towards their neighbours and their neighbourhood are broadly related to socio-economic, demographic and cultural factors that vary across Wales.

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## 1. Introduction

Wales is often seen as quite uniform but, for its size, it is a diverse country with distinct geographical differences in population and other socio-economic and cultural characteristics (Welsh Assembly Government, 2000). As a nation Wales has been rather neglected in terms of small area mapping and analysis of social data. This is partly due to its status as a government office region in UK national statistics. It is also due to a lack of detailed social survey data for small areas within Wales, with the decennial census of population being one of a few exceptions. This situation is by no means peculiar to Wales and a dearth of reliable small scale social data is characteristic of the UK as a whole. However, Wales has recently acquired a new data source; one which allows small area mapping and analysis and one which is not available elsewhere in the UK. This is the annual 'Living in Wales' survey and we aim to explore some small area differences using this relatively recent source of Welsh national social data.

The Living in Wales survey is the main source of general statistical information about households in Wales (Welsh Assembly Government, 2007). It was first undertaken in 2004 with the most recent release with respect to this research being 2007. It has an average annual response of around 7,500 households (an average annual response rate of around 60%), with different households surveyed each year. The survey covers a variety of social, economic and opinion based questions and is one of the few data sources (such as the Welsh Index of Multiple Deprivation and the Welsh Health Survey) to allow Welsh national social data to be mapped below the level of the Unitary Authority. For example, pooling data from the 2004-07 surveys creates a large enough sample size for analysis at the Middle Layer Super Output Area (MSOA) level. MSOAs have been aggregated from smaller census areas and adhere to local authority boundaries. They have a minimum of 5,000 residents and 2,000 households with a mean population of around 7,200. Wales has 413 MSOAs and these will be used in this analysis to represent neighbourhoods. On average, there are 74 households per MSOA in the pooled Living in Wales survey (2004-07) with a standard deviation of 36 households. This ranges from a minimum of 21 households per MSOA to a maximum of 225 households, but as the 10<sup>th</sup> - 90<sup>th</sup> percentile range is 36 to 118 households per MSOA, the distribution is not heavily skewed. This makes the MSOAs robust units for statistical analysis. The survey data will be proportioned using a weighting factor so that they are representative of the total number of households in Wales.

This research uses eight attitudinal questions that have been asked in each year of the survey on aspects of the respondent's local neighbourhood, with a likert scale response to each question. The questions concern the degree to which the respondents trust the people in their neighbourhood, how they rate their neighbourhood as a place to bring up children and how often they talk to their neighbours. It includes questions on whether they feel that they belong to their neighbourhood, whether friendships with people

in their neighbourhood means a lot to them, whether they can get advice from their neighbours, borrow things and ask favours of their neighbours, whether they can work together to improve their neighbourhood and whether they see themselves as similar to their neighbours.

The survey did not define 'neighbour' nor 'neighbourhood' but allowed respondents to use their own understanding of the terms. This means that neighbourhood will not conform to any particular geographical construction but will vary by respondent and the context within which they live. Thus a respondent living in a rural area may constitute the village that they live in as their neighbourhood whilst the neighbourhood of a respondent living in an inner-city area may constitute several adjacent streets. MSOAs will therefore not be necessarily congruent with the territorial boundaries of the neighbourhoods of the respondents. Rather they provide a convenient unit of analysis given the limitations of sample size in using smaller units together with a lack of information from the survey to construct more bespoke neighbourhoods. The possible effects on the results of using MSOAs will be discussed in a later section.

## 2. Method

### 2.1 Cluster Analysis

Z-scores were calculated for each attitudinal variable and these were aggregated to an average z-score, weighted by respondent, for each of the 413 MSOA neighbourhoods. The neighbourhood level z-scores were used in a k-means cluster analysis in order to partition the neighbourhoods into a small number of clusters, with the result that neighbourhoods within a cluster are more similar in terms of their z-scores (based on Euclidean distance), than neighbourhoods in the other clusters (see [Everitt et al., 2001](#), for a detailed discussion of cluster analysis). As the number of clusters has to be specified *a priori*, several cluster analyses were performed, each with a different cluster number. An examination of the cluster analyses revealed five clusters to be optimal in terms of maximising difference between clusters and parsimony in the number of clusters. The cluster distances and number of MSOAs in each cluster are reported in [Table 1](#). The cluster distances show that at least half of the pairwise distances are greater than one standard deviation, demonstrating distinctiveness between these cluster pairs. Cluster 5 is the most distinctive and has the fewest members. Cluster 3 has the most similarity to the other clusters and has the largest membership.

Cluster ID	Distances between cluster centres				N° of MSOAs
	1	2	3	4	
1					90
2	0.98				76
3	0.70	0.64			136
4	1.51	0.83	0.84		93
5	2.59	1.88	1.95	1.14	18

Table 1. Summary of the cluster analysis.

## 2.2 Mapping and Cartogram generation

The main map displays a conventional topographic map of Wales, with neighbourhoods represented by land area, and a cartogram of the same area in which the neighbourhoods have been distorted in proportion to population size. This land-area map representation privileges the sparsely populated rural areas of mid- and west Wales which dominate the map, with the densely populated areas of south Wales and the northern coastal fringe too small to discern. The map would suggest that the majority of Wales is classified by a single neighbourhood (neighbourhood 1, coloured brown) with the four remaining neighbourhood types squeezed into the south-eastern corner and northern edge. However, such an assumption is inaccurate with the majority of neighbourhoods not being classified as Type 1.

A more informative picture of neighbourhood classification is displayed by the cartogram representation of Wales. This distorted map of Wales, with the rural areas in mid- and west Wales shrunk and the densely populated areas of south and north-east Wales expanded, allows a clearer picture of where most people live. Crucially, this distortion is not at the expense of the interpretability of the map with the different parts of Wales being easy to recognise and identify. The cartogram allows the map reader to appreciate that the neighbourhood type shaded brown no longer dominates the country. Table 2 reports a summary of basic area and population statistics for both representations of Wales. This shows how the area of Neighbourhood 1 has shrank by almost a half in the cartogrammetric representation reflecting the proportionally smaller population of rural Wales. The remaining four neighbourhoods have increased in size, with Neighbourhoods 2 and 3 experiencing only a marginal proportional increase and Neighbourhood 5 experiencing the largest proportional increase reflecting the high population densities of these predominately inner-city areas.

An examination of the map, cluster analysis and the original data allows us to describe the different neighbourhood types by the attitudes of the people who live in them.

Cluster ID	Map Label	Geographical description	Conventional Map Area (km <sup>2</sup> )	Cartogram Map Area (km <sup>2</sup> )	Proportional Difference in Map Area	Population 2001
1	Rural	Rural mid-west- and north-west Wales	15,552	9,214	0.59	608,186
2	Valleys	Valleys and former mining areas	1,223	2,045	1.67	566,472
3	Semi-rural hinterland	Suburban and semi-rural areas	2,942	3,808	1.29	952,310
4	Deprived	Deprived – non-former mining areas	627	1,840	2.94	656,505
5	Urban Mobile	Inner-city neighbourhoods	37	303	8.29	119,612

Table 2. Characteristics of clusters.

### 2.3 Neighbourhood classification and description

Neighbourhood type 1 is characterised by people who trust most of their neighbours and who believe that their neighbourhood is a very good place to bring up children. Over half talk to their neighbours on most days, and regard their friendship as meaning a lot to them. They tend to ask their neighbours for advice and for favours and to borrow things from them. They have a very good sense of belonging to the area and tend to see themselves as similar as other people in their area and are willing to work with others to improve the neighbourhood. These neighbourhoods are predominately rural and are concentrated in mid-, west and north-west Wales.

Neighbourhood type 2 is characterised by people whose attitudes are quite similar to those in neighbourhood type 1, with two main exceptions. The first is that they trust their neighbours a lot less than in neighbourhood type 1, with less than half trusting most of their neighbours and a quarter trusting very few of them. The second is that only a quarter believe that their neighbourhood is a very good place to bring up children, although half think that it is a fairly good place. These neighbourhoods are almost exclusively found, and almost entirely compose, the neighbourhoods of the Welsh valleys. These are former coal mining communities that have experienced de-industrialisation and population loss since the mid-twentieth century. The only other areas outside of the valleys where these neighbourhoods can be found are in the former

slate mining communities of north-west Wales and a few neighbourhoods in north-east Wales

Neighbourhood type 3 is characterised by people having attitudes to the place where they live that tend to reflect the Welsh average. These neighbourhoods are predominantly the suburbs of the cities in south Wales or the semi-rural hinterland that surround them. They can also be found in the more affluent areas of the coastal fringe of north Wales and the market towns of mid-Wales.

Neighbourhood type 4 is characterised by people with a mix of attitudes towards their neighbourhood. Compared with the previous neighbourhood types, fewer people tended to strongly agree that they rely on their neighbours for advice, favours and friendship and fewer people strongly agreed that they have a sense of belonging to their neighbourhood and that they thought themselves as similar to their neighbours. Fewer people trust most of their neighbours with a third trusting very few people at all. Despite this, around half believe that it's a fairly good place to bring up children with a further fifth believing that it is a very good place. These neighbourhoods are located in more deprived areas of Wales and generally outside of the former mining communities. They are concentrated in the south Wales urban areas and the coastal fringe of north Wales.

Neighbourhood type 5 has the fewest members and is perhaps the least neighbourly. Only a quarter trust many people in their neighbourhood and over half trust few people or no-one at all. Two fifths believe that it is a fairly good place to bring up children but nearly one third think that it is a poor place. Fewer people talk to their neighbours compared to the other neighbourhood types with a quarter talking to them less than once or month or never. Here, people are less likely than in the other neighbourhood types to see neighbours as friends and less likely to ask advice and favours from them. They have less of a sense of belonging and are less likely to see themselves as similar to others in their neighbourhood. These neighbourhoods are predominately found in the inner-cities of Cardiff, Newport and Swansea and very rarely outside of these areas. They are not necessarily deprived areas (although some are) with this neighbourhood type including regenerated docklands. Instead, it is characterised by private rented accommodation and a very varied and mobile population.

### 3. Conclusions

This has been an inductive, data-driven approach to neighbourhood classification (Everitt et al., 2001). An important observation is the way in which 'geography' emerges through mapping the results of the cluster analysis. There were no explicitly geogra-

phical variables in the cluster analysis but strong spatial patterning in the clusters is obvious from the map. This may be partly due to using MSOAs as a unit of analysis which would have an effect of smoothing out differences in neighbourhood attitudes at smaller scales. Hence the cluster classification would not be representative of everyone living in a particular MSOA. It would also contribute to the modifiable areal unit problem in the sense that different spatial units may give rise to different spatial patterns. However, despite these caveats, the patterning suggests that the attitudes of people in Wales towards the neighbourhood in which they live are broadly very similar - people living in similar places broadly share similar attitudes. Moreover, the analysis suggests that these attitudes are strongly embedded within particular parts of Wales allowing this interesting geography to emerge. The distinctive clustering of neighbourhood type 2 within the Welsh valleys but rarely outside of this area is a good example of this strong spatial clustering in attitudes. The distinctive rural neighbourhood type 1 is another example. The five neighbourhood types broadly conform to other metrics used to classify Wales at small scales, such as deprivation indicators, commuting patterns and local housing markets areas (Milbourne et al., 2005). This association suggests that people's attitudes towards their neighbours and their neighbourhood are broadly related to socio-economic, demographic and cultural factors that vary across Wales.

WISERD is investigating four localities covering each of these neighbourhood types. One locality is based around the predominately rural neighbourhoods (1) of west and mid-Wales. Another is located around the valley neighbourhoods (2) with a third concerned with the inner-city neighbourhoods in the vicinity of Cardiff City centre. The fourth locality is based around the A55 corridor, the major trunk road that connects the urban and industrial parts of north-east Wales with the ferry port of Holyhead in the north-west of the country, running along the coastal fringe. This locality takes in diverse neighbourhood types, from the rare example of neighbourhood 5 in Wrexham, through the deprived and affluent suburban and semi-rural neighbourhood types in north-east Wales to the rural neighbourhood type of west Wales and the valley type neighbourhoods of the former slate mining communities in Snowdonia.

## Software

SPSS was used to analyse the Living in Wales data and classify the five neighbourhood types. ESRI ArcView 3.2 was used to map the data. Cartograms were generated using the rubber sheet method (Dougenik et al., 1985; Jackel, 1997) using a Python script coded by Eric Wolf and available from the ESRI website. This creates a contiguous area cartogram which inflates neighbourhoods with high population density and contracts the more sparsely populated ones, whilst retaining the shape and relative location of the neighbourhoods as much as possible.

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