

# Constructing tracts 1981-2001

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## Introduction

Measuring change over time and space is notoriously difficult. Geographical boundaries change, different questions are asked in different censuses and surveys, the meanings of questions change over time even when the question wording remains the same and so on. In the context of the research presented here we took boundary changes into account by combining wards at different points in time so as to minimize the impact of ward boundary changes. The smallest areas we can compare have populations of approximately 30,000 people. However we also ensure that very few areas have populations of over 65,000 people so that in almost all cases we are comparing sets of wards with very similar numbers of people across both space and time (Tract population statistics are shown on the last page of this document). The smaller areas we wish to consider within these three sets of districts are approximately defined as parliamentary constituencies split in half. These are areas defined principally for pragmatic reasons. They are the smallest areas for which consistent social statistics can be measured over the last thirty years using data collected for local government wards which have in almost all cases had their boundaries changed at least once over this period. By taking into account ward boundary changes we overcome the problems of past data being available for incompatible areas.

We began with the boundaries of parliamentary constituencies because they place a limit on the problem to be solved. This is similar to how census output areas were designed within wards – to place a limit on the problem to be solved. However all our zone design is of necessity a manual process which begins by deciding how wards within a constituency can be grouped. The first step in the grouping procedure was to identify two types of constituencies: urban and rural. Urban constituencies have a high proportion of urban areas (above 65%, usually more than 90% of the population), whereas rural constituencies have more rural areas, at least 35% of the population, usually 45-55%. We use the DoE 1991 definition of urban areas in this work. Where rural constituencies were split by a local authority boundary we treated that boundary as a natural break (see below).

The rules we followed for allocating wards to the pair of tracts formed from a constituency differed depending on how we classified the constituency. By far the majority were classified as urban constituencies, so they are described first, by a series of rules. In many constituencies the rules are incompatible, i.e. they cannot all be satisfied, but they are listed in the order in which we attempted to apply them. For urban constituencies we grouped wards into larger tracts on the basis of the criteria shown on the next page.

## **Urban Constituencies – Rules for creating**

1. Tracts should be contiguous in all years
2. Tracts should contain at least 25% of the population of the constituency for all years, and be as close as possible to 50%
3. Tracts should have borders that change as little as possible through the 5 years of boundary data (1981, 1991, 1998, 2000, 2001)
4. Where an Urban Area boundary cuts through a constituency, tracts should use the border where possible, taking rule (2) into account.
5. The variance in estimated average income is minimised
6. Tracts should be compact in shape
7. Each tract contains wards that are similar in physical size
8. Towns that are entirely contained within a constituency were kept intact, rather than split between tracts
9. Constituent ward names were kept consistent across time, even where the ward has shifted (i.e. try to keep areas with the same names together)
10. Use of natural divisions, e.g. a river or motorway, was made if possible
11. Tracts to have borders that follow a LA border where it cuts a constituency nearly in half (thus allowing the tracts to nest within local authorities)
12. Tracts were created on an East/West basis, to aid creation of a cartogram

## **Rural Constituencies**

For rural constituencies we used the population living in urban settlements within those constituencies to define their tracts. For each of the five years, every separate urban area (as defined by DoE in 1991) had at least one ward allocated to it (automatically using a GIS and then edited laboriously by hand). These wards would either be completely or partially located in an urban area. Wards that did not overlap with urban areas were designated as rural. This allowed an approximate calculation of the percentage of people living in rural or urban areas within constituencies. Most of the constituencies classified as rural constituencies contain around 50% of people living in each type of area, which makes them suitable for this method.

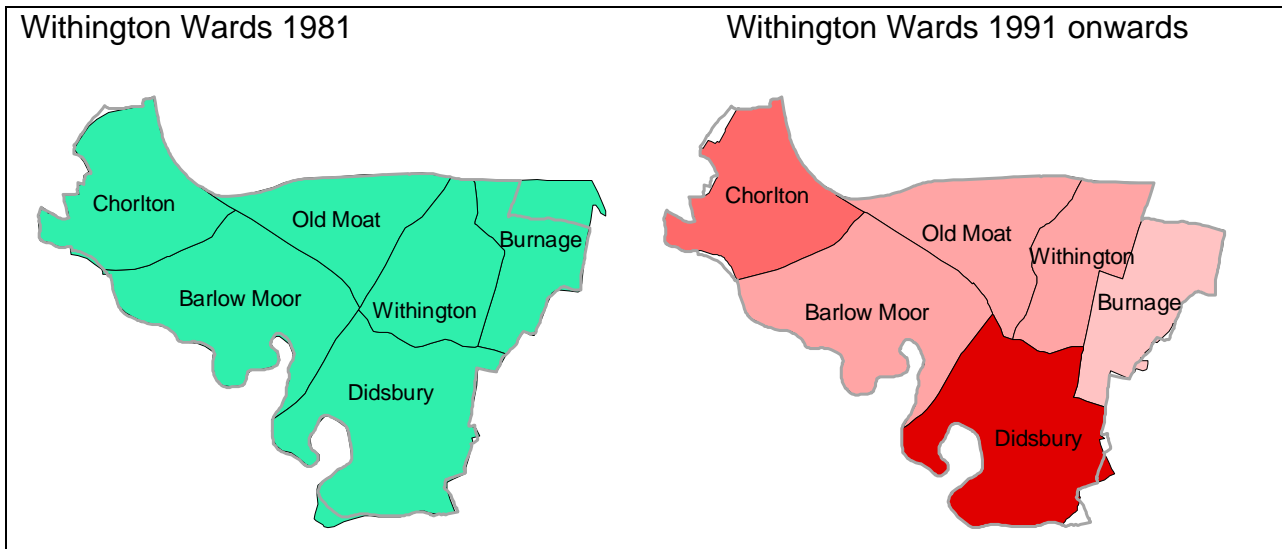
The method simply consisted of forming one tract from those wards designated as rural, and the other from those designated as urban. Obviously these tracts are not contiguous, and their shape and borders tend to vary somewhat across time due to the changing nature of the wards allocated to them. There are very few such constituencies in practice in England and Wales.

## Checking

After constructing a set of tracts on the basis of the rules described above, we followed a series of procedures to check that the allocation of wards to tracts has been done as intended, and that it has not produced tracts with large unexplained population shifts over time. Therefore, the following checks were carried out:

- Firstly, we checked that every ward had been allocated to a tract for each of the five years.
- Secondly, we checked that wards with the same names had not moved between tracts over time without good reason.
- Thirdly, we calculated the population of each tract at each census year, and looked for any unexplained anomalies. These might result from ward boundaries being completely redrawn, leaving them straddling constituency boundaries. Closer inspection of the population shifts might lead to allocating a ward to a different tract to the original decision. In other tracts, the attempt to satisfy rules 4 and 5 described above, or rules lower down the list, might have produced tracts with very high or low populations, or large changes across time.
- A fourth and final check involved using 1991 census data at Enumeration District level, in order to check the impact of the inevitable shift of some of the tract boundaries over time. Data relating to ethnicity and employment was used, and 1991 EDs were allocated to tracts drawn using both 1991 wards and 2001 wards. This allowed us to measure the percentage change in census counts obtained by using the 2001 boundaries against the 1991 boundaries, and compare this to the 'real' change obtained from comparing both with 2001 census data. An Excel file showing this process will be made available on our website, but in summary, the small changes measured by comparing the two sets of tract boundaries were insignificant compared to the real change measured between the 1991 and 2001 censuses.

## Example: Creating tracts from constituencies in Manchester Withington

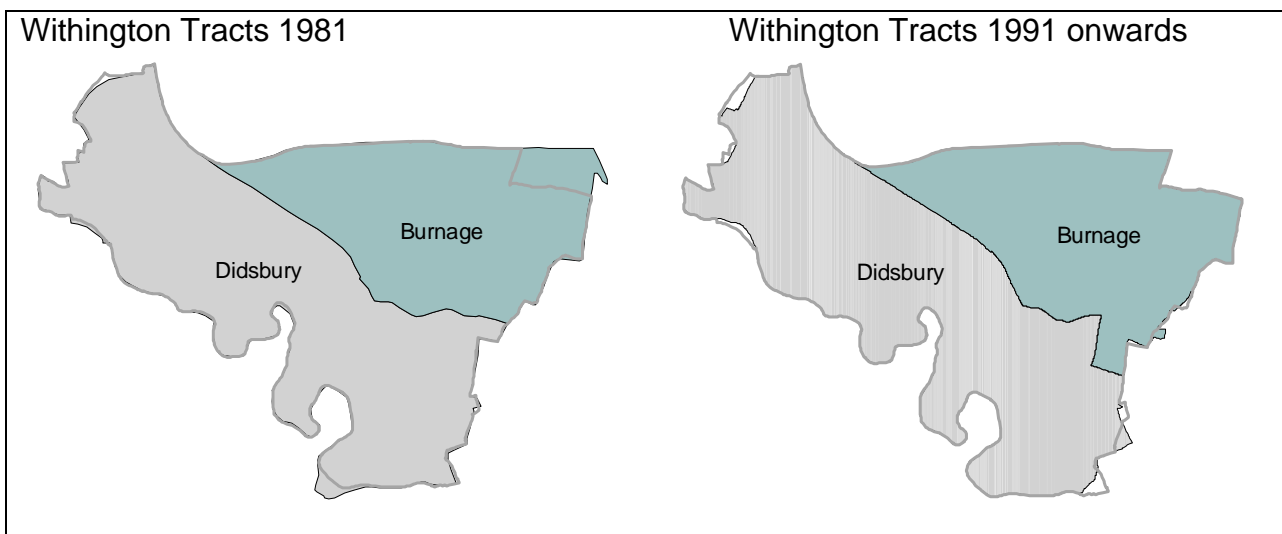


The map on the right has been shaded to show average income for each ward from 1998 data. The darker wards are, on average, richer.

Ward boundaries in Manchester were re-drawn slightly between 1981 and 1991. In this constituency, the borders of Old Moat, Withington, and Burnage wards changed (the old boundaries are shown on the map on the left)

With six wards of similar population, we would usually form tracts with three wards each, and there is no reason not to do this in this case. Making a cut that groups Chorlton, Barlow Moor, and Didsbury together looks the best for dividing by income, and would also create compact tracts. Whichever way we make the cut, the boundary will change slightly, but not significantly, between the two time periods.

### The tracts



## Tract Statistics

### England & Wales

Number of tracts:	1138
Population Mean (2001):	45,731
Population Median (2001):	45,485
Population Lower Quartile (2001):	39,132
Population Upper Quartile (2001):	52,166
Population Minimum (2001):	14,378
Population Maximum (2001):	91,107

### Scotland

Number of tracts:	144
Population Mean (2001):	33,740
Population Median (2001):	35,153
Population Lower Quartile (2001):	26,382
Population Upper Quartile (2001):	43,115
Population Minimum (2001):	12,217
Population Maximum (2001):	63,752

## Population size – notes

We have attempted to create Tracts with as similar a size as possible. However, in practice this is difficult to do, taking the other aims into account, as set out in our list of rules on page 2. Parliamentary Constituencies vary in population size from 40,000 to over 130,000, so there was an inevitable range of 20,000-65,000 in the size of tracts.

This range has been extended somewhat because in places we have attempted to make the tracts more homogenous than would be possible by equally dividing a Parliamentary Constituency, for example by following Urban Area boundaries, and where possible we have also followed Local Authority boundaries. Our ideal neighbourhoods would have all been the same size, but would have been less useful in practice if they would not fit reasonably well inside larger areas, and there would have been more variation in the characteristics of those living within some of them. Sticking fairly rigidly to Parliamentary Constituencies boundaries also makes it possible to display the tracts on the Universal Data Map cartogram created by Danny Dorling and colleagues, which will be made available on our website.