Segregations in the cities: exploring change in social, economic and demographic segregation in Aberdeen, Durham, Edinburgh and Glasgow between the 2001 and 2011 censuses

**Introduction**

Segregation is a concept that has been operationalised in a variety of ways, resulting in a large number of distinct segregation indices, as well as a variety of derivations and modifications of earlier indices. A pivotal paper by Massey & Denton [1988] used factor analysis to explore similarities and differences between around twenty separate segregation measures when applied to the same binary data, white and non-white population counts by 1980 US Census tracts. The paper argued that these measures should be grouped into five overarching ‘dimensions’ of segregation: evenness, exposure, concentration, centralisation, and clustering. In a later paper they proposed that high levels of segregation according to measures in each of these dimensions should be referred to as ‘hypersegregation’, and argued that a state of ‘hypersegregation’ existed for Black populations in US metropolitan areas in the 1980s

Douglas Massey, one of the authors of the pivotal 1988 paper discussed above, later updated their analyses [1996] (with White & Phua) of these twenty measures to look at equivalent census tract data for the 1990 data, concluding that two of these five dimensions, concentration and clustering, were not as distinct using the 1990 data compared with the 1988 data, casting doubt on the exact number of distinct dimensions that extant measures captures. Two later analyses inspired by Massey & Denton’s approach have argued there may only be two distinct and overarching definitions, though reached different conclusions as to what these two dimensions are: Reardon & O’Sullivan (2004) arguing for evenness-clustering and exposure-isolation, and Brown and Chung (2006) arguing for evenness-concentration and clustering-exposure.

In parallel with debates about the number of dimensions of segregation that exist and the most appropriate ways of measuring them, a number of new and derived measures have been developed which aim to address some real or perceived methodological flaws in earlier indices. For example, in its application to geographic data, such as US census tracts, there are spatial relationships between the ‘observations’ (minority and total population counts), and a number of modifications of earlier measures, predominantly the widely used dissimilarity index (Duncan & Duncan 1955), have been proposed (e.g. Morrill 1991, Wong 1993, 1998, 2005) which aim to ‘adjust’ index values according to the spatial relationship between population areas. Other ways in which extant measures have been modified and generalised have been to allow measures of segregation between three or more mutually exclusive population groups [examples including Reardon & Firebaugh 2008], to allow measures to be calculated based on continuous rather than discrete spatial data [Reardon & Sullivan 2004?], to allow ordinal relationships between population groups to be represented [Reardon 2008, Dawkins 2004, 2007] and to allow the calculation of uncertainty intervals based on spatial statistical methods [Lee et al 2014].

While there has been a great deal of development and innovation in terms of how segregation is measured, much of the focus in terms of what is measured has tended to be on ethnic/racial segregation. However, segregation measures can be applied to a much larger range of spatially varying population characteristics. Within a series of three reports, we calculate a large number of segregation measures for a range of population characteristics in the four largest cities in Scotland: Glasgow, Edinburgh, Dundee and Aberdeen. By extracting and harmonising the definitions of different population categories used within comparable tables from the 2001 and 2011 censuses, we can use these measures to show how much different types of segregation have changed over this decade with regard to a range of spatially varying population characteristics.

Methods

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| **Variable** | **Group A** | **Group B** |
| Accommodation | Lives in a house in a single household | Lives in a flat, caravan or shared accommodation |
| Car | Has no car | Has one or more cars |
| Country of birth | Born in Scotland | Born in the rest of the UK or elsewhere in the world |
| General Health | Reports having good health | Reports having not good health |
| Limiting Long-Term Illness | Reports having a limiting Long-term Illness | Does not report having a limiting long-term illness |
| Marital Status | Single (including separated, divorced, separated and widowed) | Married (including remarried) |
| National Statistics Socioeconomic Classification | Higher (higher and lower managerial/professional) | Lower (routine, intermediate, small self-employed) |
| Religion | Any religion | No religion |
| Pensioners | Is a pensioner | Is not a pensioner |
| Home ownership | Owns a house (either outright or with a mortgage) | Does not own a house (including renting from the private sector, living in social housing, or living rent-free) |
| Ethnicity | White | Not White |

City region definitions

Segregation measures for each of the above population types were calculated both for the whole of Scotland, and also for the top four city regions. The city regions were defined using travel to work area boundaries.

[to do: add figure showing the travel to work boundaries on a map]

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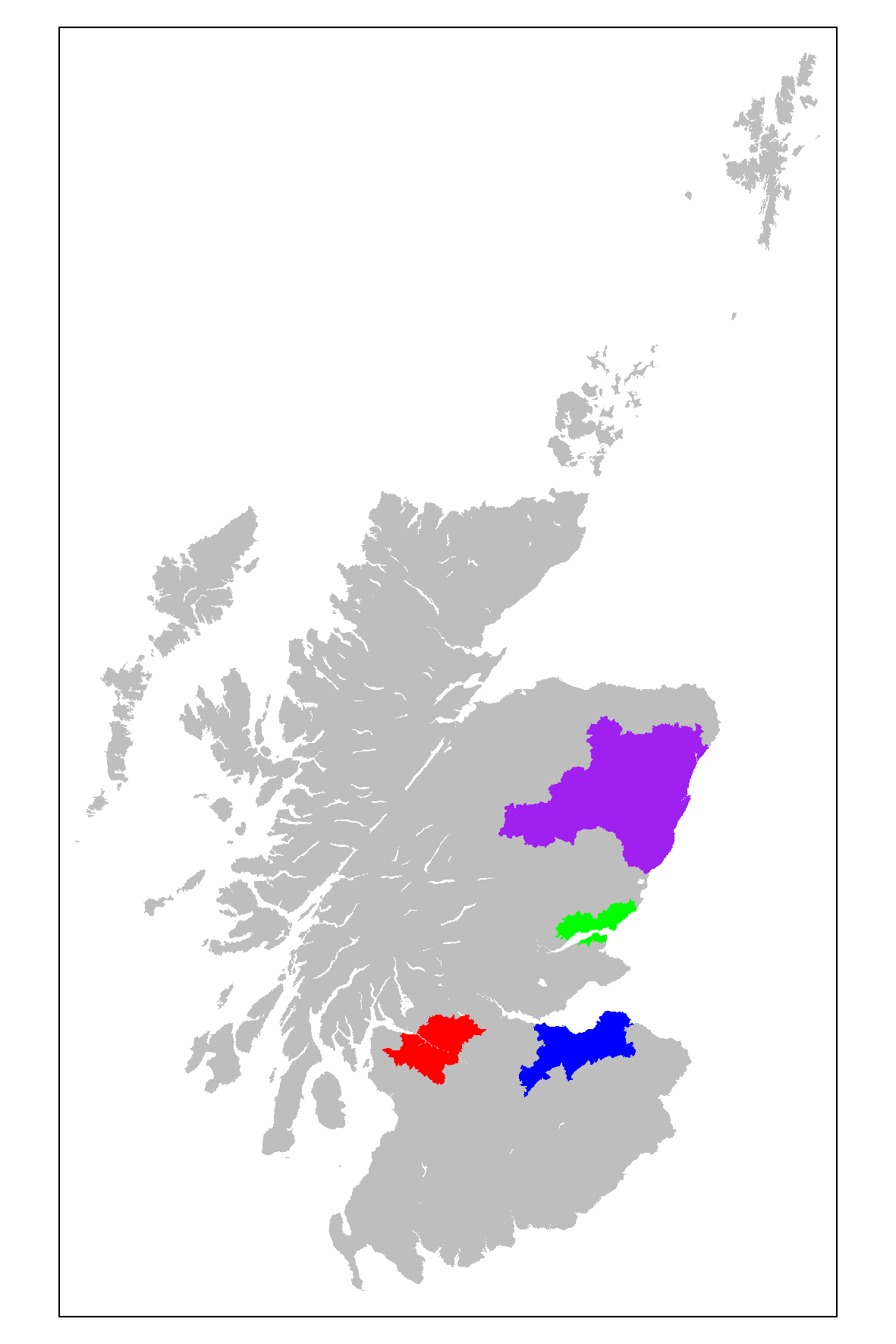


Figure The four travel-to-work areas: Glasgow in red; Edinburgh in blue; Dundee in green; and Aberdeen in purple.

Results