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The Changing Geography of Deprivation in Britain: 1971 to 2011 and Beyond

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Following a period of austerity after World War II, by the end of the 1950s Britain was entering a time of economic growth and associated improvements in standards of living. There was, however, a need to reconstruct bomb-damaged town centres and residential areas , as well as an increasing awareness of problems of inequality and deprivation as some places benefited from the improvements much faster than others (Rydin, 1993). Concurrently, population was growing through family formation and the baby boom of the late 1950s and early 1960s and near-full employment encouraged immigration from Commonwealth countries (see Chapters 1 and 4). As a result, there was increasing pressure on the existing housing stock in what were already dense urban areas (Ward, 1994). Improved housing quality was also needed and the slum clearance approaches of the 1930s were resumed to address problems of unfit dwellings and urban decay (Cullingworth and Nadin, 1994). Redevelopment programmes involved a reduction in previous densities since new homes tended to be larger so as to eliminate overcrowding problems and provide bathrooms and better kitchens as well as car parking spaces (Rydin, 1993; see also Chapter 7). Then, from the 1960s onwards, a succession of government initiatives intervened in order to raise educational and other standards, with attempts at targeting the worst-performing (or 'priority') areas – what became known as the 'inner city problem' (Champion, 1989: 125-29).

To be implemented efficiently as well as have their effectiveness monitored, these sorts of measures required much greater intelligence than had been available before then, needing data both on a wider range of indicators of deprivation and wellbeing and at a much finer geographical scale than the whole local authority districts for which most census output had previously been released. As the main source of sociodemographic data in Britain, the scope of the census has responded to this challenge, with the number of questions increasing. In addition to basic questions about each individual, the 1951 Census included questions on household amenities for the first time. These questions were repeated in 1961 with additional enquiries about country of birth and housing tenure but a 'long form' questionnaire with these questions was only collected from 10% of households (Denham and Rhind, 1983). It was not until 1971 that this detailed information, plus the inclusion of car ownership, was available at small-area level for the population rather than for a sample. Moreover, during this period, geography as a

discipline went through a ‘quantitative revolution’, with many practitioners starting to use a wide array of analytical tools for which the multivariate nature of census data was an ideal source (Robinson, 1998).

The combination of policy and practical needs, improved census data availability and enhanced practitioner skillsets, has led to a variety of census-based schemes being developed in the UK for measuring small-area deprivation as a composite of sets of indicator variables, following pioneering work using the 1971 Census on urban deprivation (Holtermann, 1975). These deprivation measures have many uses, including the targeting of resources for regeneration and as explanatory variables in studies of health and education. They help us to identify whether small areas have changed their level of deprivation over time and thereby assess, for example, whether declining populations are associated with poorer economic circumstances, the impact of area-based planning initiatives and whether a change in the level of deprivation leads to a change in health.

Even decades later, however, there are several facets which make the measurement of changing deprivation challenging. First, the variables used as inputs to a composite deprivation measure may not be available in successive censuses. Second, the geographies for which data are released at small-area level change at each census so that, over time, comparisons are not necessarily for the same place and areal extent, even if the location has the same name (Norman and Riva, 2012). Third, the deprivation index score for an area is cross-sectional, calculated relative to the year in question, so that a score cannot be directly compared with the score for another time point to identify absolute change in deprivation. If a measure can be derived which is comparable over time, then practitioners can use that information to assess whether places are becoming more or less deprived in parallel with economic cycles and other changes such as housing development schemes.

This chapter begins with an overview of previously devised deprivation schemes and then goes on to outline the method used to develop a time-series of area deprivation for 1971 to 2011, using data from all five censuses harmonised to contemporary small-area geographies in Great Britain. Areas which are persistently deprived or advantaged over time are highlighted and trajectories of change used to reveal locations that are improving socioeconomically or becoming more deprived. Changes in population size and age structure are then analysed against this backdrop of changing deprivation. Given the view expressed by the National Statistician that

data sources other than the census should be exploited as much as possible (ONS, 2014), the chapter concludes with some thoughts on future approaches that might be adopted to identify deprivation if the 2021 Census proves to be the last.

Deprivation Measures

There is no clear-cut definition of the concept of deprivation (Carstairs and Morris, 1989) but deprivation is often taken to be a state of disadvantage relative to the local community, wider society or the nation to which an individual, family or group belongs (Townsend, 1987). People can be deprived of adequate education, housing of good quality, rewarding employment, sufficient income, good health and opportunities for enjoyment (Dorling, 1999). Multiple deprivation reflects concentrations of people in areas of 'slums, unemployment and health risks but also in their resources in terms of rateable value, the quality of their hospitals and schools and their numbers of doctors and teachers' (Holman, 1978: 37).

A major use of census data has been to determine the sociodemographic characteristics of small areas by combining a set of variables into a single, summary measure. A motivation has been to produce a deprivation index which can then be used in policy and research applications to identify and address social and economic inequalities. Despite repeated calls from academics and others, the UK Census has not included an income question (Dorling, 1999; Boyle and Dorling, 2004). For this reason, deprivation indices use proxy indicators of income and other dimensions of deprivation. Following Holtermann's (1975) identification of urban deprivation using the small-area statistics of the 1971 Census, various schemes have been developed including the Jarman Underprivileged Area index (UPA) (1983), the Townsend index (1987) and the Carstairs index (Carstairs and Morris, 1989). Official schemes include the Index of Local Conditions (DoE, 1983 and 1994). These deprivation measures have been highly influential for the allocation of public resources (Simpson, 1996; Brennan et al., 1999; Blackman, 2006) and are regularly provide explanatory variables in models of various outcomes including health (Law and Morris, 1998; Senior et al., 2000; Boyle et al., 2002; Boyle et al., 2004; Norman et al., 2005) and educational achievement (Higgs et al., 1997). Underpinned by census data but using other sources where appropriate, deprivation indices have also been developed in Australia, Canada, France, New Zealand, South Africa, the US and elsewhere (Broadway and Jesty, 1998; Eroğlu,

2006; Bell et al., 2007; Havard, 2008; Noble et al., 2010; Pornet et al., 2012; Fu et al., 2015; Norman et al., 2016).

These types of scheme use a set of variables, each of which is believed to represent a dimension of deprivation, that are then combined into a single index score. The input variables to the different schemes vary, but a deprivation indicator which is ubiquitous is unemployment (Haynes et al., 1996), with non car access, non home ownership, low social class, and household overcrowding also commonly used (Senior, 2002). The choices of which input variables to use at which geographical scale and of which method to use to combine them into a single number have all been subject to wide debate (e.g. Senior, 1991; Carr-Hill and Rice, 1995; Coombes et al., 1995; Bradford et al., 1995; Simpson, 1996; Senior, 2002). Whilst there is a lack of consensus on technical aspects, census-based index construction is generally well-understood and transparent to practitioners. Despite differences in the detail of schemes, strong correlations between indices has consistently been found (Morris and Carstairs, 1991; Mackenzie et al., 1998; Hoare, 2003).

A need for deprivation measures outside of census years, the potential for the use of administrative data sources as deprivation indicators (on the same and further dimensions than those available in the census) and the recognition that small-area census geographies may not be appropriate for technical and applied reasons has led to alternatives being explored. In the late 1990s, the then Department of the Environment, Transport and the Regions (DETR) commissioned Indices of Deprivation for England (Noble *et al.,* 2000; Noble *et al.,* 2006). Several innovations in this work are of value: a national set of small-area population estimates were produced for a post-censal year; the small-area geography used was contemporary and accounted for post-censal boundary change; and various ‘domains’ of deprivation were indicated by administrative data for a post-censal year, consistently across space and contained indicators not available in the census (e.g. income, crime, skills and training; access to services). During the 2000s, a series of updates were released, referred to as Indices of Multiple Deprivation (IMD) in England and the UK’s other constituent countries. Much of the innovation of the pre-2001 version was retained and the IMDs have become the official measures of deprivation in the UK (Norman, 2010a).

The following features of these alternative approaches are notable:Input variables are derived from post-2001 administrative records so the schemes are regularly updated;

- There are different IMDs in each of the UK countries with the different indicator variables used seen as the most relevant to each country;
- The small-area geographies used are the 'statistical' geographies of Lower layer Super Output Areas (LSOAs) in England, LSOAs in Wales, Datazones (DZs) in Scotland and Super Output Areas (SOAs) in Northern Ireland;
- A sophisticated methodology is used to produce domains of deprivation;
- Much of the usage by practitioners is based on an area's rank so has a straightforward interpretation.

However, the methodology is not as well understood as the methods used for the census based measures such as the Townsend and Carstairs schemes and there is a risk that the IMDs are used inappropriately (Adams and White, 2006). A change in rank over time does not mean that an area necessarily has different characteristics since the changing ranks depend on change in other areas.

As noted above, a drawback with the regularly used schemes, whether based on census or administrative data sources, is that they are cross-sectional, devised for one point in time. This means that the impact of a policy or a changing deprivation/outcome relationship cannot be judged if the 'before' and 'after' situations are based on deprivation measures which use time-point-specific variables, methods and geographies.

The updatability of the IMDs and range of indicators used are advantages over a purely census-based scheme but due to different variables being used at different times and because of the methodology used, the IMDs are not comparable over time. Although the range of indicator variables is more restricted than the administrative sources used in the IMDs and the time increments are once every ten years rather than more frequent, the census based schemes can be developed as long-term measures of deprivation change.

In terms of geographical coverage, the development of different IMDs for each of the UK's constituent countries helps ensure their policy relevance. However, combining the separate IMDs to a UK coverage is inappropriate and the lack of an official UK scheme is something of a weakness (Morelli and Seaman, 2007; Whynes, 2008) – a situation which has been explicitly recognised by the ONS (2010). Schemes such as the Townsend and Carstairs indices have been produced for Great Britain with data from the 1971, 1981, 1991, 2001 and 2011 Censuses and for the UK (i.e. including Northern Ireland) from the 1991, 2001 and 2011 Censuses.

The geography of the census-based deprivation indices has most commonly been the electoral wards used for the dissemination of census data, though other geographies such as 'Enumeration Districts' (EDs) and 'Output Areas' (OAs) have also been used. The statistical geographies used for the IMDs (LSOAs, DZs and SOAs, see above), having a much more even population size than wards which can vary from 500 to 20,000 (Norman et., 2007), are designed to allow the safe release of population-related data and are more numerous than electoral wards, allowing a very detailed geographic focus..

A barrier to time-series analysis of sociodemographic data is that geographical boundaries are revised regularly. Unless a consistent geographical approach is taken with a data time-series, it cannot be known whether changes in sociodemographic data collected for areas at different time points are genuine social change or an artefact of boundary changes (Norman et al., 2003). Dolan et al. (1995) and Freeman et al. (2015) look at change in small-area characteristics between 1981-91 and 2001-11 respectively but are not necessarily comparing like with like geographically due to boundary changes in the intervening periods. The geographies of census data release change over time (Norman and Riva, 2012) but conversions between geographies can be carried out to yield a harmonised set of zones (Norman et al., 2003). The small-area geographies used for the IMDs are frozen between 2001 and 2011 allowing short-term time-series analysis unaffected by boundary change. However, due to demographic change in the intercensal period, these statistical geographies were revised for outputs from the 2011 Census to maintain evenness of population size across zones. Direct comparisons of 2001 and 2011 data cannot necessarily be readily achieved.

Previous work has developed UK-coverage deprivation measures which were comparable over time 1991 to 2001 by harmonising census small-area geographies (wards in England, Wales and Northern Ireland and postal sectors in Scotland). The method is detailed in Norman (2010a), used in Norman (2010b) and Norman et al. (2011), applied for alternative geographies in Scotland by Exeter et al. (2011) and subsequently for small areas in Australia (Norman et al., 2016). The same approach was extended back in time to devise a set of comparable deprivation measures for each census from 1971 to 2001 for small areas across Great Britain. These 1971 to 2001 deprivation scores have been used to analyse changes in cancer registrations and survival (see, for example, Basta et al. 2014; Blakey et al. 2014; McNally et al. 2012, 2014a and b, 2015). Changes in deprivation have also been related to environmental equity in England (Mitchell and

Norman, 2012) and levels of air pollution in Great Britain (Mitchell et al., 2015). A UK coverage deprivation scheme prior to 1991 is, however, difficult due to differences in data availability in Northern Ireland (Norman, 2010a).

Developing a 1971 to 2011 Measure of Changing Small-area Deprivation

The aim here is to produce a deprivation index for each census 1971 to 2011 for the same set of small-area zones, so that if a score is different at each time point, this can readily be seen whether an area's deprivation reduced or increased over time. The approach is based on the Townsend index because the input variables are available in similar enough definitions at each census across Great Britain, though not for Northern Ireland (Norman, 2010a). The small areas selected for use here are the LSOAs in England and Wales and the DZs in Scotland, using 2011 boundary definitions so as to have contemporary relevance. This section describes the methods of data processing, starting with obtaining the raw input variables, then converting the data from the original census to the LSOA/DZ geographies and calculating comparable deprivation scores.

Input Deprivation Indicators

The Townsend index uses four input variables which identify levels of: unemployment (as a percentage of those who are economically active) and non-car ownership, non-home ownership and household overcrowding (each as a percentage of all households) (Senior 2002; Norman 2010a). Household overcrowding is defined as more than one person per room. The appropriate numerators and denominators have been obtained from the UK Data Service for the 1971, 1981, 1991 and 2001 Censuses and from Nomis for the 2011 Census; all for the smallest geographical areas for which data are available by year and country (EDs and OAs as appropriate).

Converting Between Geographies

The small-area geographies used for the dissemination of census data alter between censuses despite the recognition that redefining boundaries hampers time-series analysis (Norman et al., 2003). Data can be converted between zonal systems by apportioning data using the area of population overlap between different boundary systems. The weights to apportion the data can be calculated by counting unit postcodes (a proxy for population distribution) which fall in both the

source area (the zone in which the data exist) and the target area (the zone the data are need for). This geographical data conversion approach is stepped through and illustrated in both Norman et al. (2008) and Norman (2010a) for converting 1991 data to 2001 geography, while variations relating to the older censuses are detailed in Norman and Riva (2012). This method of geographical data conversion is reliable as relationships between variables are retained (Norman et al., 2003). Reliability is ensured when converting from smaller (ED/OA) to larger areas (LSOA/DZ) since, even if there is not a perfect fit, aggregating up geographical scales is less prone to the uncertainties involved in estimating from larger to smaller areas (Norman and Riva, 2012).

Conversion tables have been developed for the work reported here, which link the smallest areas relevant to each census 1971 to 2001 to the 2011 boundary definitions of the LSOAs/DZs. These tables have been used to convert the numerators and denominators of the deprivation indicator variables along with population age structure from the geography of each earlier census into the 2011 LSOAs/DZs.

Calculating Comparable Deprivation Scores

The steps involved in calculating Townsend scores on a cross-sectional basis are: obtain the raw input numerators and denominators, calculate percentages of all four variables; log transform the unemployment and over crowding variables to be (near) normal distributions; standardise all the variables so that they are all on the same scale; and sum the standardised variables (equally here; some schemes weight the inputs at this stage based on perceived important) to derive the final deprivation score. A final step categorises the scores into quantiles based on equal number of areas in each category or equal numbers of people, the latter having current support as a choice.

The method used for standardisation in a cross-sectional scheme such as Townsend is to calculate z-scores. This involves, for each area: subtracting the mean of observations of all areas from the observation for the area and then dividing by the standard deviation across all areas. In effect, a variable's value for an area is placed relative to the national level. For individual variable z-scores and when summed to single deprivation scores, a positive value represents greater deprivation in relation to the national level and negative values mean lesser deprivation.

To calculate changing deprivation over time, the method previously adopted (within the UK by Norman, 2010a; Exeter et al., 2011; and for Australia by Norman et al., 2016) has been to calculate the z-scores for each area in every year relative to the average national level over the whole time period. For example, if non-home ownership across all areas was 10% at one time point and was 5% at the next, the average rate for all areas in both years was 7.50% and the standard deviation 3.50. An area's non-home ownership rate in both years is then compared with 7.50% to determine whether its level of non-home ownership has improved or worsened during the time interval. For the deprivation indicators for the five censuses from 1971 to 2011, observations in each area and year are placed relative to the average across all areas and years. Population weighted quintiles are calculated by ranking all areas across all years and then by dividing the result into five categories of equal population size.

Once the z-scores have been summed in each year to a deprivation score, an increase or reduction of an area's score over time can be interpreted as worsening or improving deprivation. Similarly, if an area changes deprivation quintile, this has a ready interpretation. It should be noted that the categorisation of the continuous scores imposes boundary effects whereby for one area a small change in deprivation might result in a change of quintile whilst for another location a large change may find the area remaining in the same quintile. The results of adopting this approach are described in the next section.

Changing Deprivation 1971 to 2011

National Level Changes

Figure 11.1a illustrates the changing level of mean deprivation for Great Britain from 1971 to 2011. Since zero is the level with which deprivation is compared for both areas and over time, deprivation was higher in 1971 and 1981 but decreased to 1991 and then to 2001. There is a slight increase in the mean level of deprivation to 2011 but this still indicates that Great Britain is substantially less deprived in 2011 than in earlier years. There are differences between Great Britain's constituent countries (Figure 11.1b), with Scotland experiencing a much higher level of deprivation in 1971 but with the level reducing rapidly to 2001 and then with a further slight improvement by 2011. Both England and Wales follow a similar path as Great Britain as a whole, though England appears to worsen more between 2001 and 2011.

<Figure 11.1 about here>

Subnational Deprivation Changes

Table 11.1a reports correlations between census years of the time comparable deprivation scores for the LSOAs/DZs in Great Britain. The correlations between adjacent censuses are stronger than between censuses further apart in time. The correlation between deprivation in 1971 and in 2011 is 0.68 which indicates that, whilst there will be some differences in areas, the distribution of deprivation is broadly similar over time. Given that correlations between adjacent censuses become stronger over time, this implies that there was more change in the distribution of deprivation in the 1970s and 1980s than in the 1990s and 2000s.

<Table 11.1 here>

Table 11.1b has the cross-tabulation between quintiles of deprivation in 1971 and in 2011. The highlighted diagonal in the table contains counts of areas which stayed in the same quintile over time, the cells below the diagonal are those areas which became less deprived over time and the cells above the line are the areas which become more deprived. Of the 41,729 LSOAs / DZs, 21% stayed in the same quintile with 76% becoming less deprived and 3% more deprived. It is telling that 3,569 areas were in the most deprived quintile 5 at both the beginning and end of the study period. Comparing the frequency distributions of quintiles at each census time point (Table 11.1c) shows that the percentage of most deprived areas increased marginally between 1971 and 1981, decreased rapidly to 2001 and then increased a little again. The middle ground (Quintiles 2-4) saw progressive changes towards less deprived distributions by 2001 paralleled by large rises in the percentages of areas which are least deprived. Between 2001 and 2011, there are shifts downwards. In terms of capturing areas changing quintile, it should be noted that there are floor and ceiling constraints since areas in quintile 5 cannot become more deprived and areas in quintile 1 cannot become less deprived.

Continuing with the combinations of 1971 and 2011 levels of deprivation, Figure 11.2 illustrates those areas which are in the least deprived areas (Q1) in both 1971 and 2011, those areas which became more deprived and those which were in the most deprived areas (Q5) in both of these years. In the main, these differently classified areas are located in urban areas. The most striking pattern is in London and surrounding areas (Figure 2d) with the least deprived areas in

1971 and 2011 forming northern and southern crescents in the 'metropolitan green belt'. The areas becoming more deprived over time form a ring around the outer London 'suburban' boroughs and the areas most deprived at both time points are concentrated in inner London. It is interesting that Hanna and Bosetti (2015) also find outer London becoming more deprived, albeit only looking at 2001 to 2011 and for London Boroughs. Across Great Britain, the (white coloured) areas other than those mapped in Figures 2a, b and c have all become less deprived (i.e. these are the 76% of LSOAs/DZs below the diagonal in Table 1b), at least on the basis of switches between quintiles.

<Figure 11.2 about here>

In terms of which local government areas (LGAs) have small areas in these different categories, those with the highest proportions of least deprived areas (with around 20% of their LSOAs/DZs classified as least deprived in both 1971 and 2011) include Epsom and Ewell, Oadby and Wigston, Brentwood, Solihull and Mole Valley. LGAs in which high percentages (up to 100%) of their LSOAs/DZs became less deprived include Rutland, Bolsover and Newark and Sherwood in England, Moray and Aberdeenshire in Scotland and Gwynedd in Wales. London boroughs dominate those locations in which high proportions of areas become more deprived over time, headed by Enfield, Harrow and Redbridge in which over 40% of LSOAs were more deprived in 2011 than was the case in 1971. Away from London, Milton Keynes, Peterborough and Crawley had over 25% of their LSOAs more deprived by 2011 suggesting that these new / expanded towns have experienced social decline. Although founded in 1967, in 1971 Milton Keynes was still predominately a rural, non-deprived area characterised by country villages so the development of the urban area since then has been paralleled by increasing deprivation. For those LGAs with areas most deprived in both 1971 and 2011, the list is headed by London boroughs (Hackney, Tower Hamlets and Newham, for example). Elsewhere, over 35% of the DZs in Glasgow City have been persistently deprived over time (consistent with Norman et al., 2011; Exeter et al., 2011).

Population Change and Deprivation Change

For small-area planning purposes, information is needed on whether the population is growing or declining because areas with shrinking populations are often found to be in economic decline and

more deprived over time (Reher, 2007; Hollander et al., 2009; Norman, 2010b; Johansson, 2014). Since people move to different type of places at different ages (Norman and Boyle, 2014), for service planning it is also useful for know whether the population is youthful or ageing. Between 1971 and 2011 the Great Britain population grew from 54 million to over 61 million mainly due to increased longevity and net international migration gain but to a small extent from natural increase including a resurgence in births after 2001 (Tromans et al., 2008; see also Chapter 1).

Figure 11.3a illustrates population change in this period for areas classified by their deprivation quintile in 2011. This shows that the most deprived quintile 5 has a loss of population between 1971 and 2011, but with decreasing deprivation there is a progressive increase in population gain, reflecting that the growth has been in less deprived areas. This growth has been shown in other studies to be the result of net sub-national migration gain (Norman, 2010b; Norman et al., 2016) rather than natural change gain, but disaggregation by demographic component is not possible here.

<Figure 11.3 about here>

Figure 11.3b classifies the population change by the persistent and changing deprivation categories used above and including those areas whose level of deprivation does not change in the middle deprived quintiles 2 to 4. There is a net loss of population in the areas which are most deprived in both 1971 and 2011 and small net population gains in areas becoming more deprived and those which are middle deprived. The areas becoming less deprived are where there is the majority of the population growth. This will reflect both demographic and deprivation change process. People are more likely to move to less deprived circumstances when they are able to (Norman et al., 2005) and, given the relationship between mortality and deprivation, may then live longer than people in more deprived circumstances.

Figure 11.3c then illustrates both change in total population at each census and the distribution of the population across the deprivation quintiles. This shows the increase in national population, particularly since 1991. At the same time, there is a change in the distribution across deprivation quintiles between 1971 and 1991 with fewer people living in the most deprived areas and more people living in less deprived areas. Between 1991 and 2001 this continues with a marked reduction of population in the more deprived areas mirrored by increases in the less and particularly, the least deprived quintile. Whilst overall there is a slight increase in deprivation

between 2001 and 2011 (as noted above from Figure 11.1), more people are living in less deprived than more deprived locations compared with the pre-2001 era.

Figure 11.4 illustrates dependency ratios using the same two sets of geographies as in Figures 11.3a and 11.3b. Dependency ratios reveal differences in population structures by expressing the ratio of the young and the elderly to the working age population. Youth dependency ratios take the size of the 0-19 age-group relative to those aged 20-64 and elderly dependency ratios those persons aged 65 and over relative to those aged 20-64, with both expressed per 100 (Holdsworth et al., 2013). Changes in dependencies show whether populations are becoming more youthful or are aging. Figure 11.4a shows dependency ratios calculated for 1971 and 2011, classified by their deprivation quintile in 2011. In both years, youth dependencies increase with level of deprivation, showing that more deprived areas have more youthful populations, there is a large decrease in these youth dependencies between 1971 and 2011 and a flattening of the deprivation gradient. The opposite is true for elderly dependencies with less deprived areas having larger proportions of elderly relative to the working age population. These dependencies have increased between 1971 and 2011 reflecting the aging population and the negative gradient with deprivation has also increased.

<Figure 11.4 about here>

Figure 11.4b illustrates dependency ratios by persistent and changing deprivation categories. The youth dependencies show little relationship with these categories in 1971, except for the areas classified in quintile 5 in both years, and even less so in 2011. This suggests that population change of youth ages (relative to the working ages) is evenly spread across types of areas. Conversely, the elderly (relative to the working ages) are distributing away from the more and most deprived areas, which will be through both migration and premature mortality (Norman et al., 2011). The increased elderly dependencies in less and least deprived areas may be accounted for by this migration from more to less deprived areas (Norman et al., 2005) and by increasing longevity in less deprived locations (Rees et al., 2009).

The Future of Deprivation Measures

The UK's decennial census is the most comprehensive source of sociodemographic information at a range of geographical scales (especially the small-area level), but the future of the census as

a source is uncertain (Norman, 2013). Rapid population change and the need for more timely statistics increasingly drive the need for alternative methods for the collection and dissemination of population-related data in the UK. In recent decades, census taking has become more costly, while the concept of a snapshot of the population at one time point has become less relevant (Dugmore et al., 2011; Yacyshyn and Swanson, 2011). In May 2010, Sir Michael Scholar, Chair of the UK Statistics Authority (UKSA) wrote to the Minister for the Cabinet Office, 'As a Board we have been concerned about the increasing costs and difficulties of traditional Census-taking. We have therefore already instructed the ONS to work urgently on the alternatives, with the intention that the 2011 Census will be the last of its kind' (ONS, 2011). As a result, following the 2011 Census, ONS established the 'Beyond 2011' programme to assess the feasibility of using administrative statistics as an alternative to the census. Informed by Beyond 2011, the National Statistician recommended that there *will* be a 2021 Census but that the country's statistical system should be *enhanced* by greater use of administrative data (ONS, 2014). Since it can be anticipated that the variables used here to measure 1971- 2011 deprivation change will also be available in the 2021 Census, extending the time-series will be possible to that point but not beyond it.

Looking further ahead in terms of measuring deprivation, the IMD has already paved the way, given that this scheme is underpinned by administrative sources. So-called 'administrative data' are collected by government departments and other organisations for various purposes but not necessarily to count or characterise the population or for others to use in their research. There are various advantages to the use of administrative data including cost savings, relieving the burden on survey respondents and even providing data on individuals who may not normally respond to the census (such as the use of benefits data). Notwithstanding some drawbacks with the IMD already noted (specificity to each of the UK's constituent country and lack of comparability over time), there *is* a future for deprivation measures using administrative data.

The complex IMD methodology is, however, beyond the skills of many practitioners and so is hard to emulate. It is possible, though, to construct a deprivation measure from many fewer administrative variables than used in the IMD (since the IMD comprises seven domains of deprivation, each one informed by multiple variables) and calculate a deprivation score using the same approach as the Townsend or Carstairs schemes. A local scheme for Doncaster's LSOAs in 2007 has just three variables but even so a correlation of 0.96 with the IMD 2007 (D'Silva and

Norman, 2015), while one for England's LSOAs for 2001, 2006 and 2010 with only five input variables (Ajebon and Norman, 2015) also correlates highly. These less sophisticated schemes would lead to very similar conclusions being drawn about the geography of deprivation and their production is within the skillset of most practitioners.

So, can a scheme based on administrative data measure deprivation change over time? Ajebon and Norman (2015) calculate three cross-sections using equivalent data inputs although without producing time comparable scores and quintiles as used in this chapter for 1971 to 2011, but the potential is there. There are, however, some risks with using administrative data. If data have been collected by an organisation for their purposes, then there is little control by researchers regarding data collection and dissemination, whereas for census data there are extensive consultations on the topics, questions, variable definitions and the table content for data release. The nature of the administrative data released will affect what can subsequently be achieved with the source in terms of data type, variable definition and the geography for which data are available (D'Silva and Norman, 2015). There is less risk when the scheme assessing the character of areas has few variables and a simple methodology. Indeed, a scheme with just one input variable, namely the ratio of claimants of means-tested benefits to the number of households in each small area in Great Britain, has successfully been used to measure neighbourhood change annually (Gambaro et al., 2015). However, if the qualification criteria for access to the benefit were to change, there would be a lack of comparability from one year to the next.

Conclusion

There is a long track record of using the decennial census to characterise small areas by their level of deprivation, relative to the national situation. Through extensive academic debate, the pros and cons are well known about variable input applicability, methods of normalisation and standardisation and the weighting of variable combinations into single deprivation scores. As alternatives, from the late 1990s onwards, the construction of the various Indices of Multiple Deprivation (IMD) has moved away from the reliance on census data towards greater use of administrative data, with the result that more timely measures can be generated. Recently, simpler schemes than the IMD have been developed which use fewer input variables and have methodologies emulating the more traditional census-based schemes. Whilst there are

differences in the detail of outputs, generally the various deprivation schemes correlate very closely such that similar conclusions would be drawn about whether or not particular locations are relatively deprived and about relationships with other phenomena such as health (Ajebon and Norman, 2015).

A drawback with both the census-based and administrative-data-based schemes is that they are cross-sectional and only applicable close to the point in time for which they were devised. Since equivalent variables are available at small-area level for all censuses since 1971, the input variables for the Townsend scheme can be used to calculate changing deprivation over time, once the geography of data dissemination has been harmonised, as shown in this chapter. So that the measures have contemporary relevance, the older census data have been adjusted to the 2011 Lower Super Output Areas in England and Wales and the Datazones in Scotland. The resulting deprivation scores for these small areas in Great Britain are then comparable for the 1971, 1981, 1991, 2001 and 2011 Censuses such that, if a score increases or decreases for a particular area, this can be interpreted as worsening or improving deprivation over time. The results show that, in the main, areas become less deprived over time, but some areas remain persistently deprived whilst others retain their advantaged position. Few areas become more deprived but there are locations where this occurs including new and expanded towns. There are distinct patterns of change in the London area with inner London persistently deprived, the suburban areas towards the edge of Greater London becoming more deprived but these are surrounded by areas remaining non-deprived. In Glasgow, there are concentrations of some of the most deprived areas in Great Britain which persist over time.

There are caveats which should be noted about the time-series of census-based deprivation measures reported here. In terms of the input variables used in the Townsend scheme, whilst unemployment represents the same kind of personal and community-level stress over time, perhaps household overcrowding is less applicable as a deprivation indicator given very low levels for the last few censuses. Car ownership too is less of an indicator of material circumstances and more about accessibility now. This may have different meanings in rural and urban areas for which the latter will have better public transport availability than the former. Non-home ownership, too, may not be as diagnostic a deprivation indicator as it once was, with the separation of ‘social housing’ from ‘private rental’ tenure being an alternative to be explored. A simple fix with the available data is to weight the indicators, though their relative importance

would largely be subjective. The categorisation of the deprivation index into population-weighted quintiles shows clearer patterns which the continuous scores are unable to provide. However, as noted above, areas may change their level of deprivation substantially but not cross a quintile boundary or *vice versa*. It is both a strength and drawback that the comparable deprivation presented here has 10 year intervals: on the one hand, this gives long-run patterns less affected by annual fluctuations, but alternatively there is merit in adopting Hinck's (2015) approach to identify typologies of neighbourhood change on an annual basis using administrative sources which capture short-term changes as well as medium-term trends.

In sum, with the future of census taking after 2021 in doubt, the use of administrative data is becoming essential. Alternative schemes to the IMD show that simpler approaches result in similar geographies of deprivation and advantage. Simpler methods have the merit of less skilled practitioners being able to produce their own schemes and have the potential for using measures which are comparable over time and are available for smaller time increments than the decennial census. Since the IMD itself is used to formulate local policy, devising a scheme to measure change based on time-robust administrative variables is becoming essential, as also is a measure which is applicable across all four of the UK's constituent countries.

References

Adams, J. and White, M. (2006). Removing the health domain from the Index of Multiple Deprivation 2004 - effect on measured inequalities in census measure of health. *Journal of Public Health* 28(4): 379-383 doi:10.1093/pubmed/fdl061.

Ajebon, M. and Norman, P. (2015). Beyond the Census: A Spatial Analysis of Health and Deprivation in England. *GeoJournal* DOI:10.1007/s10708-015-9624-8.

Basta N.O., James P.W., Gomez-Pozo B., Craft A.W., Norman P.D., McNally R.J.Q. (2014). Survival from teenage and young adult cancer in northern England, 1968-2008. *Pediatric Blood and Cancer* 61(5) 901-6 DOI 10.1002/pbc.24939.

Bell, N., Schuurman, N. & Hayes, M. V. (2007). Using GIS-based methods of multicriteria analysis to construct socioeconomic deprivation indices *International Journal of Health Geographics* 6: 17.

Blackman, T. (2006). *Placing health. Neighbourhood renewal, health improvement and complexity.* The Policy Press: Bristol.

Blakey K, Feltbower RG, Parslow RC, James PW, Pozo BG, Stiller C, Vincent TJ, Norman PD, McKinney PA, Murphy MF, Craft AW, McNally RJQ (2014) Is fluoride a risk factor for bone cancer? Small area analysis of osteosarcoma and Ewing sarcoma diagnosed among 0-49 year olds in Great Britain, 1980-2005. *International Journal of Epidemiology* 43(1): 224-234 doi: 10.1093/ije/dyt259.

Boyle, P. and Dorling, D. (2004). The 2001 UK census: remarkable resource or bygone legacy of the 'pencil and paper era'? *Area* 36.2: 101–110.

Boyle, P., Norman, P. & Rees, P. (2002). Does migration exaggerate the relationship between deprivation and limiting long-term illness? A Scottish analysis. *Social Science & Medicine* 55: 21-31.

Boyle, P., Norman, P. & Rees, P. (2004) Changing places: do changes in the relative deprivation of areas influence limiting long-term illness and mortality among non-migrant people living in non-deprived households? *Social Science & Medicine* 58: 2459-2471.

Bradford, M. G., Robson, B. T. and Tye, R. (1995). Constructing an urban deprivation index: a way of meeting the need for flexibility. *Environment and Planning A* 27: 519-533.

Brennan, A., Rhodes, J. & Tyler, P. (1999). The distribution of SRB challenge fund expenditure in relation to local-area need in England. *Urban Studies* 36(12): 2069-2084.

Broadway, M. J., and Jesty, G. (1998). Are Canadian inner cities becoming more dissimilar? An analysis of urban deprivation indicators. *Urban Studies*, 35(9): 1423-1438.

Carr-Hill, R., and Rice, N. (1995). Is enumeration district level an improvement on ward level analysis in studies of deprivation and health? *Journal of epidemiology and community health,* 49(2), S28-S29.

Carstairs, V. and Morris, R. (1989). Deprivation: explaining differences in mortality between Scotland, England and Wales. *British Medical Journal* 299: 886-889.

Champion, T. (1989). Internal migration and the spatial distribution of population. In Joshi, H. (ed.) *The changing population of Britain.* Basil Blackwell: Oxford: 110-132.

Coombes, M., Raybould, S., Wong, C., and Openshaw, S. (1995). Towards an index of deprivation: a review of alternative approaches. *1991 Deprivation Index: A Review of Approaches and a Matrix of Results,* 1-67.

Cullingworth, J. B. and Nadin, V. (1994). *Town and Country Planning in the UK.* Routledge: London.

D'Silva S and Norman P (2015) Impacts of mine closure in Doncaster: an index of social stress. *Radical Statistics* 112: 23-33.

Denham, C. J. and D. W. Rhind. (1983). 'The 1981 Census and its results'. In Rhind, D., (ed.) *A census users handbook.* Methuen, London: 17-88.

DoE. (Department of the Environment) (1983). *Urban Deprivation: Information Note 2, Inner Cities Directorate.* Department of the Environment: London.

DoE. (Department of the Environment) (1994). *A 1991 Index of Local Conditions.* Department of the Environment: London.

Dolan, S. A., Jarman, B., Bajekal, M., Davies, P. M., and Hart, D. (1995). Measuring disadvantage: changes in the underprivileged area, Townsend, and Carstairs scores 1981-91. *Journal of epidemiology and community health*, 49(Suppl 2), S30-S33.

Dorling, D. (1999). Who's afraid of income inequality? *Environment and Planning A*: 31 571-4.

Dugmore, K., Furness, P., Leventhal, B. and Moy, C. (2011). Beyond the 2011 Census in the United Kingdom. *International Journal of Market Research*, 53(5), 619-650

Eroğlu, S. (2007). Developing an index of deprivation which integrates objective and subjective dimensions: extending the work of Townsend, Mack and Lansley, and Halleröd. *Social indicators research*, 80(3), 493-510.

Exeter D J, Boyle P J and Norman P (2011). Deprivation (im)mobility and cause-specific premature mortality in Scotland. *Social Science and Medicine* 72: 389-397

Freeman, L., Cassola, A., and Cai, T. (2015). Displacement and gentrification in England and Wales: A quasi-experimental approach. *Urban Studies*, 1-18 DOI: 10.1177/0042098015598120.

Fu, M., Exeter, D. J., and Anderson, A. (2015). 'So, is that your 'relative' or mine?' A political-ecological critique of census-based area deprivation indices. *Social Science and Medicine* 142: 27-36

Gambaro, L., Joshi, H., Lupton, R., Fenton, A., and Lennon, M. C. (2015). Developing Better Measures of Neighbourhood Characteristics and Change for Use in Studies of Residential Mobility: A Case Study of Britain in the Early 2000s. *Applied Spatial Analysis and Policy*, DOI 10.1007/s12061-015-9164-0

Hanna, K. and Bosetti, N. (2015) Inside out: the new geography of wealth and poverty in London. Centre for London. [Accessed January, 2016]. Available from http://centreforlondon.org/publication/inside-out-the-new-geography-of-wealth-and-poverty-in-london-2/

Havard, S., Deguen, S., Bodin, J., Louis, K., Laurent, O. & Bard, D. (2008). A small-area index of socioeconomic deprivation to capture health inequalities in France. *Social Science & Medicine* 67(12): 2007-2016.

Haynes, R., Gale, S., Lovett, A. and Bentham, G. (1996). Unemployment rate as an updatable health needs indicator for small areas. *Journal of Public Health Medicine* 18(1): 27-32.

Higgs, G., Senior, M. L. & Williams, H. C. W. L. (1998). Spatial and temporal variation of mortality and deprivation 1: widening health inequalities. *Environment & Planning A* 30(9) 1661-1682.

Hincks, S. (2015) Deprived neighbourhoods in transition: Divergent pathways of change in the Greater Manchester city-region. *Urban Studies* DOI: 10.1177/0042098015619142

Hoare, J. (2003). Comparison of area-based inequality measures and disease morbidity in England, 1994-1998. *Health Statistics Quarterly* 18, 18-24.

Holdsworth, C., Finney, N., Marshall, A., Norman, P. (2013). *Population and Society.* London: Sage Publications Ltd.

Hollander, J. B., Pallagst, K., Schwarz, T., Popper, F. J. (2009). Planning shrinking cities. *Progress in Planning*, 72(4), 223-232.

Holman R. (1978). *Poverty: explanations of social deprivation.* Martin Robertson: London

Holtermann, S. (1975). Areas of urban deprivation in Great Britain: an analysis of 1971 Census data. *Social Trends* 6: 33-45.

Jarman, B. (1983). Identification of Underprivileged Areas. *British Medical Journal* 286: 1705-9.

Johansson, M, (2014). Demographic Trends in Rural Europe. In A.K. Copus, P. de Lima (Eds.), *Territorial Cohesion in Rural Europe: The Relational Turn in Rural Development* (pp. 99-125). Abingdon: Routledge.

Law, M. R. & Morris, J. K. (1998). Why is mortality higher in poorer areas of England and Wales? *Journal of Epidemiology and Community Health* 52: 344-352.

Mackenzie, I. F., Nelder, R., Maconachie, M. and Radford, G. (1998). My ward is more deprived than yours. *Journal of Public Health Medicine* 20: 186-90.

McNally, R.J.Q, Basta, N.O, Errington, S, James, P.W., Norman, P.D., Hale, J.P. and Pearce, M.S. (2015) Socio-economic patterning in the incidence and survival of boys and young men diagnosed with testicular cancer in northern England. *Urologic Oncology: Seminars and Original Investigations* http://dx.doi.org/10.1016/j.urolonc.2015.07.014

McNally, R.J.Q., Basta, N.O., Errington, S., James, P.W., Norman, P.D. and Craft, A.W. (2014a) Socio-economic patterning in the incidence and survival of children and young people diagnosed with malignant melanoma in northern England. *Journal of Investigative Dermatology* 134(11):2703-2708 doi:10.1038/jid.2014.246

McNally, R.J.Q., Blakey, K., Parslow, R.C., James, P.W., Pozo, B.G., Stiller, C., Vincent, T.J., Norman, P., McKinney, P.A., Murphy, M.F., Craft, A.W., and Feltbower, R.G. (2012) Small area analyses of bone cancer diagnosed in Great Britain provide clues to etiology. *BMC Cancer* 12: 270 doi:10.1186/1471-2407-12-270

McNally, R.J.Q., James, P.W., Ducker, S., Norman, P.D., James, O.F.W. (2014b) No rise in incidence but geographical heterogeneity in the occurrence of Primary Biliary Cirrhosis in northeast England. *American Journal of Epidemiology* 179(4):492-498

Mitchell, G. and Norman, P. (2012). Longitudinal environmental justice analysis: Co-evolution of environmental quality and deprivation in England, 1960-2007. Geoforum 43: 44-57 doi:10.1016/j.geoforum.2011.08.005.

Mitchell, G., Norman, P. and Mullin, K. (2015). Who benefits from environmental policy? An environmental justice analysis of air quality change in Britain, 2001-2011. *Environmental Research Letters* doi:10.1088/1748-9326/10/10/105009.

Morelli, C. and Seaman, P. (2007). Devolution and inequality: a failure to create a community of equals? *Transactions of the Institute of British Geographers* 32(4): 523–538.

Morris, R. and Carstairs, V. (1991). Which deprivation? A comparison of selected deprivation indices. *Journal of Public Health Medicine* 13(4), 318–326.

Noble, M., Barnes, H., Wright, G., and Roberts, B. (2010). Small area indices of multiple deprivation in South Africa. *Social Indicators Research,* 95(2), 281-297.

Noble, M., Penhale, B., Smith, G., Wright, G., Dibben, C., Owen, T. and Lloyd, M. (2000). *Measuring Multiple Deprivation at the Small Area Level: the Indices of Deprivation 2000*. DETR: London.

Noble, M., Wright, G., Smith, G. and Dibben, C. (2006). Measuring multiple deprivation at the small-area level. *Environment and Planning A* 38: 168-185.

Norman, P, Boyle, P. and Rees, P. (2005) Selective migration, health and deprivation: a longitudinal analysis. *Social Science and Medicine* 60(12): 2755-2771

Norman, P, Boyle, P., Exeter, D., Feng, Z. and Popham, F. (2011) Rising premature mortality in the UK s persistently deprived areas: Only a Scottish phenomenon? *Social Science and Medicine* 73 1575-1584 doi:10.1016/j.socscimed.2011.09.034

Norman, P. (2010a) Identifying change over time in small area socio-economic deprivation. *Applied Spatial Analysis and Policy* 3(2-3) 107-138

Norman, P. (2010b) Demographic and deprivation change in the UK, 1991-2001. In *Understanding Population Trends and Processes Volume 2: Spatial and Social Disparities* (eds.) John Stillwell, Paul Norman, Claudia Thomas and Paula Surridge. Springer: Dordrecht: 17-35

Norman, P. (2013) Whither / wither the census? *Radical Statistics* 106: 13-17

Norman, P. and Boyle, P. (2014) Are health inequalities between differently deprived areas evident at different ages? A longitudinal study of census records in England and Wales, 1991-2001. *Health and Place* 26:88-93 http://dx.doi.org/10.1016/j.healthplace.2013.12.010

Norman, P. and Riva, M. (2012) Population health across space and time: the geographical harmonisation of the ONS Longitudinal Study for England and Wales. *Population, Space and Place* 18: 483-502 DOI: 10.1002/psp.1705

Norman, P., Charles-Edwards, E. and Wilson, T. (2016) Relationships between population change, deprivation change and health change at small area level: Australia 2001-2011. In *Demography for Planning and Policy: Australian Case Studies* (eds) Tom Wilson, Elin Charles-Edwards and Martin Bell: Springer: Dordrecht: 197-214

Norman, P., Purdam, .K, Tajar, A. and Simpson, L. (2007) Representation and local democracy: geographical variations in elector to councillor ratios. *Political Geography* 26 57-77

Norman, P., Rees, P. and Boyle, P. (2003). Achieving data compatibility over space and time: creating consistent geographical zones. *International Journal of Population Geography* 9: 365-386.

Norman, P., Simpson, L. and Sabater, A. (2008) Estimating with Confidence and hindsight: new UK small area population estimates for 1991. *Population, Space and Place* 14(5): 449-472

ONS (2010) *Comparing across Countries' Indices of Deprivation: Guidance Paper.* Office for National Statistics. [Accessed December, 2015]. Available from http://www.neighbourhood.statistics.gov.uk/dissemination/Info.do?page=analysisandguidance/analysisarticles/indices-of-deprivation.htm

ONS (2011). Beyond the 2011 Census Project. Office for National Statistics. [Accessed September, 2015]. Available from: http://www.ons.gov.uk/ons/about-ons/what-we-do/programmes---projects/beyond-2011/index.html.

ONS (2014). *The Census and Future Provision of Population Statistics in England and Wales: Recommendation from the National Statistician and Chief Executive of the UK Statistics Authority*. [Accessed December, 2015]. Available from http://www.ons.gov.uk/ons/about-ons/what-we-do/programmes---projects/beyond-2011/index.html.

Pornet, C., Delpierre, C., Dejardin, O., Grosclaude, P., Launay, L., Guittet, L., ... and Launoy, G. (2012). Construction of an adaptable European transnational ecological deprivation index: the French version. *Journal of epidemiology and community health*, 66(11), 982-989.

Rees P, Wohland P and Norman P (2009) The estimation of mortality for ethnic groups at local scale within the United Kingdom. *Social Science and Medicine* 69: 1592–1607

Reher, D.S. (2007). Towards long-term population decline: a discussion of relevant issues. *European Journal of Population*, 23(2), 189-207.

Robinson, G. M. (1998). *Methods and techniques in human geography.* John Wiley and Son Ltd. Chichester.

Rydin, Y. (1993). *The British planning system: an introduction.* Macmillan: Basingstoke.

Senior, M. (1991). Deprivation payments to GPS: not what the doctor ordered. *Environment and Planning C* 9: 79-94.

Senior, M. L. (2002). Deprivation indicators. In *The Census Data System* edited by Rees P, Martin D and Williamson P. John Wiley: Chichester; 123-137.

Senior, M., Williams, H. & Higgs, G. (2000). Urban-rural mortality differentials: controlling for material deprivation. *Social Science & Medicine* 51, 289-305.

Simpson, S. (1996). Resource allocation by measures of relative social need in geographical areas: the relevance of the signed chi-square, the percentage, and the raw count, *Environment and Planning A* 28: 537-554.

Townsend, P. (1987). Deprivation. *Journal of Social Policy* 16: 125-46.

Tromans N, Natamba E, Jefferies J and Norman P (2008) Have national trends in fertility between 1986 and 2006 occurred evenly across England and Wales? *Population Trends* 133: 7-19.

Ward, S. (1994). *Planning and urban change.* Paul Chapman: London.

Whynes, D. K. (2008). Deprivation and self-reported health: are there 'Scottish effects' in England and Wales? *Journal of Public Health* 31(1): 147-153.

Yacyshyn, A.M., and Swanson, D.A. (2011) *The costs of conducting a national census: rationale for re-designing current census methodology in Canada and the United States.* [Accessed January 2016]. Available from http://cssd.ucr.edu/Papers/PDFs/Yacyshyn_Swanson_JOS_Aug26_2011.pdf

Table 11.1: Relationships between area deprivation in Great Britain over time

a) Correlations between deprivation scores at each census time point

	1981	1991	2001	2011
1971	0.86	0.79	0.74	0.68
1981		0.91	0.85	0.80
1991			0.92	0.90
2001				0.94

b) Crosstabulations between 1971 and 2011 deprivation quintiles

		2011					
		Q1	Q2	Q3	Q4	Q5	Total
1971	Q1	670	75	12	3	3	763
	Q2	4,050	951	229	74	13	5,317
	Q3	5,562	3,294	1,321	505	53	10,735
	Q4	2,659	3,501	3,298	2,104	498	12,060
	Q5	849	1,412	2,674	4,350	3,569	12,854
	Total	13,790	9,233	7,534	7,036	4,136	41,729
Between 1971 and 2011		Least deprived	Less deprived	Same deprived	More deprived	Most Deprived	

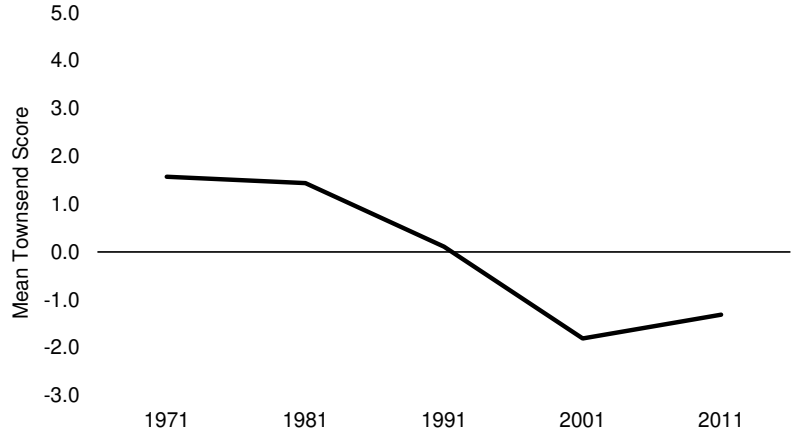
c) Frequencies of areas within each quintile at each census

	1971	1981	1991	2001	2011
Q1	2%	6%	15%	39%	33%
Q2	13%	18%	25%	23%	22%
Q3	26%	22%	20%	17%	18%
Q4	29%	22%	19%	14%	17%
Q5	31%	33%	21%	7%	10%
Total	100%	100%	100%	100%	100%

Note: Q1 = least deprived quintile; Q5 = most deprived quintile

Figure 11.1: Changing national level deprivation: 1971-2011

a) Mean Townsend Score: Great Britain



b) Mean Townsend Score: England, Wales and Scotland

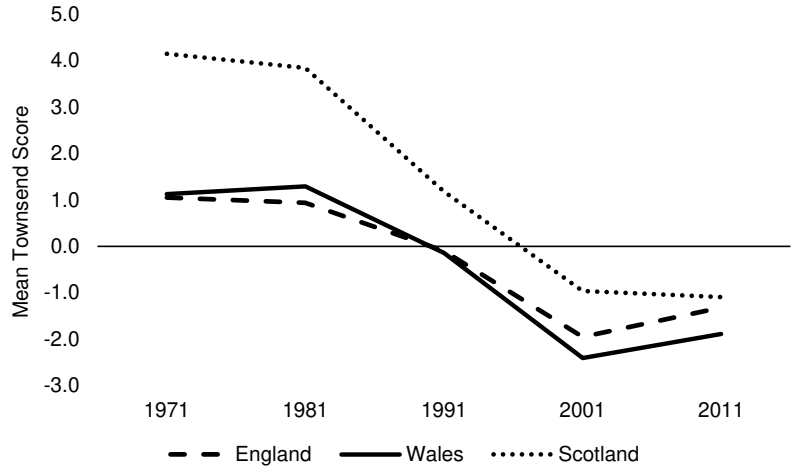
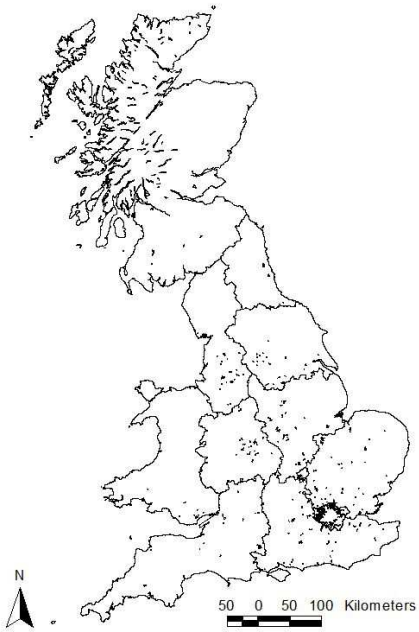


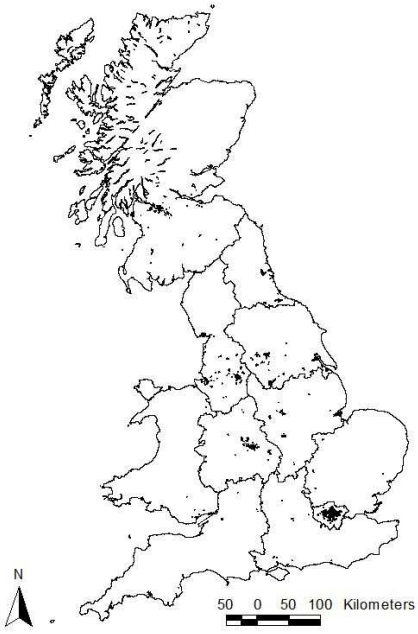
Figure 11.2: Persistent and changing levels of deprivation: 1971 and 2011

a) Areas staying least deprived

b) Areas becoming more deprived

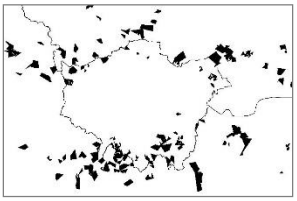


c) Areas staying most deprived

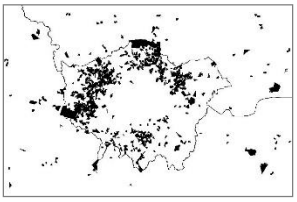


d) London and surrounding area

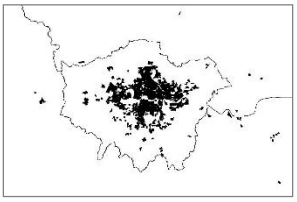
Least Deprived



More Deprived



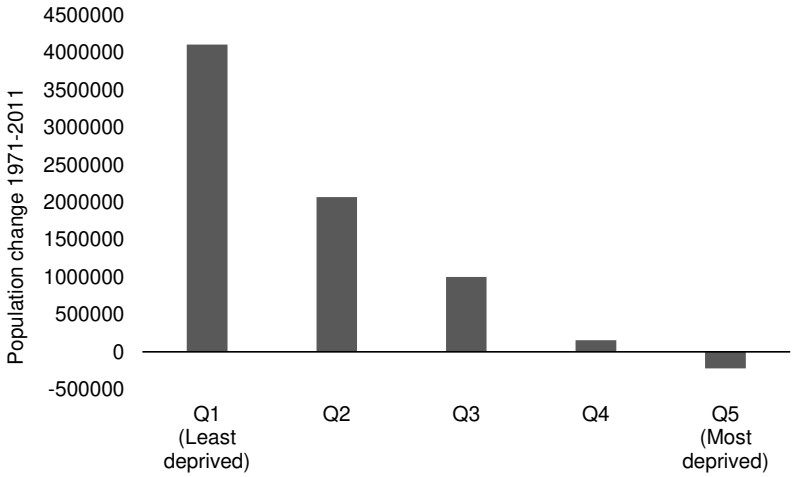
Most deprived



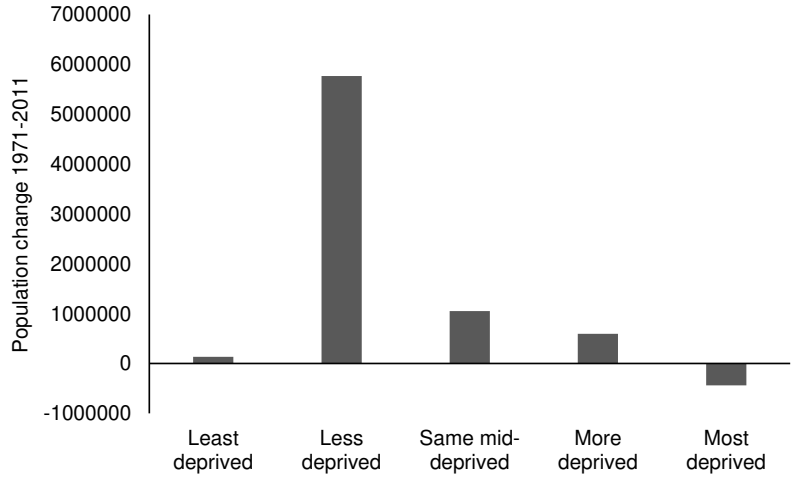
Note: The boundaries shown are the Government Office Regions in England and the countries of Wales and Scotland

Figure 11.3: Changing population and deprivation: 1971 to 2011

a) Population change by the 2011 deprivation quintiles



b) Population change by persistent and changing deprivation



c) Population distribution by deprivation quintile

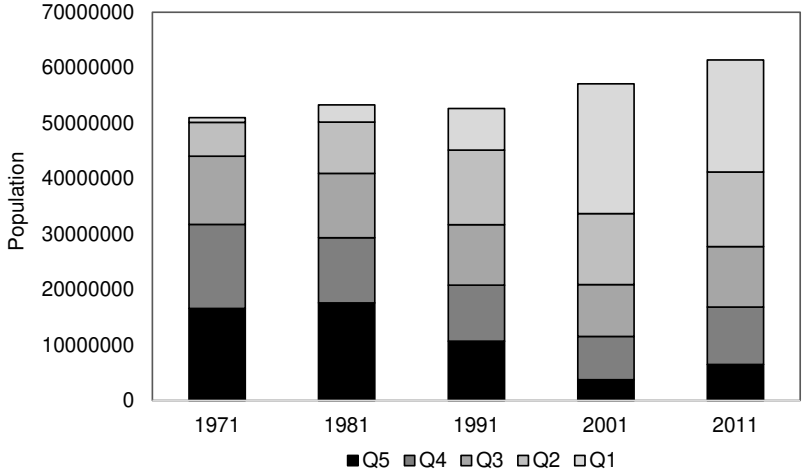
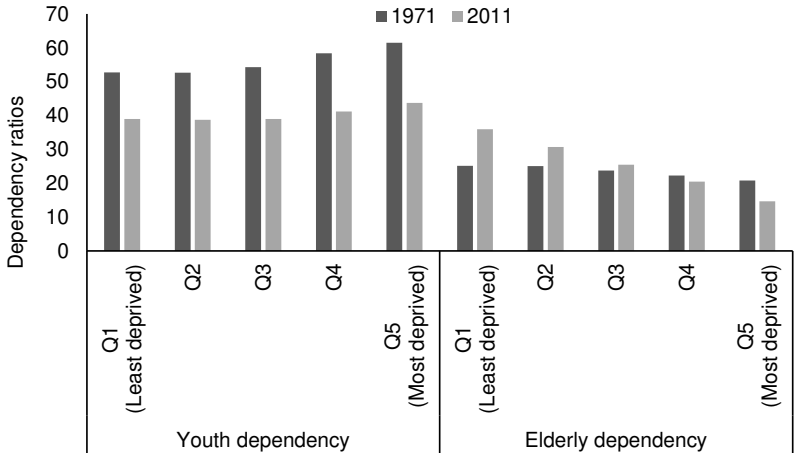


Figure 11.4: Changing dependency ratios and deprivation: 1971 to 2011

a) Dependency ratios by the 2011 deprivation quintiles



b) Dependency ratios by persistent and changing deprivation