

REFERENCE No. RES-163-25-0012

ESRC Understanding Population Trends and Processes

Micro-geography of UK demographic change 1991-2001

Paul Norman, December 2007

Background

Change in population composition occurs through ageing, births and deaths and through migration between areas with different migration patterns for people of different ages. In some areas, people tend to age *in situ*; others have more transient populations. There is a need for population counts by age, sex and other demographic detail by geographic area (Simpson 1998; Rees *et al.* 2004). This need relates to: i.) monitoring social trends in which populations provide denominators; ii.) distribution of financial resources; iii.) investment of resources and statistical backing for funding bids; iv.) development of area typologies such as deprivation indexes; v.) assessment of demand for housing, schooling, employment, services, pensions; and vi.) the size and characteristics of catchment populations for business marketing.

To provide counts of people by area and the time point(s) for which data are needed we can: i.) carry out a census or survey; or ii.) remotely estimate or forecast a population. In the UK, we use a combination of censuses, surveys and estimates and forecasts and, without a national population register, utilise input data from Vital Statistics (births and deaths) and other administrative records. The convention is for population counts to relate to the mid-year, 30th June. For the 1990s, official sources provide data for local authority districts but many applications need data for smaller areas.

This UPTAP project aimed to address this small area data need and to analyse population change during the 1990s. To achieve this, fundamental data issues needed to be addressed which otherwise prohibit the derivation of time-series for small area socio-demographic statistics. Prior to this project, population-related data directly comparable in both 1991 and 2001 were not available for areas smaller than local authority districts. This lack of comparability relates to changes in census and administrative geographies which occurred during the intercensal period, to inconsistencies over time in census questions and data detail and to adjustments made to official estimates 1991 onwards after the 2001 Census was released.

Aims and objectives

This project aimed to: a.) quantify and map changes in population size and social characteristics which occurred in small geographical areas across the UK between the 1991 and 2001 Censuses; b.) calculate the components of demographic change to better understand the relative contributions of natural change and migration; c.) calculate deprivation indexes and identify areas becoming differently

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deprived over time and; d.) analyse 1991-2001 change in rates of unemployment, health and housing tenure. Analyses based on these calculations would inform on locations where the population is ageing or more transient, along with small area trends in health.

To achieve these aims, the objectives were to: 1.) create a 'gold standard' socio-demographic time-series of data for 1991 and 2001 for small geographical areas; 2.) decompose, characterise and map changes in population structure and area socio-demographic characteristics; 3.) provide innovative interpretation of population trends and processes underlying polarisation, counter-urbanisation and deprivation alleviation; and 4.) enhance the statistical and analytical skills of the applicant and build on a recently established publication record.

During the funding period, objectives 1 and 2 were met and underpinned achieving aims a, b and c. Thus, the project's data estimation phase was entirely successful with a set of small area age-sex disaggregate populations produced for small areas across the whole of UK alongside data on births and deaths, population change, net migration counts and area characteristics (deprivation scores and urbanisation measures) for 7,958 wards in England, 881 wards in Wales, 1,010 postal sectors in Scotland and 582 wards in Northern Ireland. All data produced are for 1991 and 2001 and are comparable and consistent in variable definition and geography. Each small area is linked to higher geographies in which each lay: the local authority (LA) including LA types; Government Office Region and country. Negotiations are ongoing to deposit data with the Data Archive.

It was expected at the project outset (over two years, 40% of my time) that the creation of these population resources would need a large amount of time and this would be disproportionate compared with interpretive elements. However, putting together this database took substantially longer than originally anticipated due to delays in data supply, data quality issues and to some extent the distractions of a change of institution and new responsibilities. Thus, with regard to objectives 3 and 4 and aim d, the analytical and interpretive elements and publication plans were not as far developed as I would have liked by the end of the award period. Nevertheless, conference and seminar presentations of results-related aspects have been given over the last few months and papers are part written. Further presentations and writing to which I am committed will ensure these aims and objectives and original communication plans are met over the next few months.

Methods

Context. To achieve the project aims there was a need for demographic and population information to be consistent for both 1991 and 2001 across the UK. Prior to analyses being possible, extensive estimation was carried out to ensure data were comparable across space and time. Whilst methodological developments were not a focus of the UPTAP initiative, this research applied, updated

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and extended methods previously developed under ESRC funding: the 'Updated UK Area Masterfiles' project (H507255164).

The UPTAP programme does aim to add value to ESRC investments in the collection and promotion of large-scale datasets. This study utilised 1991 and 2001 Census data, vital statistics, GIS digital boundaries and postcode directories and during the project I liaised with ESRC-funded support units including Census, ESDS Government, UKBORDERS and Data Archive. A major data input were populations from the 'Estimating With Confidence' (EwC) project funded in the 1990s by ESRC (H519255028) and needing updating. I am negotiating with the Data Archive to deposit the revised EwC data and this is an important project output. The principal data sources underpinning this project were:

- Census area statistics for 1991 and 2001 provided age-sex counts, plus variables on illness, tenure, unemployment, non-car ownership and household overcrowding. These are for use in rate and deprivation index calculations;
- 'Estimating with Confidence' small area populations for 1991 and components which enhanced the 1991 Census population data to be a 1991 mid-year estimate;
- Mid-year subnational population estimates (1991 and 2001). These provided official estimates of population to which the small area populations in this project are made consistent. 2001 CAS ward estimates are provided by ONS for England and Wales with equivalents calculated here for Scotland and Northern Ireland;
- Vital Statistics on births and deaths (between 1990 and 2002) underpinned the calculation of natural change and fertility and mortality rates;
- GIS digital boundaries relevant to the 1991 and 2001 Census and administrative geographies;
- National Statistics Postcode Directories.

The frameworks and methods being used to analyse the information in the population resources database are outlined at the end of this methods section.

Context-specific data issues being addressed. To monitor trends or identify differences in the size and characteristics of sub-national populations, analysis of change over time between the UK's decennial censuses is needed. Successive censuses must be comparable but this is not necessarily the case due to many inherent problems (Norris and Mounsey, 1983; Norman, 2006). Direct comparisons of 1991 and 2001 demographic characteristics are severely hampered because:

- The small area geographies of the 1991 and 2001 Censuses are markedly different;
- Population definitions, attributes and variable information may be inconsistently available;
- Social area classifications such as deprivation indexes are time-point specific;
- The UK's census data are high quality but adjustments were made to counts from both the 1991 and 2001 Censuses following their initial release.

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Thus, at the project outset, population-related data directly comparable in both 1991 and 2001 were not available for areas smaller than local authority districts. The sections following detail methods used to: i.) harmonise geographies; ii.) re-estimate 1991 mid-year populations; and iii.) harmonise variable information and calculate deprivation scores. In iv.) methods of analysis are outlined.

i.) Harmonising geographical information. The UK experiences more boundary changes over time than the rest of Europe put together (ONS 2003) with ward boundaries regularly adjusted in response to population change and local government structure revised in the 1990s (Norman *et al.*, 2007a). Unless a consistent geographical approach is taken with time-series data we cannot know whether population changes for areas are real or due to boundary change. Along with Simpson (2002), I have been at the forefront of devising generic methods to convert between different geographical systems and thereby establish time-series data on a consistent basis in the face of boundary changes over time (Norman *et al.*, 2003). This research required data originally disseminated for areas used for the 1991 Census to be converted and compatible with the 2001 Census geography and extends previous work. N.B. ESRC funding underpinned the ‘Convert’ website which automated this procedure. 1991-2001 conversions were not available in Convert and an update, ‘GeoConvert’, only came online in July 2007 and does not appear to have the quality assurance of Convert.

To achieve the geographical harmonisation, directories linking postcodes to other geographical areas inform ‘Geographical Conversion Tables’ which are used to adjust population-related data from the ‘source’ geography in which data pre-exist to the ‘target’ geography, the zonal system for which data are needed. The assumption is that distributions of residential postcodes proxy population distributions. Counts of address-weighted postcodes in the overlaps between source and target geographies are used to calculate conversion weights. Norman (2006) describes and illustrates this geographic data conversion method.

At the project outset, the National Statistics Postcode Directory (NSPD) (available from UKBORDERS) was expected to provide source to target links between the smallest geographical areas of the 1991 and 2001 Censuses, Enumeration Districts (EDs) and Output Areas (OAs) and thereby capture small area variations in socio-demographic distributions (though project analyses will report on wards). Test conversions within England and Wales using this source produced nonsensical results in some areas. Examination of apparently problem conversions indicated that some EDs and OAs were non-overlapping even though postcodes apparently linked these geographies. Investigations of documentation and consultation with academics including Ludi Simpson (Manchester) and Dave Martin (Southampton) determined that possible error sources included: postcodes were clerically assigned to EDs and some may have originally been incorrect; time-related attrition as subsequent postcode directories were issued; and postcodes may have ‘moved’ over time as Royal Mail

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reassigned them or new housing is built. Postcodes are linked to OAs differently using their centroid grid reference and the GIS point-in-polygon (PiP) function.

An alternative approach was taken to link postcode locations. GIS boundaries for 1991 EDs and 2001 OAs (from UKBORDERS) were mapped with 1991 residential postcodes in the NSPD located as points using their grid reference. Postcodes were linked to both EDs and OAs using the GIS PiP function. Unfortunately, test conversions based on the links derived in this way also produced nonsensical results in some areas (different to the NSPD linked areas). Investigations determined that some ED polygons had incorrect alphanumeric codes. Further consultation revealed that several copies of the ED boundary files have existed since first digitised in the 1990s and they are not error free including the copy at UKBORDERS (who have been informed). Extensive data cleaning was needed before reliable geographical conversions could be made.

The above problems were unexpected and making corrections time-consuming. The conversions of raw data needed to be completed before any other work could proceed. N.B. The difficulties reported here relate to small areas in England and Wales and not Scotland or Northern Ireland where the postcode and GIS files were closely aligned with test data conversions consistent in result. Consultations during this work with ONS about boundary changes during the 1990s and the methods used to convert local authority data from pre- to post-1998 definitions were slow and ultimately uninformative. Norman *et al.* (2007b) describes and illustrates the method of conversions between ED and OA geographies.

ii.) Re-estimating 1991 mid-year populations. Even after imputation of missing households, the UK's 1991 Census counts were lower than expected. In the 1990s, the ESRC-funded Estimating with Confidence project distributed official non-response data for LA districts on a small area-specific basis as a set of components to allow for underenumeration, timing changes between census day and mid-year and student address and armed forces adjustments (Simpson *et al.*, 1997). The EwC-enhanced census counts were accepted as the 'gold standard' for mid-1991 small area populations and were widely used in research. Following the 2001 Census, evidence suggested that previous official upward adjustments to 1991 populations were too large. Revisions were retrospectively made by ONS and GROS to 1991 non-response and to the official annual time-series of subnational mid-year population estimates but only 1992 onwards by the Northern Ireland Statistics and Research Agency (NISRA).

These revisions to estimated non-response in districts imply that the 1991 non-response component previously estimated by EwC for sub-district areas in England, Wales and Scotland should also be revised. In collaboration with CCSR colleagues Ludi Simpson and Albert Sabater, we determined that the non-response revisions should not be achieved by a simple scaling of each 1991 small area EwC

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population estimate using the proportion by which each district was later revised. This is because the original EwC estimates distributed non-response information differentially with more allocated to areas where census enumeration was more difficult. A revision of small area populations should re-distribute the non-response allowance, scaling the EwC allowance on a small area-specific basis by the proportion which the district allowance changed post-2001. The method used to revise the original EwC 1991 small area populations and adjustment components is detailed in nominated output Norman, Simpson and Sabater (2007b) but comprised the following broad steps:

- a.) ED level EwC components including age-sex detail were constrained to the 1991 ward component total;
- b.) ED components were converted to the 2001 OA geography;
- c.) OA components were summed to districts to provide an original 2001 LA estimate;
- d.) The difference between the original and official revised estimates was used to indicate the size of the revision to the official undercount revision at district level;
- e.) The small area non-response was scaled by the LA non-response revised : original ratio;
- f.) The components were summed to give the revised 1991 mid-year estimate. Then, more detailed age information was estimated than originally disseminated by the EwC project.

The small area mid-year populations estimated during this work are directly comparable with 2001 small area estimates by population definition and geography thereby enabling sub-district population change over the decade to be calculated. I am currently negotiating with the Data Archive to deposit the revised EwC estimates for use by other researchers. N.B. The estimation phase of this project was delayed because 1990-91 Vital Statistics supplied by ONS and allocated to the 2001 OAs contained errors and the data re-supply took many months as the section carrying out this work at ONS transferred from London to Newport.

iii.) Harmonising variable information and calculating deprivation scores. These aspects are reported together since the data preparation considerations are the same. The variables here relate to Vital Statistics (VS) on births and deaths and the 1991 and 2001 Census data needed as inputs for area deprivation calculation. An urban-rural measure is also developed. The demographic and population attribute information need to be consistently defined over time so that change can be identified. At the project outset, the harmonisation of the VS data was not thought to present any problems because the national statistic agencies had all committed to supply data to the required demographic and geographic specification. Whilst GROS and NISRA supplied data promptly and to specification, as noted above, ONS needed to re-supply data and this took a long time.

After reviewing different schemes and the availability of input variables and their applicability over time, the deprivation scheme developed here was the Townsend index (Townsend, 1987). The Townsend index is a composite score comprising four census input variables: percentages of

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unemployment, overcrowding (more than 1 person per room), non-car ownership and non-home ownership. To calculate comparable scores for all wards in England, Wales, Scotland and Northern Ireland for both 1991 and 2001, the raw data were obtained from CASWEB and harmonised in terms of both variable detail and geography. The appropriate numerators and denominators for 1991 were converted to the 2001 geography.

When devising the household overcrowding variable, an error was found on CASWEB. Whilst the labelling of the 'persons per room' table in Northern Ireland was consistent with equivalent tables for England, Wales and Scotland, data checks and consultation with NISRA determined that counts of persons per room were disseminated in different categories in 1991. NISRA kindly supplied a paper copy of data in categories equivalent to the rest of the UK which were manually input to the files. Justin Hayes at MIMAS has now revised the labelling of Northern Ireland Table SAS 23 on persons per room but the categories on CASWEB are inconsistent with GB.

Townsend deprivation scores were calculated for all wards across UK. The SPSS syntax I devised for this is posted on MIMAS along with 2001 deprivation scores for England and Wales wards calculated part way through this work. See: <http://cdu.census.ac.uk/2001/help/faq.htm#deprivation>

Conventionally, Townsend scores (and other area measures) are time-point specific. Observations for wards for each input variable are expressed relative to that variable's national rate (using z scores), e.g. a ward's unemployment rate is relative to UK unemployment rate. This project aimed to identify change between time-points. To achieve this, numerators and denominators of the four input variables for the 10,431 wards in both 1991 and 2001 were stacked in one file. Thus, when calculating deprivation, for each ward, rates in both 1991 and 2001 of each variable are expressed relative to the UK 1991-2001 average of that variable. The resulting Townsend scores are then comparable so that if an area changed from a (relatively deprived) score of +6 in 1991 to +5 in 2001 then, according to the composite of the input variables, the area became less deprived over time.

Many studies stratify results by deprivation quintiles. Quintiles may be equal numbers of areas in each fifth of the total number of areas or equal numbers of population in each fifth of the total population. These are referred to here as ward quintiles (WQs) and population weighted quintiles (PWQs), the latter more often used recently. Expressing results by differently defined quintiles can produce different results (perhaps only subtly). The Townsend scores have been divided into quintiles across the 1991-2001 distribution of both wards (c. 4,170 wards in each WQ quintile) and population (c. 23 million people in each PWQ quintile). Social change over time can now be analysed by quintile.

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A variety of urban-rural indicators have been produced since 1991 and interest remains in differentiating population-related aspects, e.g. migration and health inequalities, between town and countryside. Schemes which measure urbanicity tend to be country, time-point and application-specific and may not allow investigations of change over time across the UK. Whilst area population density is not an ideal urban-rural indicator, persons per hectare (PPH) can be consistently measured in both 1991 and 2001. The PPH for each ward has been calculated and categorised using an OECD scheme: Most Urban (>35 PPH); Very Urban (25–35 PPH); Suburban (13–25 PPH); Semi-Rural (2–13 PPH); and Rural (<2 PPH).

iv.) Methods of analysis using the population resources database. Using the population resources detailed above, the following methods, have been (will be) used to analyse various aspects.

1991-2001 population change: analyses will inform on

- Fertility using: counts; crude birth rates; and indirectly standardised birth rates;
- Mortality using: counts; crude mortality rates; and indirectly standardised mortality rates;
- Natural change using: births minus deaths; crude rate of natural increase;
- Population change using: total change; percentage change;
- Net migration using: residue of population change and natural change;
- Relative contributions of natural change and migration using: counts and percentages; stratified using the Webb Index;
- Age structure change using: population-weighted average age; dependency ratios; absolute numbers and percentages of elderly.

1991-2001 deprivation change: analyses will inform on

- Overall changes at national level of the input variables;
- Identifying wards which change quintile; differentiating non-deprived and deprived wards whose scores increase or decrease;
- For wards which change: identifying which of the input variables changes; determining local information about housing change, employment and industry change or regeneration projects;
- Relating population change and health change to deprivation change.

Geographical hierarchy: to stratify results for wards by

- Government Office Region (GOR) thereby differentiating Wales, Scotland and Northern Ireland and nine GORs in England;
- Local authority type using both the old OPCS scheme applied to 2001 LAs and the latest ONS classification;
- Ward results classified by deprivation quintile (PWQs) and by persons per hectare categories.

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Results

i.) Population resources database development. Before any interpretive analyses could be carried out, fundamental aspects prohibiting the derivation of a time-series of small area sociodemographic statistics were addressed. Driving the project specification was the need for population-related information for 1991 and 2001 to be directly comparable at small area level across the UK otherwise calculations of change are either impossible or at best ill-advised. Achieving this comparability was dominant in terms of the time input to this project and the success of this phase is a major result. The datasets produced during this project comprise, for small areas across UK:

- Sex and age disaggregated small area mid-year populations for 1991 and 2001;
- Calculations of population change, natural change and net migration over the decade;
- Calculation of comparable deprivation indicators for 1991 and 2001;
- Categorisation of urban, suburban and rural areas for 1991 and 2001;

N.B. These deprivation and urban-rural schemes are comparable over time and across UK, unlike official schemes which are invariably time point and country specific.

ii.) Summary of analyses to date. For small area population change between 1991-2001, the major demographic-related changes identified are that populations in the most urban and more deprived areas were maintained because of natural change gain. A large number of people migrated away from these more urban and more deprived areas to less deprived, semi-urban locations and is therefore consistent with previous research showing counter-urbanisation effects with movements of middle-aged and older people to the more advantaged urban fringe. Thus, the more urban and deprived areas retain younger age populations than less urban and non-deprived areas. As a result, relative to other areas, less deprived and most rural areas have been ageing most.

For deprivation change between 1991-2001, relative deprivation generally eased because at national level unemployment, non-home ownership and household overcrowding were lower in 2001 than in 1991 whilst access to cars increased. Urban areas mainly remain more deprived than rural areas with very few large changes at small area level such that locations tend to stay at a similar level of deprivation.

For illness and mortality between 1991 and 2001, health relates more strongly to local small area deprivation than to larger area characteristics (LA type) or GOR. Mortality generally improved between 1991 and 2001 whilst long-term illness gets worse. Overall, areas becoming less deprived have better health than those becoming more deprived. Similarly, areas with growing populations and areas of net migration gain have better health than areas contracting or experiencing net migration loss.

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Activities

Eleven presentations (listed below) have been given over the two year (40% of my time) funding period. Methods and analyses to date have been presented at UPTAP-specific meetings, relevant conference strands and seminars, including the ESRC Research Methods Festival, RGS-IBG, British Society for Population Studies and International Conference on Population Geographies in Hong Kong. These activities have provided an ideal opportunity for discussing results and networking.

After the funding period I have seven further presentations to report on research findings. Whilst some methodological aspects will be noted, these presentations will focus on analyses of population and deprivation change. These include presentations at ONS and GROS and the ESRC Research Methods Festival.

Outputs

In addition to the population resources database produced during the estimation phase of this project, the following publications have been produced.

A paper reviewing problems and solutions involved in producing comparable data over time has been published and is a nominated output:

- Norman P (2006) Sociodemographic spatial change in the UK: data and computational issues and solutions. *GIS Development special issue Maps & Census* 10(12): 30-34

The method to revise the original Estimating with Confidence 1991 small area populations is detailed in a nominated output of this project and is currently being refereed. The revised EwC 1991 populations have been offered for deposit at the Data Archive. The 1991 and 2001 deprivation scores will be offered once the method to produce them has been peer reviewed.

- Norman P, Simpson S & Sabater A (2007) 'Estimating with Confidence' and hindsight: new UK small area population estimates for 1991. *Population, Space & Place* (submitted)

A further paper using the population resources has been submitted during 2007 and is currently under review:

- Norman P, Gregory I & Dorling D. (2007) Geographical trends in infant mortality: England and Wales. *Health Statistics Quarterly* (submitted).

At least three more papers relating to this project should be written.

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Impacts

The 1991 and 2001 population resources are being used by academic and other researchers in various projects as follows:

- Albert Sabater (University of Manchester) (collaborator in the EwC revisions) who has extended the estimates reported here to have ethnic group dimensions;
- Ludi Simpson (collaborator in the EwC revisions) and Nissa Finney (University of Manchester) to estimate migration between censuses;
- Danny Dorling & Bethan Thomas (University of Sheffield) for mortality rates with a particular focus needing allowances for students in estimates;
- Steve Rowan (Office for National Statistics), 1990s small area health rates, see below;
- Clive Sabel (Small Area Health Statistics Unit, Imperial College) time series of denominators for health rates;
- Diane Edwards (West Midlands Health GIS Service), David Forman (North Yorkshire Cancer Registry and Information Service) and Tim Vincent (University of Oxford) for changes in cancer rates over time;
- Jaksina Katarzyna (University of Plymouth) population change in Cornwall;
- Jean Adams (Newcastle University) health change 1991-2001
- John Hollis (London Research Centre), Jan Freeke (Glasgow City Council) and Julian Flowers (Eastern Region Public Health Observatory) have copies of the estimates.

Steve Rowan's research using the population resources is published with my inputs and the UPTAP programme acknowledged:

Rowan S (2007) Trends in cancer incidence registration by deprivation: 1990-2002. *Health Statistics Quarterly* 36: 24-35

For a project by Prof Tony Champion (Newcastle University) for the Rural Evidence Research Centre, I used the geographical data conversion method to convert the 1991 and 2001 mid-year estimates from wards to Urban areas (defined by ONS) and thereby enable population and net migration change to be calculated for these areas.

For Dr Dan Vickers' UPTAP project 'The Changing Residential Patterns of the UK 1991-2001', I converted 1991 Census data for Enumeration Districts to the 2001 Census Output Area geography.

The analytical aims of the project are not as far advanced by the end of the funding period as had been hoped at the outset. However, at recent conferences I have presented analyses which identified relationships between natural change and migration and changes in social characteristics of small areas. Our understanding of various geographical aspects of population trends and processes is thus enhanced through the identification of locations in which population is ageing *in situ*; areas which are changing in population size and structure through net migration; and areas which over time are experiencing changes in deprivation and health. Further work will add detail to these presentations.

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The UPTAP programme aims to build capacity in secondary analysis amongst new and mid-career researchers. At the beginning of the project I was three years post-PhD, a post-doctoral fellow at the Centre for Census and Survey Research in Manchester. This study was my first funded research and provided a valuable opportunity to learn project management. At the outset, I had well-developed sociodemographic data handling skills so this project offered the opportunity to enhance my secondary analysis and interpretive abilities. Complete UK coverage in this project extended my experience through a greater understanding of UK-wide demography and geography. Towards the end of the project's first year I was appointed Lecturer at the School of Geography, University of Leeds. Having the UPTAP project helped my lectureship application through a strong set of research questions and potential for a growing publication record.

Future research priorities

I am being encouraged by users to both backdate, but most particularly to update the estimates to 2006 then we can track longer-term population change at small area level. To a degree, this is covered by ONS, GROS and NISRA for recent years, but not necessarily for the geographical areas or the age-sex detail needed for studies.

I have recently been involved in a Scottish Government Conference on 'Using small area statistics to develop public policy What already exists and where next?' where I presented 'Demographic change at small area level' to a workshop of local authority and other researchers which aimed to determine their priorities for the provision of demographic data. The findings at this workshop will help inform a new PhD research project by John McCarthy whose studies I am supervising.

Whilst I am now involved in a new UPTAP project to project future ethnic group populations, part of this will involve determining fertility, mortality and migration over the last 25 years so that we have evidence of trends which can inform forecasts. The experience in my first UPTAP project will be invaluable.

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Presentations (1-11 during, and 12-18 after the funding period)

- 1 Norman P (2006) The micro-geography of UK demographic change 1991-2001, Presented at UPTAP Inaugural Conference, Leeds, March
- 2 Norman P, Boyle P & Brown M (2006) Which influences the self-reporting of health, country of birth or country of residence? (British analysis using individual-level data), Presented at the International Population Geography Conference, Liverpool, June
- 3 Norman P (2006) Methods to allow analysis of change over time at small area level using census, vital statistics and other administrative data, Presented at ESRC Research Methods Festival, Oxford, July
- 4 Norman P (2006) Vital statistics: an invaluable resource for demographic and health research. Presented at the Health Surveys User Meeting, July
- 5 Norman P (2007) The micro-geography of UK demographic change 1991-2001. Poster presented at UPTAP Conference, Leeds, March
- 6 Norman P (2006) The micro-geography of UK demographic change 1991-2001. Presented at the UPTAP session RGS-IBG Annual Conference, London, 30 August – 1 September
- 7 Norman P (2006) Challenges for creating a time-series of socioeconomic data. Presented at CSAP seminar, November
- 8 Norman P (2006) The micro-geography of UK demographic change 1991-2001 Phase 2: Changing area deprivation. Presented at the UPTAP Seminar, LGA, London, November
- 9 Norman P (2007) The micro-geography of UK demographic change 1991-2001. Presented at 4th International Conference on Population Geographies, Hong Kong, July
- 10 Norman P, Simpson L & Sabater A (2007) ‘Estimating with Confidence’ and hindsight: Population estimates for areas smaller than districts, revisions to levels of 1991 Census non-response. Presented at BSPS Conference, St Andrews, September
- 11 Norman P (2007) The micro-geography of UK demographic change 1991-2001. Presented at an UPTAP session BSPS Conference, St Andrews, September
- 12 Norman P (2007) Demographic change at small area level. Presented at The Scottish Government Conference on ‘Using small area statistics to develop public policy What already exists and where next?’ at Our Dynamic Earth, Edinburgh, November
- 13 Norman P (2007) Migration: a common bugbear in epidemiological or ecological studies. Presented at the Institute of Health & Society, Faculty of Medical Sciences, Newcastle University, November
- 14 Norman P (2001) Micro-geography of England and Wales’ demographic change 1991-2001. To be presented at an ONS conference, December
- 15 Norman P (2008) Micro-geography of Scotland’s demographic change 1991-2001. To be presented at a GRO Scotland conference, February
- 16 Norman P (2008) Micro-geography of UK demographic change 1991-2001. To be presented at a CCSR seminar in Manchester, February
- 17 Norman P (2008) Micro-geography of UK demographic change 1991-2001. Final report to be presented at the UPTAP annual meeting, March
- 18 Norman P (2008) Creating consistent demographic time-series data. To be presented at the ESRC Research Methods Festival, July

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- Norman P (2006) Sociodemographic spatial change in the UK: data and computational issues and solutions. *GIS Development special issue Maps & Census* 10(12): 30-34
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- Norman P, Rees P and Boyle P (2003) Achieving data compatibility over space and time: creating consistent geographical zones. *International Journal of Population Geography*. Vol 9, Issue 5, September-October 2003: 365-386
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