Incorporating social trends into sub-national household projections

6 Outline of proposed project.

Please give a full description of the proposed project, structuring your proposal to include the following information: Title; Aims; Background; Relevance to policy; Plan of action, including design and methods; Contribution to policy, knowledge and development of methods. You should also incorporate the anticipated outcomes of the research, highlighting the academic as well as the policy relevant benefits envisaged. Do not attach additional material in reply to this question.

Please note that the maximum length of the project description should not exceed the 2 pages provided and the font size used should ensure that details are clearly legible (e.g. 11pt. type or larger) You are strongly advised to refer to a) the *Collaborative Guidance Notes for Applicants 2006* and b) the corresponding annex before completing this section

Aims

(1) Provide improved national household projections for Scotland that take more direct account of the social forces shaping and influencing future household and family formation

(2) Explore the potential for improving the robustness of subnational household projections using alternative and more theoretically informed headship definitions

(3) Produce nested sub-national household projections which supplement point estimates with indicators of the associated uncertainty ranges

(4) Produce sub-district household projections by 'borrowing strength' from headship rates calculated for similar sub-district areas located elsewhere in Scotland

Background

The household projection methodology currently adopted by GROS is driven at both national and sub-national level by two inputs: (i) population projections derived using a cohort-component projection model; (ii) trend-based headship rate projections. Projected changes in headship rates – the proportions of household heads found in population sub-groups defined by age and household type – are used to convert the projected population in each population group into projected households. The current methodology is robust and methodologically defensible. For this reason similar methods are adopted by other statistical agencies (e.g. ONS). However, the headship rate method of household projection suffers from a known weakness, providing only an indirect summary measure of the complex social forces actually under-pinning changes in household and family formation (Lutz et al., 1999). These forces include the declining average duration of partnership/marriage, the increasing number of same-sex partnerships, increased sharing of children between households, the increased independence of the elderly, and changes in the age at which the young leave home and form partnerships in response to changing education, labour and housing market conditions. Critically, interactions between these individual underlying factors may well lead to future headship rates deviating significantly from currently observed trends. One possible solution is to calculate headship rates for more tightly defined population sub-groups, but the adoption of too many sub-groups leads to instability in observed trends due to the shrinking size of 'at risk' populations, and still fails to directly capture the interaction between social forces. The alternative proposed for this studentship is to project household and family formation using a dynamic microsimulation (DM) approach. In DM a set of anonymised individuals, plus their associated characteristics, are drawn from a representative survey dataset. For each projection year these individuals are then subjected to a series of transition probabilities, including death, giving birth, moving home and forming or dissolving a partnership. The result is a projected population that captures not only changes in age/sex structure, but also in household and family structure, at the same time yielding a set of projected household counts. A key advantage of DM over the headship rate method is that it makes explicit the underlying factors driving household and family formation, with the final projected household totals being the result of the complex interaction of these factors. Another advantage is that the method also tracks kinship, providing additional projections of both nuclear and extended families. The use of dynamic microsimulation models for demographic purposes is well established. For example, Wachter (1997) has used the approach to model evolving household structures in historic populations, whilst Morrison (2000) has used DM to project household changes in a contemporary Canadian context. A key disadvantage of DM is that it is 'data hungry', making its direct use in the sub-national projection of households problematic. For this reason the proposed studentship will combine the robustness of a sub-national headship rate methodology with the more richly informed household projections of a national DM model to gain the best of both worlds.

Relevance to policy

GROS provides biennial updates to their national and sub-national (council) household projections. These projections are used to inform a wide range of policy decisions, in both the public and commercial sectors, ranging from housing and transport to the provision of services such as education, health and water supply. Household projections which take better account of forecast social trends promise greater accuracy, and will

provide greater insight into the extent to which policy interventions can be made to, for example, alter demand for new housing.

Plan of action
Year 1: Training and literature review
The appointed student will take the ESRC-recognised MRes in Population Studies offered at Liverpool, taking optional modules specialising in demographic analysis, and including a dissertation which will review relevant literature and analyse 'synthetic cohorts' extracted from successive Labour Force Surveys (or similar) to explore key determinants in the changing pattern of Scottish household and family formation, including aspects of ethnic and social diversity, thus providing a backdrop to the subsequent PhD.

Year 2: National household projections, including high/low scenarios
The student will use an off-the-peg dynamic microsimulation model with freely available computer code (SOCSIM), into which they will input projected vital event rates used by GROS to drive their cohort component population projection model. Once the basic demographic accounting of the model (births, deaths & migration) has been confirmed as producing results consistent with GROS population projections, the student will spend the majority of the year estimating projected trends in transition probabilities for various aspects of household formation/dissolution based upon analysis of the Scottish Longitudinal Study and the British Household Panel Study, and taking into account where possible the ethnic and social dimensions of this behaviour. The transition probabilities will then be applied in the DM model to produce projected changes in household (and family) numbers at a national level. Following quality assurance of the resulting projections, use of preferred and high/low vital event and transition probability scenarios will allow for the production of both point estimates and an indication of the ranges of uncertainty involved.

Year 3: Sub-national projections, including high/low scenarios
The current GROS headship rate is based upon the theoretically and technically unsatisfactory 'first adult on the form' definition of headship. An alternative 'breadwinner' definition (household reference person) was recently rejected due to deficiencies in 1991 Census data. The student will experiment with alternative headship definitions, for example 'oldest female' (on the grounds that during household dissolution children tend to remain with, and return to, their mother), to see if this leads to headship rates that are at the same time more statistically and theoretically robust. The finally preferred headship rate will be applied to GROS subnational population projections, as at present, but then controlled to fit the new national household projections produced in year 2.

Year 4: Sub-district projections, borrowing strength from similar areas
To date GROS have not produced official sub-district household projections, although moves are being made in this direction. The major problem is the statistical reliability of the rates concerned for small areas. One solution is to 'borrow strength' by combining the data for socio-demographically similar, but geographically discontinuous, areas. The student will experiment with a small range of off-the-shelf and bespoke area classifications to produce a set of reliable headship rate trends, which will then be used to project sub-district household totals, constrained to fit previously estimated district and national totals.

Contribution to policy, knowledge and development of methods
The proposed studentship will contribute to knowledge by providing an improved set of national, district and sub-district projections of households, for the first time taking into account trends in the forces directly shaping household formation in Scotland, and for the first time providing indicators of the uncertainty surrounding these projections. The improved projections will contribute to policy by leading to more informed decision making and medium-term planning in areas such as housing and service provision. The studentship will contribute to the development of methods by demonstrating: (i) the potential for combining microsimulation and headship rate methods; (ii) providing an alternative functional definition of 'headship'; (iii) showing how to produce sub-district household projections by 'borrowing strength'.

Dissemination plans & Ethical considerations
During the '+3', the student will be expected to annually submit a paper for publication in a relevant academic journal, present a paper at a relevant academic conference and to present seminars in both Liverpool and GROS. A project website will be maintained with downloadable working papers and projection results (subject to GROS approval). The student will abide by ESRC, Scottish Executive and GROS ethical codes, including obtaining a Basic Disclosure certificate, signing the Official Secrets Act, maintaining strict respondent confidentiality at all times and obtaining pre-dissemination clearance when required.

References
Lutz W, Vaupel J & Ahlburg D (1999) *Frontiers of population forecasting*, Population Council, New York.
Morrison R (2000) 'DYNACAN', in Gupta A & Kapur V (eds) *Microsimulation in Government Policy and Forecasting*, North-Holland, Amsterdam, 599-603.
Wachter K, Blackwell D & Hammel E (1997) 'Testing the validity of kinship microsimulation', *Mathematical and Computer Modelling*, 26(6), 89-104

7   Academic Supervisor(s) details

	Name of supervisor	Position held	Total number of students currently supervised
Principal Supervisor	Dr Paul Williamson	Senior Lecturer	1
Other supervisor(s)	Dr Clare Holdsworth	Senior Lecturer	3

8   Please give information on recent work by and relevant expertise of the academic supervisor(s). Please support your answer by identifying the last three relevant publications of the supervisor(s).

Dr Paul Williamson (Principal Supervisor) has been employed as a lecturer and senior lecturer in the Department of Geography at the University of Liverpool since 1994. During this time he has pursued research interests in the broad field of small area population estimation and projection. Funded research projects have included the creation of spatially detailed synthetic population microdata (ESRC R000237744), the modelling of migration propensities (ESRC H51944501095) and the estimation of incomes for small areas (ERSC H507255166). Dr Williamson has extensive experience in the general field of microsimulation modelling, originating with his PhD thesis 'Community care for the elderly: a microsimulation approach'. As a result of this expertise Dr Williamson is currently involved in collaborative research with the Australian National Centre for Socio-Economic Modelling (NASTEM) on a project co-funded by the Australian Research Council and four State Governments to produce small-area (sub-district) estimates of housing affordability. In addition, he is current Vice-President of the International Microsimulation Association, and editor of the International Journal of Microsimulation. Dr Williamson also has long-standing experience in the area of demographic projection, having been funded by Yorkshire Water Plc to develop projections of future domestic water consumption, and by Liverpool Local Education Authority to report on the long-term viability of proposed PFI schools on the basis of projected changes in catchment demographics. Dr Williamson has supervised a number of PhD students on such demographic topics as migration, child mortality and the links between ethnicity, mortality and morbidity, as well as an ESRC CASE Award studentship on the estimation and projection of internet-based financial service uptake, and is currently supervising an Omani government funded PhD student on the topic of 'Population projections for Oman'.

Relevant recent publications:

Williamson P, Mitchell G and McDonald A (2002) 'Domestic water demand forecasting: a static microsimulation approach', *Journal of The Chartered Institution of Water and Environmental Management*, 16, 243-248.

Williamson P and Simpson L (2002) 'Updating the Census', Ch. 13 in Rees P, Martin D and Williamson P [Eds] *The Census Data System*, Wiley, Chichester, 185-199.

Voas D and Williamson P (2001) 'The diversity of diversity: a critique of geodemographic classification', *Area*, 33(1), 63-76.

Dr Clare Holdsworth (co-Supervisor) is a Senior Lecturer in the Department of Geography and her research focuses on household composition and classification, the dynamics of family practices and the provision of intra-generational support during the transition to adulthood. Her research uses both qualitative and quantitative techniques and cross-cultural comparisons to explore the relationships between cultural practices and family formation. She has considerable experience of the analysis of household hierarchical data files, particularly the Household SAR and of techniques for household classification. Her research has been supported by six ESRC research awards since 1994. Most recently these have explored 'Alternative Household Classifications for the 2001 Census' (with Professor Angela Dare and Rachel Leeser); 'The transition out of the parental home in Britain, Spain and Norway' with Professor David Morgan; and 'The choices and experiences of higher education students living in the parental home'. She has considerable experience of PhD supervision on topics associated with household formation and practices

Relevant recent publications:

Holdsworth, C. and Morgan, D.H.J. (2005) *Transitions in Context:: Leaving Home, Adulthood and Independence*, Maidenhead: Open University Press

Holdsworth, C. (2004) Family support and the transition out of parental home in Britain, Spain and Norway *Sociology*, 38 (5): 909-926

Wathan, J., Holdsworth, C and Leeser, R. (2004) Alternative household classifications for the 2001 Census *Environment and Planning A*, volume 36(6) June: 1101 – 1123