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Household projections In Scotland – a user/practitioner's view

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1. Context

At the present time the preparation of household projections in Scotland is the responsibility of the Housing Statistics Unit of the Scottish Executive. Before devolution the Scottish Office undertook this activity.

In 1993 a steering group was set up to oversee the evaluation work on household projection methodology undertaken by a team of researchers of Glasgow University. The group contained representatives from the Scottish Office, Local Authorities and Scottish Homes. Given that 1991 Census data were soon to be released, the Scottish Office considered it appropriate to use this as a basis to evaluate alternative household projection methods.

The evaluation consisted of:
a. a questionnaire survey, to identify uses of the projections and user requirements;
b. a comparison of projection outcomes with 1991 Census data;
c. an investigation of available household projection methods; and,
d. an evaluation of the current method.
This resulted in recommendations for changes to the method.

Recently, i.e. a few years ago, the Scottish Executive set up a Household Analysis Review Group (HARG), which has the task to look at improvements to the methodology for the estimation and for the projection of households. Like the steering group in 1993, the HARG is faced with a new batch of Census data, which will be released in the near future. This will enable (a) an evaluation to be carried out to understand household change in the 1990s, using Census data from 1991 and 2001, and (b) a re-assessment of available household projection methods to see if their potential use has improved since 1993, when the last review was carried out.

The function of the present paper is:
(a) to look backwards and to examine the reasons why the methodology was changed in the early to mid 1990s; and,
(b) to look forwards and to explore the scope for further changes which will improve the methodology.

2. Existing Methodology in 1993

The methodology used involved the application of headship rates to the population in households split by age and by marital status (see Table below) for two household types: (a) one-person households and (b) two+ person households. An exponential method was used to project these headship rates into the future, based on 1971 and 1981 Census data.

age band	single	married	widowed/divorced
15 to 29			
30 to 44			
45 to 60/65			
retired			

3. User Requirements and Changes to Methodology in 1993

3.1 User Consultation

As part of the review, Glasgow University conducted a user consultation exercise via a questionnaire. This was sent to appropriate Scottish Office Departments, Scottish Homes, all Local Authorities and Local Economic Development Companies. In some cases the completed questionnaire was followed up by a telephone interview.

The user consultation showed that delays in the preparation of the projection was a major issue with the users. As far as methodology was concerned, users felt that a more detailed breakdown of population by age and of households by type would be useful, whereas gender and marital status were considered of little interest as output categories.

3.2 Comparison of Projections with 1991 Census Results

The main results of the comparison between 1987-base household projections and 1991 Census results showed for 1991:
a.   an under-projection of 0.5% or 11,000 households for Scotland as a whole;
b.   nearly 27,000 more women-headed households and about 16,000 fewer men-headed households than expected;
c.   an under-projection of 11,500 for households headed by a 15-29 year old;
d.   nearly 30,000 more households headed by single people and about 18,000 fewer households headed by a married person than projected; and,
e.   a significant under-projection (10%) of the number of households headed by a divorced male of middle age (30-44).
It was concluded that the current method had underestimated household growth during the 1980s, in particular for the younger population and for singles. It had also failed to keep up with changes in lifestyle, in particular higher divorce and separation rates. The increased number of women reported as "household head" in the 1991 Census, without any real change in the actual family circumstances of households, has had a disrupting effect on headship rates by sex. This is referred to as the household reference person issue.

3.3. Investigation of Available Household Projection Methods

One of the objections to the headship rates method used, was, that it was too mechanical, making theoretical underpinnings unsatisfactory. The investigation into available household projection methods concluded, however, that the headship rate method should continue to be used, as other methods were either insufficiently developed, or required data at present not available, at least at sub national level.

3.4 Evaluation of the Current (1993) Method

Following this broad conclusion in support of continued use of a headship rate method, the researchers commented on the current method and noted the following shortcomings:

a. no explicit consideration of the trend in non-headship rates. The existing method of treating non-headship rates as a balance could result in anomalies;

b. complications in relation to the use of the extra data point (1991 Census) in addition to the 1971 and 1981 data points. This required a revision of the functional equation used; and,

c. the household reference person issue.

The user questionnaire had shown that marital status was of little use as an output category. The researchers noted that its elimination could allow the introduction of certain household types, in which users had expressed an interest. Therefore the steering group asked the researchers to compare the projection performance with and without the marital status component. This was done for the three districts in Central Region: Clackmannan, Falkirk and Stirling. The conclusion from this was that inclusion of the marital status did not improve projection performance. Quite apart from this, there were also problems with the unavailability of up-to-date marital status projections for Scotland.

3.5 Changes to Method.

The Steering Group agreed to implement the following changes to the household projection method:

a. elimination of marital status as a component in headship rates;

b. introduction of a more detailed breakdown of age bands and of households by type:

One adult
Two adults
Three or more adults
One adult 1 child
One adult 2+ children
Two+ adults 1 child
Two+ adults 2+ children

c. projection of both headship rates (by household type) and non-headship rates, together with a constraint to let the total of rates sum to 1; and,

d. use of a modified exponential function, based on two or more data points.

With the exception of single person households, all household types had a headship rate for an age group as a whole, without a split by sex. In this way the problems arising from the household reference person issue were avoided.

4. Problems with the present method (2002)

Experience during the 1990's and in recent years has shown up issues that are problematic with the present method:

a. a tendency to overestimate household formation during the 1990s;

b. adult feasibility problem, i.e. in some cases the household projection assumes more adults than are available in the population projection;

c. a decision is needed on the selection of which Census years to use for the projection of headship rates: 1971-1981, 1981-1991 and 1971-1991;

d. household estimates are currently only available in total, whereas household projections done by type. This allows a re-base of the projections only on a total household basis. This can give rise to a mismatch, as the projected households by type distribution is not updated for the base year;

e. no allowance is made for age-cohort effects in headship rate projection; and,

f. the use of a black box approach, i.e. there is no descriptive link of changes in headship rates to demographic events (marriage, cohabitation, and divorce).

5. Comparison with DETR method for England

The DETR method for England recognises the following five household types:

Married couple household
Cohabiting couple household
Lone parent household
Other multi person household
One person household

"Other multi person households" is a heterogeneous group, which includes lone parents with only non-dependent children, brothers and sisters living together, households of two or more unrelated adults (flat sharers) and other multi person households.

Associated with these household types are eleven household membership categories:

Household representative	1. Married couple household representative
	2. Cohabiting couple household representative
	3. Lone parent household representative
	4. Other multi person household representative
	5. One person household representative
Concealed families	6. Husband in a concealed married couple family
	7. Male cohabiter in a concealed cohabiting family
	8. Parent in a concealed lone parent family
Non-heads	9. Wife in a married couple family
	10. Female cohabiter
	11. Other individual

Individuals in the first five categories are household representatives, which is similar to the headship rate concept. The number of households is, by definition, equal to the number of individuals in these groups. Categories six to eight represent concealed families and categories nine to eleven are equivalent to non-headship rates.

For reasons of consistency the eldest male is usually chosen as the household representative in multi person households.

The non-institutional population, or private household population, is split by marital status: married, widowed/divorced and single, cross analysed by whether cohabiting or not. Within each age/sex/marital cum cohabitational category, household membership rates are projected from historical data derived from censuses and Labour Force Survey (LFS) data.

For the population split by sex and by marital status, membership rates are estimated using a tanh curve, which expresses the membership rate as a function of age over time. The aim of the time factor is to incorporate age cohort effects. The estimation process uses weighted

Census and Labour Force Survey (LFS) data. The weighting used reflects both how recent the data is and the sample size.

Projections for sub national areas are initially made independently of the national projections, but are subsequently adjusted for consistency with the national projections. This process is called "regional controlling".

6. User Requirements and Possible Changes

6.1 User Requirements

Recently a questionnaire was sent out to Scottish Executive departments and to all local authorities to obtain an update of user requirements with respect to household estimates and projections.

The responses appear to indicate a requirement for estimates and projections for smaller areas than the present unitary authorities. This fits within the Neighbourhood Statistics framework. One consequence of smaller area projections is that the interaction between available housing land supply and migration becomes much more important. A recent study by Glasgow University involved the estimation of a social rented housing demand model with three sub areas within the Glasgow conurbation. This model incorporates the interaction and includes also household transition factors, reflecting transitions between different household types over time.

There were also suggestions to utilise new data sources, particularly for the estimates (Council Tax Register and Scottish Household Survey). The respondents did not indicate a need to revise the household type distribution.

6.2 New Data Sources

One of the advantages this time is that 2001 Census data on relationships within households will be available at a 100% level, as compared with at a 10% level in 1991. The Scottish Household Survey, which is designed to give reasonably accurate results by unitary authority every two years, is also a potentially useful data source. In addition, work is progressing on a Longitudinal Survey for Scotland. The neighbourhood statistics project was mentioned already.

6.3 Possible Changes to Methodology

Changed requirements as well as opportunities generated by the newly available data sources call for a fundamental rethink of the methodology. Possible changes are:

a. a revision of the household type distribution. This should take into account the new data sources (see 6.2). Issues to consider are:
    1) a split of couple households into married couples and cohabiting couples;
    2) separate identification of concealed families;
    3) re-definition of families to include not only households with 0 to 15 year old, but also dependent children age 16 to 18.
b. use of membership rates rather than headship rates could conceivably overcome the adult feasibility problem. This would, where appropriate, require a set of rules to ensure equal numbers of male and female cohabiters, as well as of husbands and wives in married couples; and,

c. over time, as more data becomes available, membership rate functions could incorporate age cohort effects. This would probably be a requirement if the household type distribution distinguishes between married couples and cohabiting couples.

The following requirements for a household projection system have to be kept in mind:
a. data that are reliable for the population as a whole. This means use of a base with a minimum of sample error;
b. data that are comparable for the population as a whole. The data should not be unduly dependent on local factors, e.g. factory closure;
c. methods of projection must be computationally efficient and robust, i.e. largely reliable at a wide variety of spatial scales.

Given requirement c. above, the estimation and projection of headship rates or membership rates for a population split by marital status will most probably not be feasible, except perhaps at a Scottish level.

6.4 Issues for Research

Research into the following issues would potentially be very useful:

1. separate identification of sub national patterns of household change, e.g. by type of authority (e.g. cities, other urban and rural);
2. separate identification of more local patterns of household change, e.g. by type of neighbourhood within authority;
3. household transition rates could be estimated using Longitudinal Survey data at a Scotland level. This would allow a better understanding of household formation and dissolution processes.

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