REGISTRAR GENERAL FOR SCOTLAND

Projected Population of Scotland (2004-based)

Variant projections

A National Statistics publication

National Statistics are produced to high professional standards set out in the National Statistics Code of Practice. They undergo regular quality assurance reviews to ensure that they meet customer needs. They are produced free from any political interference.

First published 17 July 2006

CONTENTS Page

List of Tables

List of Figures

Main points

This paper describes variants on the "principal projections" which the Registrar General regards as the most likely level of Scotland's population in the next 25 years. The variants are based on different assumptions about the three main factors – fertility, life expectancy and migration.

The key points in this paper are:

- The future size of Scotland's population is uncertain. Under the high and low assumptions of future fertility, life expectancy and migration, the total population of Scotland at 2031 would vary between 5.3 and 4.8 million. But under "extreme" combinations of these assumptions, the population could be as high as 5.6 million or as low as 4.6 million;

- Future population growth is possible under the "high" population variant, the high migration variant, the high fertility variant and the high life expectancy variant, as well as the "young" projection to 2031;

- What is more certain is that Scotland's population is going to age. In 2004, 16 per cent of the population were aged 65 and over. Even under the extreme "young" projection the percentage of the population aged 65 and over is projected to be 23 per cent by 2031. This trend is primarily a result of the existing age structure of Scotland's population (which contains the baby boomers) and the long-term decline in fertility levels;

- Under all the variants, the "dependency ratio" is projected to remain at around 550 to 600 dependents per 1,000 people of working age until 2021. It is only after 2021, and the completion of the change to women's state pension age (and the baby boomers reaching state pension age), that the dependency ratio rises: ranging from 685 under the low fertility variant to 733 under the low migration variant. Even under the "extreme" combination assumptions of the "low dependency ratio" variant the dependency ratio will still rise to 648.

1. Introduction

1.1 Projections of future population levels are undertaken by most industrialised countries and by international organisations such as the European Union and the United Nations. A population projection shows what would happen if particular assumptions about future fertility, mortality and net migration were to occur. However, because population projections are not a precise science, an organisation will often produce a range of projections based on alternative assumptions, usually known as variant projections. Normally, one of these projections will be known as the principal, medium or central variant. Strictly, such a projection is still simply just the outcome of a particular set of assumptions, but it is inevitable that users will treat it as being a forecast of the most likely course of future events. The official UK national population projections, produced by the Government Actuary's Department (GAD), and the regular revisions of world population projections produced by the United Nations and Eurostat fall into this category. Although inevitably subject to error, these projections provide a vital guide to short and long-term planning in many different fields.

1.2 This paper summarises and presents analysis from the available variant projections for Scotland produced by GAD based on the estimated population in mid-2004, and describes some of the special case scenarios ("what if") which they also produce. The UK national population projection's work transferred from GAD to the Office for National Statistics (ONS) on 31 January 2006, but the results from the projections discussed in this paper are still available on GAD's website: www.gad.gov.uk.

2. What are Variant Projections and Why are they Needed?

2.1 Every two years GAD has, in consultation with the Registrar Generals produced a "principal" population projection and a number of "variant" projections, based on alternative assumptions of future fertility, mortality and migration, for the UK and its constituent countries. The variants are produced to give users an indication of the inherent uncertainty of demographic behaviour. The purpose is to illustrate possible alternative scenarios and not to represent upper or lower limits on future demographic behaviour. There are two distinct types of variant produced: "standard" variants and "special case scenarios".

2.2 As well as producing the "principal" assumptions, high and low assumptions are prepared for each of the components of population change (fertility, life expectancy and net migration). These are usually referred to as "standard variants". There are 27 possible combinations of these sets of assumptions, although aside from the principal projection only 12 are published by GAD. These are the six possible "single component" variants (i.e. varying only one component at a time from the principal assumptions) and six selected "combination" variants (those which produce the largest / smallest total population size (the "high" and "low" population projections), the oldest / youngest age structure (the "old" and "young" projections) and the

highest / lowest dependency ratios ("high dependency" and "low dependency" projections)). Dependency ratios show the relationship between the working age population and the two main dependent groups – children under 16 and people of state pensionable age.

2.3 As well as producing the "standard variants", GAD produce "special case scenarios", or "what if" projections, to illustrate the consequences of a particular, but not necessarily realistic, set of assumptions. Four sets of special case scenarios were prepared:

- **Replacement fertility** represents the level of fertility required for the population to replace itself in size the long-term given constant mortality rates and in the absence of migration. Around 2.075 children per woman are needed to ensure the long-term "natural" replacement of the population. The replacement fertility projection combines that level of fertility with the principal projection assumptions of mortality and migration.
- **Constant fertility** assumes that age specific fertility rates[1] will remain constant at the values assumed for the first year (2004-05) of the principal projection. Fertility rates have risen over the last two or three years and a continuation of these 2004-05 fertility rates produces long-term total fertility rates which are marginally above those assumed for the principal projection. The constant fertility projection combines constant level fertility with the principal projections of mortality and migration.
- **No mortality improvement** assumes that age/sex specific mortality rates will remain constant at the values assumed for the first year of the principal projections. This projection combines no mortality improvement with the principal projections of fertility and migration.
- **Zero migration** uses the principal assumptions of fertility and mortality and assumes that there will be zero net migration (at every age). It therefore shows the projected natural change in the population based on the principal assumptions of fertility and mortality in the absence of migration, or where migration inflows and outflows are exactly equal at every age.

2.4 Two further special case projections, based on combinations of these assumptions, were also prepared:

- **No change projection** shows what would happen if fertility, mortality and net migration were to remain constant at current levels. It therefore assumes the fertility rates from the constant fertility projections and the mortality rates from the no mortality improvement projection. Given recent fluctuations in net migration, it is much more difficult to define what is meant by the current level of migration. However the principal projections assume constant annual net migration from 2007-08 onwards at levels based on analysis of recent

[1] Age Specific Fertility Rate (ASFR) – the number of births per individual for a specific age during a specified time.

trends. Therefore the principal migration assumptions have been used for the no change projection.

- **Stationary projection** shows a population with an unchanging size and age structure which would arise, eventually, given replacement level fertility, constant mortality rates at all ages and zero net migration at all ages. The projection therefore assumes the fertility rates from the replacement fertility projection, the mortality rates from the no mortality improvement projection and zero net migration at each age as in the zero migration projection. In practice, it takes time for the population to reach stationary conditions because of the momentum resulting from the existing population age structure.

2.5 These alternative variant projections and scenarios are needed because it is impossible to project future population levels with complete accuracy. The principal projection is based on recent trends in births, deaths and migration. But it is not a firm forecast of what will happen and, in particular, it takes no account of future policy changes. It simply shows what might happen if the recent trends were to continue. The variant projections and scenarios show a range of possibilities and also show the effects of changing the underlying assumptions. These alternatives are especially useful for planning purposes.

2.6 **Table 1** shows the assumptions used in the principal projection and also the alternative assumptions used in the variant projections. For example, a net inflow of +12,500 is assumed for the long-term under the high migration variant and a net outflow of -4,500 under the low migration variant, compared with the assumed net inflow of +4,000 used in the principal projection. So the high migration variant assumes +12,500 people per annum due to migration over the long-term with the fertility and mortality assumptions used in the principal projection (i.e. TFR[2] of 1.6 and projected life expectancy at birth of 79.1 for males and 83.6 for females by 2030-31).

[2] The total fertility rate (TFR) is a commonly used summary measure of fertility levels calculated by summing the age specific rates (ASFR) for a particular year. It gives the average number of children that a group of women would expect to have if they experienced the observed ASFR in each of their childbearing years (assumed to be from age 15 to 45 for projection purposes).

Table 1 Assumptions used in the 2004-based projections

	Assumptions	Long-term Fertility (Total Fertility Rate - TFR)	Life Expectancy Males[1]	Life Expectancy Females[1]	Annual Long-term Net Migration
Standard 'single component' variants[#]	High variant	1.8	81.4	85.1	12,500
	Principal	**1.6**	**79.1**	**83.6**	**4,000**
	Low variant	1.4	76.8	82.1	-4,500
Standard 'combination' variants	High population	1.8	81.4	85.1	12,500
	Low population	1.4	76.8	82.1	-4,500
	Young	1.8	76.8	82.1	12,500
	Old	1.4	81.4	85.1	-4,500
	High medium-term dependency *	1.8	81.4	85.1	-4,500
	Low medium-term dependency*	1.4	76.8	82.1	12,500
Special case scenarios	Replacement fertility	2.075	79.1	83.6	4,000
	Constant fertility	1.61	79.1	83.6	4,000
	No mortality improvement	1.6	74.3	79.4	4,000
	Zero migration (natural change only)	1.6	79.1	83.6	0
	No change	1.61	74.3	79.4	4,000
	Stationary	2.075	74.3	79.4	0

1. These figures are for life expectancy at birth for 2031. Current annual improvements in mortality rates vary considerably by age and sex. The variant mortality projections assume that these improvements will gradually converge to common 'target rates' of improvement, at each age and for both sexes, by the year 2029.
The target rate assumptions are as follows:
- High variant: 2% annual improvement at 2029, thereafter annual improvement remaining at 2%.
- Principal projection: 1% annual improvement at 2029, thereafter annual improvement remaining at 1%.
- Low variant: 0% annual improvement at 2029, thereafter morality rates remaining constant.
- No improvement: 0% annual improvement, mortality rates remain constant throughout the projection period at the levels assumed for 2004-05.

Created by varying one component from the principal projection: high fertility, low fertility, high life expectancy, low life expectancy, high migration and low migration.

* In the long-term, the Old and Young variants produce the highest and lowest (respectively) overall dependency ratios.

2.7 Variant projections were first produced for Scotland (and the other individual countries of the UK) for the 2000-based round. The aim was that the standard variants should represent broadly comparable margins of uncertainty to the established series produced for many years at UK level. The separate fertility, mortality and migration variants are also intended to cover approximately similar margins of uncertainty. However, the cohort component method used to produce these projections does not enable statements of probability to be attached to them, or for confidence intervals to be ascribed to variants. Necessarily, therefore, the choice of assumptions is inevitably somewhat subjective.

2.8 For fertility and mortality, uncertainty at individual country level is unlikely to differ significantly from that at UK level. So, for fertility, for example, the high and low variants for Scotland assume long-term TFRs which differ from the principal by ± 0.2 children per woman as has been the convention for UK level variants. For migration, however, relative uncertainty tends to increase for smaller areas. The choice of variant migration assumptions for the individual countries has been informed by an analysis of relative standard deviations in the annual historical migration time-series.

2.9 ONS are currently conducting research into probabilistic projection methods with a view to improving the quantification of uncertainty in national population projections.

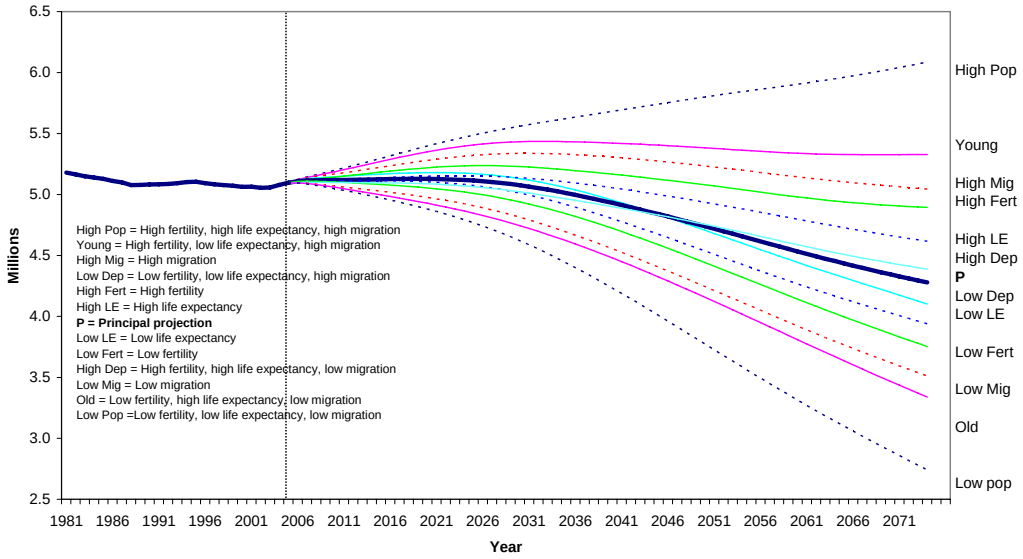
2.10 This paper presents the results for the variant projections by looking first at the standard “single component” variants and the standard “combination” variants together (as these are based on alternative plausible

assumptions) before looking at the "special case scenarios" (as these are based on less realistic assumptions). The paper concludes by looking at projected population growth due to migration and the effect of natural change. **Annex A** provides information on how to obtain the detailed results of the variant projections and contains two tables which summarise the assumptions which are used in each type of projection. **Annex B** gives information on the method of projection, the accuracy of projections and the base population used. Some of the figures in this paper show results up to 2074. But projections so far ahead should be treated with great caution: the further in the future they go, the more uncertain they become.

3. The Results of the "Single Component" and Standard "Combination" Variants

3.1 The results of the range of "single component" and standard "combination" variant projections are illustrated in **Figure 1**. The future size of Scotland's population is uncertain. Under the high and low assumptions of future fertility, life expectancy and migration, the total population of Scotland at 2031 would vary between 5.3 and 4.8 million. But under "extreme" combinations of these assumptions, the population could be as high as 5.6 million or as low as 4.6 million. **Figure 1** also shows that future population growth is possible under the "high" population variant, the "young" variant, the high migration variant, the high fertility variant, the high life expectancy variant and the low dependency variant to 2031.

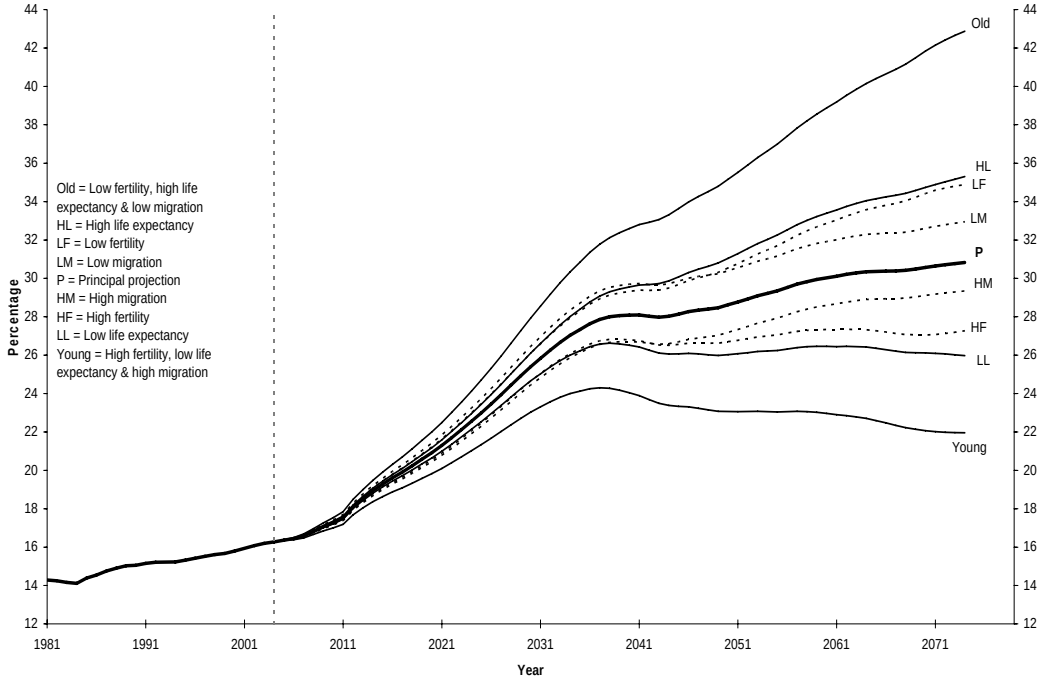
Figure 1 Actual and projected total population Scotland, under the 2004-based principal and selected variant projections, 1981-2074



3.2 However, while population decline is not inevitable, **Figure 2** demonstrates that population ageing will occur under any plausible set of assumptions. The proportion of Scotland's population aged 65 and over is likely to increase from 16 per cent now to between 25 per cent and 27 per

cent by 2031. Even under the "extreme young" combination of high fertility, high net migration and low life expectancy assumptions, the proportion would rise to 23 per cent; and the corresponding "extreme old" combination would produce a rise to 29 per cent.

Figure 2 Actual and projected percentage of the population aged over 65, Scotland, 1981-2074



3.3 The inevitability of population ageing is a consequence of the current age structure of the population. This, in turn, is a result of changes in the past numbers of births. Thus, during the first half of this century, the number of elderly people will rise as the relatively large cohorts born after the Second World War and during the 1960s baby boom replace at older ages the much smaller cohorts born previously. Also, the smaller cohorts born since the mid-1970s will replace the baby boomers.

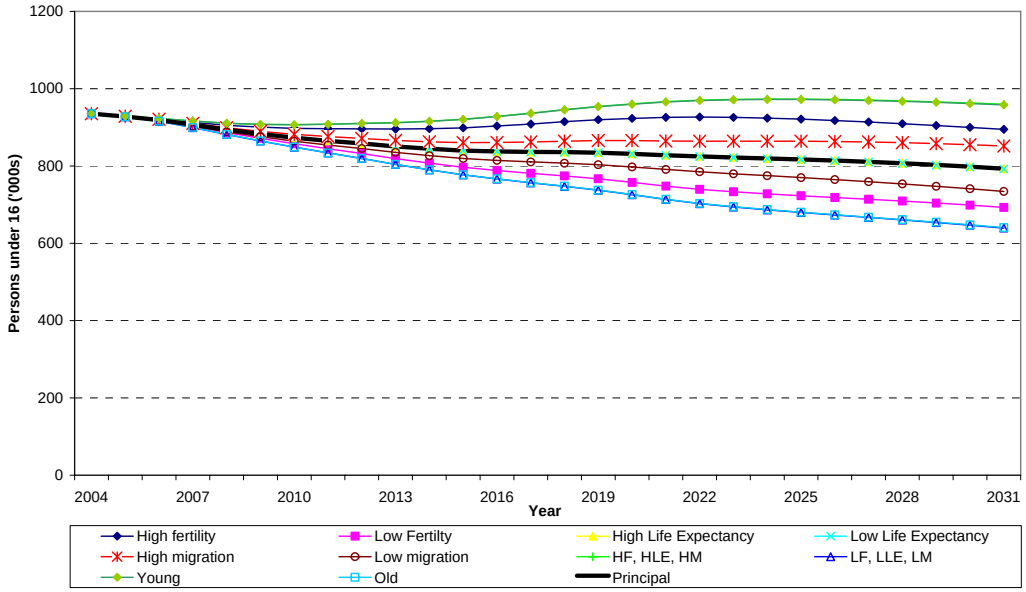
3.4 As well as looking at the differences in the projected level of Scotland's population and the proportion aged 65 and over, it is also useful to look at demographic indicators which give a suggestion of the consequences of the different assumptions on Scotland's population. This section looks at different groups in the population, the average and median age[3] and also dependency ratios[4] under the "single component" and standard "combination" variants.

3.5 The effect of the different assumptions used in the variant projections on the size of the population aged under 16 is shown in **Figure 3**.

[3] Median age: 50 per cent of the population is below this age and 50 per cent is above this age – the middle age of the population.

[4] Dependency ratios show the relationship between the working age population and the two main dependent groups – children aged under 16 and people of state pension age.

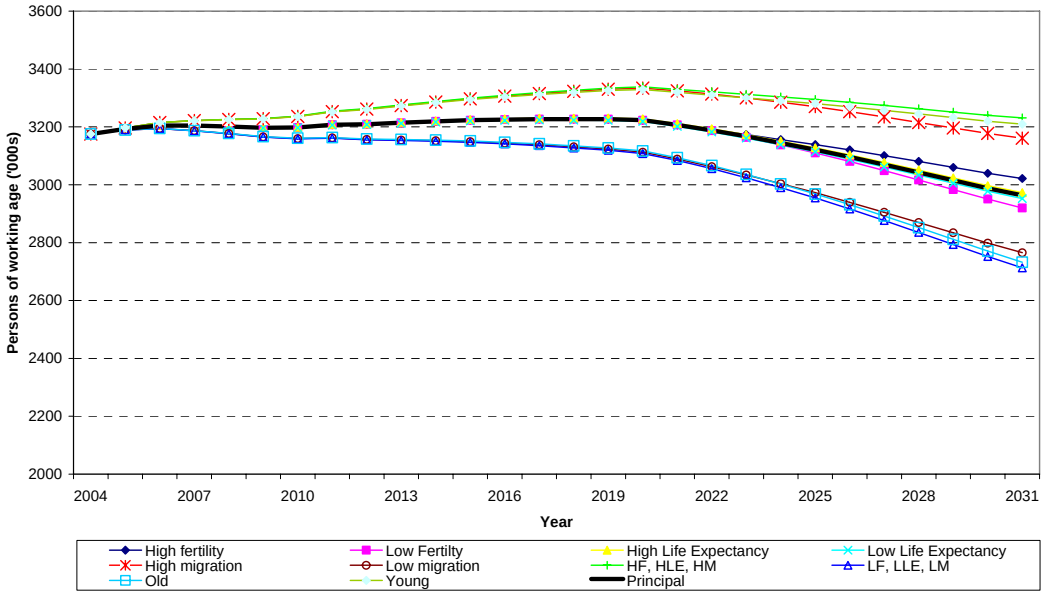
Figure 3 Population aged under 16: principal and variant projections, Scotland, 2004-2031



3.6 All the projections show the number people aged under 16 falling by 2031 except for the "young" combination and the "high" population variant. The biggest falls are projected under the "old" variant and the "low" population variant.

3.7 The number of people of working age is projected to decrease over time for nearly all the projections (as illustrated by **Figure 4**), especially after 2020 when the large birth cohorts from after the Second World War and the 1960s move into older ages and the birth cohorts of those turning 16, fewer in number, start to age.

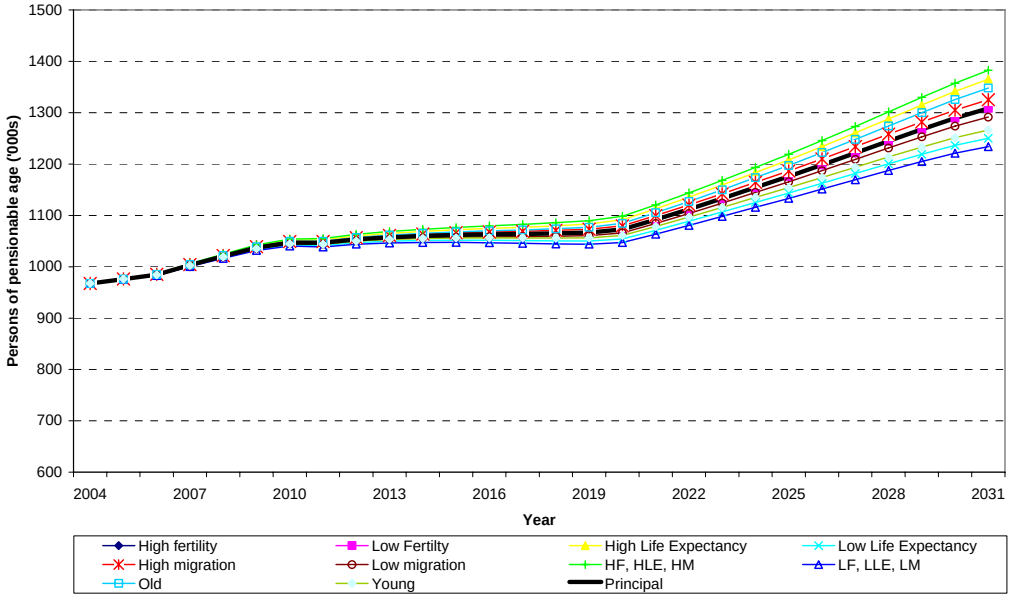
Figure 4 Population of working age under principal and variant projections, Scotland, 2004-2031



3.8 The number of people of working age would increase slightly by 2031 under the “high” population variant, and the “young” combination variant. Under the high migration variant the working age population decreases slightly compared with the 2004 level.

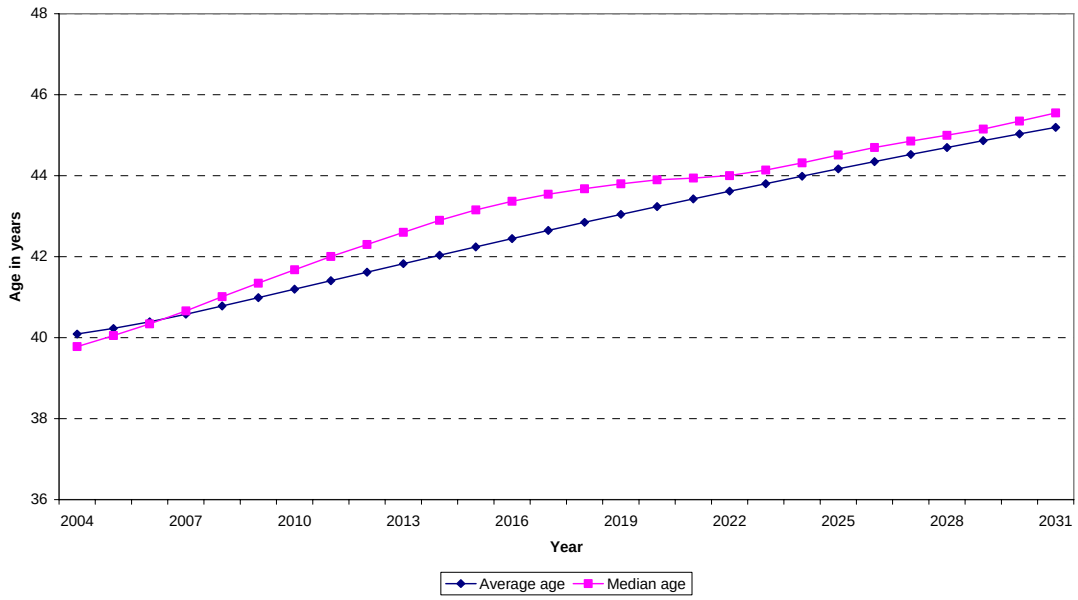
3.9 In contrast, the population of state pension age is projected to increase by 2031 under all the projections (as shown in **Figure 5**) especially after 2020 when the baby boomers reach state pension age and the change in women’s state pension age to 65 is complete.

Figure 5 Population of pensionable age principal and variant projections, Scotland, 2004-2031



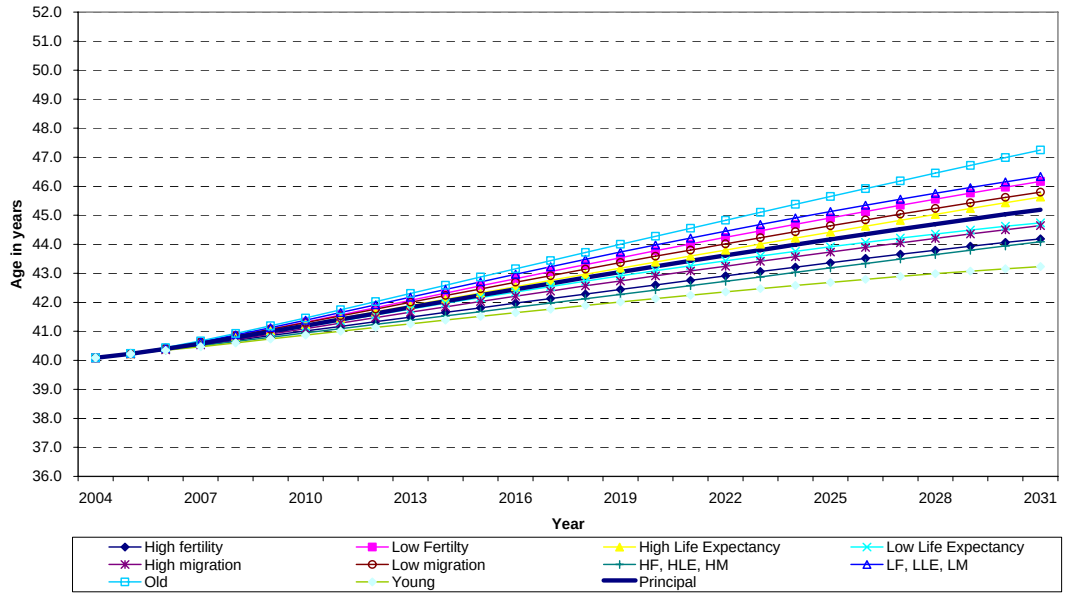
3.10 Under the principal projection, the average age of Scotland’s population is projected to increase from around 40 years in 2004 to 45.2 years by 2031, as illustrated by **Figure 6**. Similarly, the median age is projected to increase from 39.8 years in 2004 to 45.5 years by 2031.

Figure 6 Average and median population age, principal projection, 2004-2031



3.11 The average age increases under all the projections as **Figure 7** shows. Reinforcing the point that while there is uncertainty about the future level of Scotland's population, the ageing of the population seems inevitable.

Figure 7 Average age of Scotland's population under the prinicpal and variant projections, 2004-2031

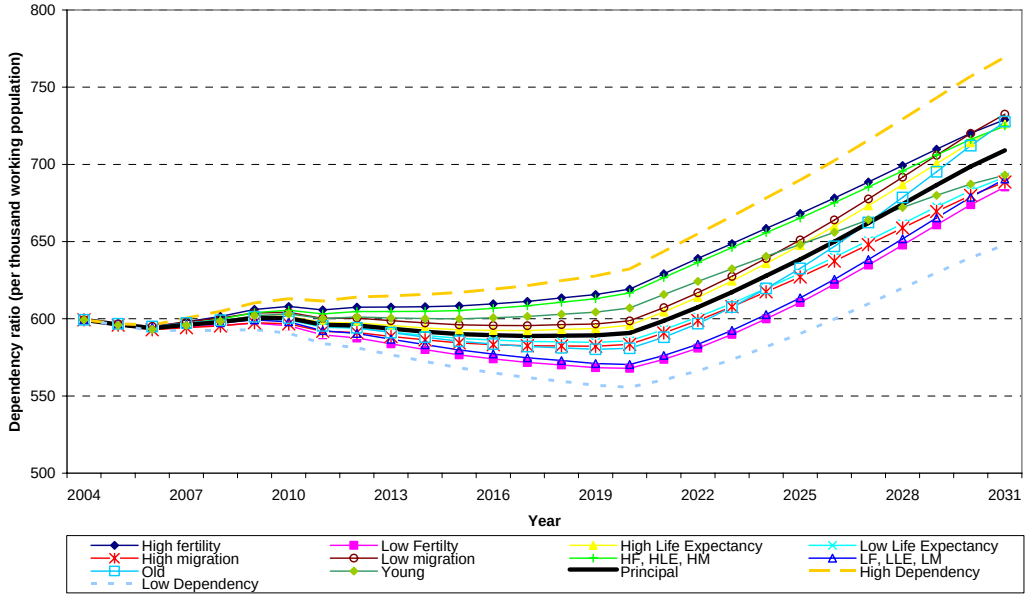


3.12 The average age is projected to be highest under the "low" population variant and lowest under the "high" population variant. Also, the high fertility variant projects a slightly lower average age than the high migration variant by 2031.

3.13 Another useful indicator of the population structure is the dependency ratio: the number of people aged under 16 and of state pension age per thousand people of working age. It should be emphasised, however, that demographically defined dependency ratios, whatever age boundaries are used, take no account of workforce participation rates and therefore do not represent real levels of economic dependence. In reality, full-time education ends, and retirement starts, at a range of ages.

3.14 **Figure 8** shows the dependency ratios under the different projections. The combination of a declining population and a sharply rising elderly population will cause the dependency ratio to rise. Under all the variants, the dependency ratio is projected to remain at around 550 to 620 dependents per 1,000 people of working age until 2021. It is only after 2021, and the completion of the change to women's state pension age (and the baby boomers reaching state pension age) that the dependency ratio rises: ranging from 685 under the low fertility variant to 733 under the low migration variant. Even under the "extreme" combination assumptions of the "low dependency ratio" variant the dependency ratio will still rise to 648.

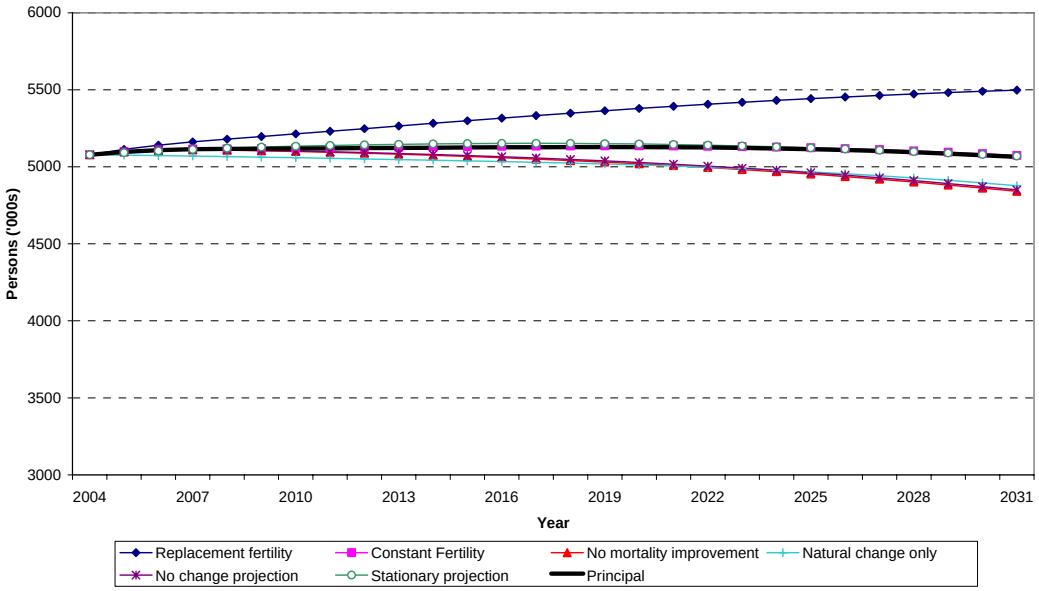
Figure 8 Dependency ratio (per thousand working population): principal and variant projections, Scotland, 2004-2031



4. The Results of the "Special Case Scenarios"

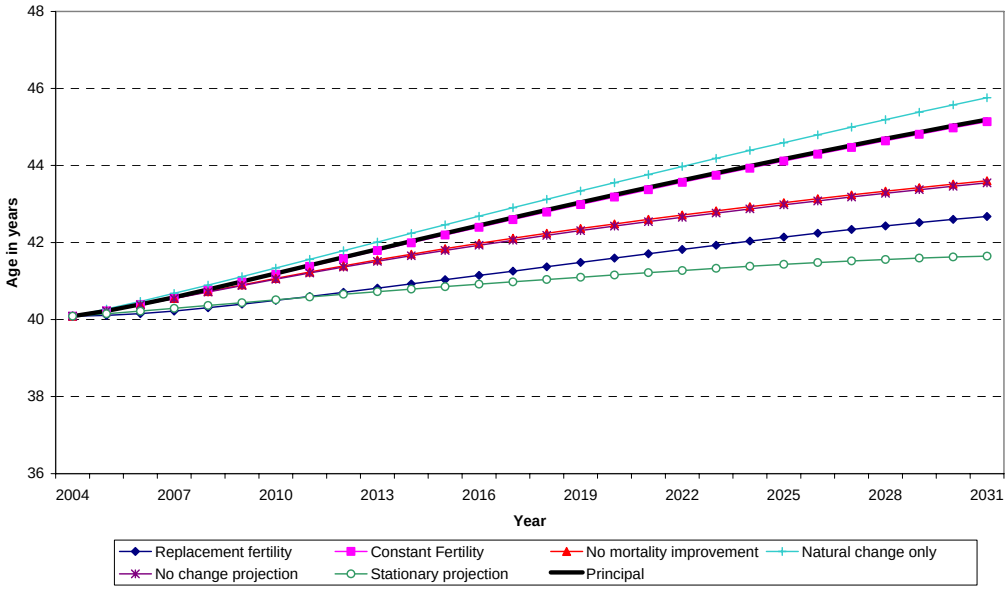
4.1 The results of the "special case scenarios" are presented in this section though they are based on less realistic assumptions and are mostly for reference purposes, though it can be argued that the zero migration (natural change only) variant could be realistic for Scotland as it falls between the high and low migration assumptions of the standard variants. **Figure 9** compares the "special case scenarios" with the principal projection and shows that only under the replacement fertility scenario does Scotland's population increase. The replacement fertility scenario assumes that the Total Fertility Rate (TFR) is just below 2.1. Currently Scotland's TFR is 1.6 so the chances of this changing to replacement levels appear to be very slim.

Figure 9 Projected population under GAD special case scenarios, Scotland, 2004-2031



4.2 **Figure 10** shows that, even under these less realistic scenarios, Scotland's average age is projected to increase from 40.1 years, ranging from 41.6 years under the stationary projection to 45.8 years under the zero migration (natural change only) projection.

Figure 10 Projected average age under GAD special case scenarios, Scotland, 2004-2031

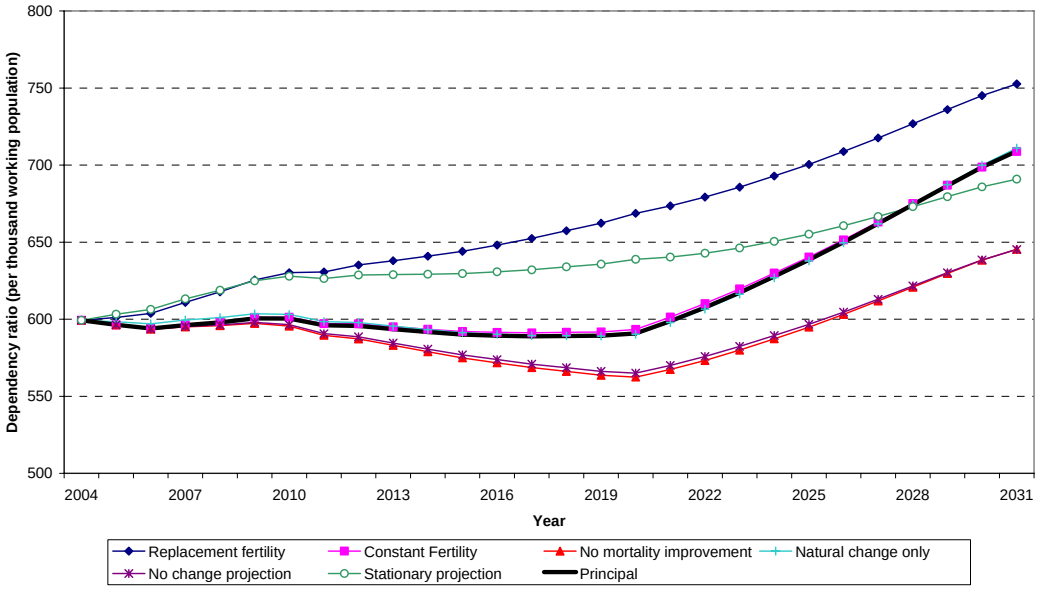


4.3 The extent to which the population is not stationary under the stationary projection (i.e. the population does not have an unchanging size and structure) reflects the inherent "population momentum" resulting from the existing population age structure. It takes time for the population to reach stationary conditions i.e. unchanging size and structure.

4.4 The dependency ratio, the number of people aged under 16 and of state pension age per thousand people of working age, is shown in **Figure 11**. It is

projected to increase from 599 to between 645 under the no mortality improvement projection and no change projection to 753 under the replacement fertility projection.

Figure 11 Dependency ratio (per thousand working population) under GAD special case scenarios, Scotland, 2004-2031



4.5 Unsurprisingly, the replacement fertility scenario causes the dependency ratio to rise because of more children being born. It is also interesting to note that the dependency ratio under the zero migration (natural change only) variant is very similar to the principal projection, showing that the assumption for migration in the principal projection has relatively little effect on long-term dependency ratios.

4.6 In summary, the "special case scenarios" are based on less realistic assumptions. The replacement fertility scenario illustrates that with a fertility rate of around 2.1, Scotland's population would increase in size and the ageing of the population would be slower than under the principal projection, though the dependency ratio would increase due to more children being born.

4.7 The constant fertility projection produces very similar results to the principal projection in that the population is projected to reduce in the long-term, with a reduction in the dependency ratio as more people die off after 2020.

4.8 The zero migration (natural change only) variant is of most interest as it is probably the only "special case scenario" that could be considered to be realistic for Scotland. That is, its assumption of zero migration falls between the high and low migration assumptions of the standard variants. The effects of migration on population growth are explored further in the next section.

5. Population Growth

5.1 The variant projections illuminate the question of the effect of migration on population growth.

5.2 The components of population change (births, deaths and migration) are not independent of each other. In particular, the projected numbers of future births and deaths are themselves partly dependant on the assumed level of net migration. An understanding of the effect of migration on population change can be obtained by comparing the results of the principal and main migration variant projections with those of the 'zero migration' (or natural change) variant projection. The natural change variant assumes that net migration will be zero at all ages in the future, but makes the same assumptions about fertility and mortality as the principal projection. In the analysis below, the effect of net migration on Scotland's population in the period to 2031 is considered.

5.3 If annual net inward migration to Scotland were to average 4,000 per year (the long-term assumption in the principal projection) this would lead to a total net inflow of 108,000 migrants in the period between 2004 and 2031. In fact, the projected total number of migrants in this period is higher at 139,000 because the migration assumptions for the first three years are higher than the long-term projections.

5.4 The assumed fertility and mortality rates are the same in the principal and the zero migration (natural change) variant projection. However, because most migrants are young adults, there is a significant second generation effect with the number of migrants increasing the number of women of childbearing age and hence the future number of births. For the same reason, relatively few migrants die in the period to 2031.

5.5 **Table 2** below shows the projected components of population change in the period to 2031 in the principal projection, the high and low migration variants (which assume long-term net migration flows of +12,500 and -4,500 respectively), and the zero migration variant.

Table 2 Projected population change, Scotland, 2004-2031

thousands

	High migration variant	Principal projection	Low migration variant	Zero migration variant
Popluation at mid-2004	5,078	5,078	5,078	5,078
Population change (2004-2031)				
Births	1,424	1,365	1,306	1,304
Deaths	1,529	1,518	1,507	1,504
Natural change	-105	-153	-201	-200
Net migration	364	139	-86	0
Total change	259	-14	-287	-200
Population at mid-2031	5,338	5,065	4,791	4,878

* Note columns may not sum due to rounding.

5.6 **Table 3** shows how the projected population change is broken down between the assumed level of net migration and projected natural change.

Table 3 Projected population change by component, Scotland, 2004-2031

thousands

	High migration variant	Principal projection	Low migration variant
Total population change between 2004 and 2031	259	-14	-287
Resulting from:			
Assumed net migration	364	139	-86
Natural change assuming no migration	-200	-200	-200
Additional natural change from assumed level of net migration	96	48	0

* Note columns may not sum due to rounding.

5.7 In the principal projection, the population of Scotland rises by 48,000 by 2031 due to “extra” natural change due to migration and under the high migration variant this increases to 96,000.

Annex A – Background and List of Available Variants

Background

The 2004-based projections are the latest for which variant projections have been published for Scotland. A list of the principal and variant assumptions can be found in the tables below. Detailed results can be found on GAD's website www.gad.gov.uk.

List of Available Variants

The 2004-based variant population projections are based on the following categories of assumptions.

Table A - Assumptions

	Fertility	Life Expectancy	Migration
Standard variants			
A	High	High	High
B	Principal	Principal	Principal
C	Low	Low	Low
Special case scenarios			
D	Replacement	No improvement	Zero
E	Constant		

From these assumptions, the following 19 projection variants have been created.

Table B - Variants

		Fertility	Life expectancy	Migration
1	Principal projection	Principal	Principal	Principal
Standard 'single component' variants				
2	High fertility	High	Principal	Principal
3	Low fertility	Low	Principal	Principal
4	High life expectancy	Principal	High	Principal
5	Low life expectancy	Principal	Low	Principal
6	High migration	Principal	Principal	High
7	Low migration	Principal	Principal	Low
Standard 'combination' variants				
8	High population	High	High	High
9	Low population	Low	Low	Low

		Fertility	Life expectancy	Migration
10	Young	High	Low	High
11	Old	Low	High	Low
12	High medium-term dependency*	High	High	Low
13	Low medium-term dependency*	Low	Low	High
Special case scenarios				
14	Replacement fertility	Replacement	Principal	Principal
15	Constant fertility	Constant	Principal	Principal
16	No mortality improvement	Principal	No improvement	Principal
17	Natural change only (zero migration)	Principal	Principal	Zero
18	No change	Constant	No improvement	Principal
19	Stationary	Replacement	No improvement	Zero

* In the long-term, the Old and Young variants produce the highest and lowest (respectively) overall dependency ratios of all the possible combination variants.

Annex B – Method of Projection, Accuracy of Projections and Base Population

Method of Projection

The projections are made for successive years running from one mid-year to the next. For each age, the starting population plus net inward migrants less the number of deaths produces the number in the population, one year older, at the end of the year. To this has to be added survivors of those born during the year. Age is defined as completed years at last birthday.

Migration is assumed to occur evenly throughout the year. For computing purposes, this is equivalent to assuming that half the migrants in a given year at a given age migrate at the beginning of the year and half at the end of the year. The number of net migration to be added to obtain the population aged x+1 at the end of the projection year therefore consists of half those migrating during the year at age x and half of those migrating during the year at age x+1.

The number of deaths in a year is obtained by adding half of the net inward migrants at each age to the number in the population at the beginning of the year and applying the mortality rate qx. The mortality rates used in the projections represent the probabilities of death between one mid-year and the next, according to a person's age last birthday at the beginning of the period. Infant mortality, i.e. the probability of a new-born child not surviving until the following mid-year, is about 85 per cent of the full, first year of life infant mortality rate.

The number of births in the year are calculated by multiplying the average number of women at each single year of age during the year (taken as the mean of the populations at that age at the beginning and end of the year) by the fertility rate applicable to then during that year. The total number of births in a year is assumed to be divided between the sexes in the ratio of 105 males to 100 females, in line with recent experience.

The number of infants aged 0 at the end of the year is calculated by taking the projected number of births, deducting the number of deaths found by applying the special infant mortality rate (see above) and adding half the number of net migrants aged 0 last birthday.

Accuracy of Projections

Although many projection makers might prefer a projection to be regarded simply as a 'scenario' (the certain outcome of a given set of assumptions), it is inevitable that users of projections will treat them as if they were forecasts of the most likely course of future events. It is important, therefore, that users know the inherent uncertainty of predicting demographic variables. The point that successive sets of projections for a particular year are likely to improve in accuracy is an obvious but important one. This effect has sometimes been

described as a ‘narrowing funnel of uncertainty’ and users must be prepared to revise their plans in the light of updated projections.[5]

The size of a population changes because of births, deaths and net migration. Errors in population projections are therefore mainly a consequence of the errors in the projections of each of these three components. However, errors in the population estimates upon which the projections are based also contribute to projection error. Projections are based on the latest estimate of the size and age structure of the population. However, these estimates are subject to later revision. Each Census provides a new starting point for the annual population estimates, removing errors which have accumulated because of imperfections in the data available, particularly regarding migration, for annual updating. These revisions are usually small compared with the other sources of error in population projections. However, base population errors are likely to grow in significance during an inter-censal period and be at their greatest immediately prior to the carrying out of a new Census. GROS revised Scotland’s population estimates for 1981 to 2000 after the 2001 Census, reducing by about 23,000 the 1991 mid-year estimate.

Base Population

The Registrar General's mid-2004 population estimates, published in June 2005 on the GROS website, were used as the base population. These cover all persons usually resident in each area, whatever their nationality. Usual residents temporarily away from home are included, but visitors are excluded. Students are taken to be resident at their term-time address. Members of HM and non-UK Armed Forces stationed in Scotland are included; HM forces stationed outside Scotland are excluded.

[5] Shaw C. GAD, Accuracy and uncertainty of the national population projections for the United Kingdom, *Population Trends* 77, Published 1994

NOTES ON STATISTICAL PUBLICATIONS
NATIONAL STATISTICS

This is a National Statistics publication. It has been produced to high professional standards set out in the National Statistics Code of Practice and Release Practice Protocol (http://www.statistics.gov.uk/about_ns/cop/default.asp).

These statistics undergo regular quality assurance reviews to ensure that they meet customer needs. They are produced free from any political interference.

THE GENERAL REGISTER OFFICE FOR SCOTLAND (GROS)

GROS is the department of the devolved Scottish Administration responsible for the registration of births, marriages, deaths, divorces, and adoptions in Scotland. We are responsible for the Census of Population in Scotland which we use, with other sources of information, to produce population statistics. We make available important information for family history. Our website is www.gro-scotland.gov.uk

ENQUIRIES ABOUT THIS PUBLICATION

Enquiries should be addressed to: Statistics Customer Services, General Register Office for Scotland, Ladywell House, Edinburgh, EH12 7TF
Telephone: (0131) 314 4243, Fax: (0131) 314 4696, E-mail: customer@gro-scotland.gsi.gov.uk

OTHER GROS STATISTICS

Further detailed statistics produced by GROS are available from the Statistics Library on the GROS website (http://www.gro-scotland.gov.uk/statistics/library/index.html). Statistics from the 2001 Census are on the website, Scotland's Census Results On-Line (www.scrol.gov.uk). See also the Census section of the main website (http://www.gro-scotland.gov.uk/statistics/census/index.html).

Information about future publications is provided on the GROS website (http://www.gro-scotland.gov.uk/futurepb.html).

COMPLAINTS AND SUGGESTIONS

If you are not satisfied with our service, please write to Peter Scrimgeour, Head of Statistics Division, Room 1/2/3, Ladywell House, Ladywell Road, Edinburgh, EH12 7TF, Telephone: (0131) 314 4290, e-mail: peter.scrimgeour@gro-scotland.gsi.gov.uk.

We also welcome any comments or suggestions that would help us to improve our standards of service.

RELATED ORGANISATIONS

ORGANISATION	CONTACT
The SCOTTISH EXECUTIVE (SE) forms the bulk of the devolved Scottish Administration. The aim of the statistical service in the SE is to provide relevant and reliable statistical information, analysis and advice that meets the needs of government, business and the people of Scotland	Ryan Stewart, Office of the Chief Statistician, Scottish Executive, 3 Floor West Rear, St Andrews House, Edinburgh, EH1 3DG Telephone: (0131) 244 0442 Fax: (0131) 244 0335 E-mail: statistics.enquiries@scotland.gsi.gov.uk. Website: http://www.scotland.gov.uk/Topics/Statistics
The OFFICE FOR NATIONAL STATISTICS (ONS) is responsible for producing a wide range of economic and social statistics. It also, for England and Wales, registers life events and holds the Census of Population.	Customer Contact Centre, Room 1.015, Office for National Statistics, Cardiff Road, Newport, NP10 8XG Telephone: 0845 601 3034 Minicom: 01633 812399 Fax: 01633 652747 E-mail: info@statistics.gsi.gov.uk Website: www.statistics.gov.uk
The NORTHERN IRELAND STATISTICS AND RESEARCH AGENCY (NISRA) is Northern Ireland's official statistics organisation. The Agency also has responsibility, in Northern Ireland, for the registration of births, marriages, adoptions and deaths and the Census of Population.	Northern Ireland Statistics and Research Agency, McAuley House, 2-14 Castle Street, Belfast, BT1 1SA Telephone 028 9034 8100 Fax 028 9034 8106 Website: www.nisra.gov.uk