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National population projections 2004-based

Report giving population projections by age and sex for the United Kingdom, Great Britain and constituent countries

Prepared by the Government Actuary in consultation with the Registrars General

Editor: Helen Bray

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The Office for National Statistics (ONS) is the government agency responsible for compiling, analysing and disseminating economic, social and demographic statistics about the United Kingdom. It also administers the statutory registration of births, marriages and deaths in England and Wales.

The Director of ONS is also the National Statistician and the Registrar General for England and Wales.

Contact points

For enquiries about this publication, contact :
Tel: 020 7533 5222
E-mail: NatPopProj@ons.gsi.gov.uk

For general enquiries, contact the National Statistics Customer Contact Centre.
Tel: 0845 601 3034
(minicom: 01633 812399)
E-mail: info@statistics.gsi.gov.uk
Fax: 01633 652747
Post: Room 1015, Government Buildings,
Cardiff Road, Newport NP10 8XG

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Acknowledgements

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Future national population projections will be produced by the National Statistics Centre for Demography within the Office for National Statistics.

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1 Executive summary

Introduction

This publication presents the results of new (2004-based) projections of the population of the United Kingdom and its constituent countries. Comparisons in this summary are with the 2002-based projections.

Key results

- The population of the United Kingdom is projected to increase from an estimated 59.8 million in 2004 to reach 67.0 million by 2031. This is equivalent to an annual rate of growth of 0.42 per cent. Longer-term projections suggest the population will continue to rise beyond 2031 but at a much lower rate of growth.
- The projected total population of the United Kingdom at 2031 is 2.2 million (3.3 per cent) higher than in the 2002-based projections. This is due to a combination of higher assumed levels of net migration, higher short-term birth rate assumptions and slightly higher life expectancy assumptions.
- Fifty-seven per cent of the projected 7.2 million increase in the population between 2004 and 2031 is directly attributable to the assumed level of net inward migration. The remainder is attributable to natural increase (an excess of births over deaths).

The change in the age distribution between 2004 and 2031 is shown by **Figure 1.1**. The projection has the following features:

- The number of older people will significantly increase relative to the number of younger people, with the mean age of the population expected to rise from 39.5 years in 2004 to 43.3 years by 2031.
- The number of children aged under 16 is projected to fall by 4.0 per cent from 11.6 million in 2004 to 11.2 million in 2014 and then to rise slowly until the late 2020s. This is a smaller drop than in the 2002 projections, due to a short-term increase in birth rates.
- The number of people of working age (currently defined as between ages 16 to 64 for men and 16 to 59 for women) is projected to rise by 3.1 per cent from 37.1 million in 2004 to 38.2 million in 2010. Allowing for the planned change in women's state pension age from 60 to 65 between 2010 and 2020, the working age population will rise further to 40.5 million by 2020 and is then projected to remain at around this level. Without the change in women's state pension age this period would instead have seen the working age population rise much more slowly from 38.2 million in 2011 to 38.6 million by 2020.
- The number of people over state pension age is projected to increase by 9.3 per cent from 11.1 million in 2004 to 12.2 million in 2010. Allowing for the change in women's state pension age, the population of pensionable age will rise only slightly further (to 12.5 million) by 2020. However, a faster increase will then resume, with longer-term projections suggesting that the number over state pension age will reach 15.3 million by 2031 and 17.5 million by the middle of the century.
- The population aged 80 and over is expected to grow from 2.6 million in 2004 to reach 5.0 million by 2031. Longer-term projections suggest this rapid increase will continue for another twenty years, peaking in the mid 2050s at 7.4 million. The total aged 80 and over is then expected to fall away slightly.

Figure 1.1

Age pyramid of population in 2004 and 2031

United Kingdom

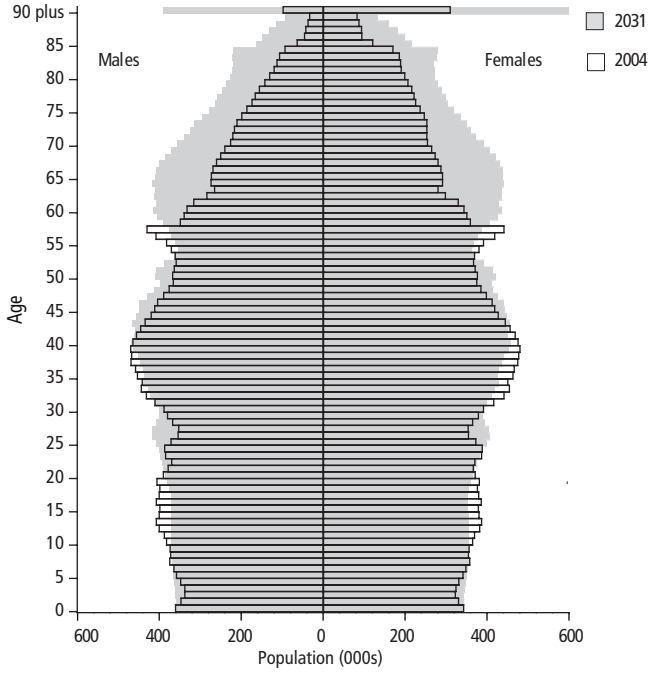

Table 1.1

Population of the United Kingdom by age, 1971–2071

thousands

Year	All ages	Under 16	16-64	65 & over	(80 & over)
	Estimates				
1971	55,928	14,257	34,263	7,408	(1,288)
1981	56,357	12,543	35,339	8,476	(1,572)
1991	57,439	11,685	36,695	9,059	(2,126)
2001	59,113	11,863	37,878	9,373	(2,459)
	Projections				
2006	60,533	11,529	39,296	9,708	(2,696)
2011	61,892	11,231	40,172	10,489	(2,917)
2021	64,727	11,399	40,588	12,740	(3,604)
2031	67,013	11,483	40,191	15,340	(5,023)
	Longer-term projections				
2041	*68,353*	*11,246*	*40,214*	*16,894*	*(5,957)*
2051	*69,252*	*11,270*	*40,377*	*17,605*	*(7,265)*
2061	*69,858*	*11,307*	*39,868*	*18,682*	*(7,352)*
2071	*70,481*	*11,217*	*40,029*	*19,235*	*(8,230)*

Due to differences in past and present demographic patterns, and those assumed for the future, projected trends differ for the four countries of the United Kingdom.

- The population of Scotland is projected to increase slightly until the year 2019 then start to fall, while the population of Northern Ireland is projected to continue growing until the early 2030s and then start to fall. The population of Wales is projected to continue increasing beyond 2031 but at a very low rate of growth, while the population of England is also projected to continue rising, but more strongly. Further details of the results for individual countries are available in **Appendices I and II.**

Underlying assumptions

The assumptions underlying the projections are based on an analysis of recent demographic trends. For the United Kingdom as a whole the key assumptions for the future are that:

- Average completed family size, which has been falling from a peak of nearly 2.5 children per woman for women born in the mid 1930s, will level off at 1.74 children for women born after 1990. For the first few years, assumed birth rates are a little higher than the 2002-based projections, but the long-term assumption of average family size is unchanged.
- Expectation of life at birth, based on the mortality rates for the year in question, is expected to rise from 76.7 years in 2004 to 81.4 years in 2031 for men, and from 81.1 years in 2004 to 85.0 years in 2031 for women. The 2031 figures are slightly higher than those assumed in the previous projections. However, beyond 2031, the life expectancy assumptions are increasingly higher than in the previous projections.
- The long-term net inward migration assumption to the United Kingdom is 145 thousand persons per year from 2007–08 onwards. This compares with an assumed net inflow of 130 thousand a year in the 2002-based projections.

Main changes in this projection

- In the 2002-based projections, life expectancy assumptions were increased and it was assumed that, twenty-five years into the projection period, reductions in mortality rates would be 1 per cent a year at all ages. Rates of improvement were then assumed to halve after every subsequent 25 years. For the 2004-based projections, there is little change in the assumptions for rates of improvement for the first 25 years, but annual improvements are then assumed to remain at 1 per cent a year throughout the remainder of the projection period.
- The 2002-based projections included a downward adjustment for unattributable population change of 27 thousand persons per year for England & Wales. After revisions to the 2001 and 2003 population estimates for England and Wales, this adjustment was removed from subsequent mid-year estimates and for the 2003 and 2004 projections.

Table 1.2

Population of the United Kingdom by constituent country, 1971–2041

thousands

Year	United Kingdom	England	Wales	Scotland	Northern Ireland
Estimates					
1971	55,928	46,412	2,740	5,236	1,540
1981	56,357	46,821	2,813	5,180	1,543
1991	57,439	47,875	2,873	5,083	1,607
2001	59,113	49,450	2,910	5,064	1,689
Projections					
2006	60,533	50,714	2,977	5,108	1,733
2011	61,892	51,967	3,037	5,120	1,767
2021	64,727	54,605	3,165	5,127	1,830
2031	67,013	56,832	3,256	5,065	1,860
Longer-term projections					
2041	*68,353*	*58,299*	*3,292*	*4,913*	*1,849*

- Actual birth rates have increased in the two years prior to the 2004-based projection round. The long-term fertility assumptions remain the same at 1.74 for the United Kingdom, but adjustments have been made in the short-term to make the transition from the latest rates to the long-term assumption.
- The long-term assumption for annual net migration to the United Kingdom has been increased to 145 thousand each year compared with 130 thousand a year in the 2002-based projections.
- Short-term adjustments were made to the migration assumptions in respect of migration from the EU accession countries. The migration assumption for the first year of the projection is 255 thousand, reducing gradually to 145 thousand for 2007–08 onwards.
- The total population of the United Kingdom at 2031 is 2.2 million higher than in the 2002-based projections. This is due to a combination of all the changes to the assumptions.

2 Introduction

Purpose

The 2004-based national population projections for the United Kingdom and its constituent countries were produced by the Government Actuary's Department (GAD) at the request of the Registrars General of England & Wales, Scotland and Northern Ireland. The assumptions were agreed in consultation with the statistical offices of the four countries.

The primary purpose of the national projections is to provide an estimate of the future population of the United Kingdom (and of its constituent countries) as a common framework for use in national planning in a number of different fields. Normally, a new set of projections is made for that purpose every two years, based on assumptions which are judged to be most appropriate from the statistical evidence available at the time. These official sets of projections ensure that the many users of projections can work on consistent assumptions.

History

The Government Actuary's Department first made projections of the population of the United Kingdom in the 1920s. One of the main uses of these earliest projections was in connection with long-term financial estimates under the Contributory Pensions Acts and other schemes of social insurance. In 1954, responsibility for the production of the official national projections was given to the Government Actuary and since then they have been increasingly used in all areas of government planning. New projections were made each year from 1955 to 1979 and then every second year until 1991. There was then a 1992-based set of national projections. Since then projections have been produced every second year. Additional, interim 2001-based and 2003-based projections were carried out following, respectively, the 2001 Census and subsequent revisions to population estimates for England & Wales.

Transfer of responsibilities for national projections

On 31 January 2006, the function of producing the national projections on behalf of the three Registrars General was transferred from the Government Actuary's Department to the newly created National Statistics Centre for Demography (NSCD) within the Office for National Statistics. The NSCD is responsible for the coordination and production of population statistics and demographic analyses for the UK. Future sets of national projections will be produced by ONS in consultation with the General Register Office for Scotland, the Northern Ireland Statistics and Research Agency and the Welsh Assembly Government Statistical Directorate.

Publications

This report, the latest in a regular series started in 1970, gives full details of the new national projections made by the Government Actuary's Department, based on the estimated population at the middle of 2004. These replace the previous 2003-based interim projections[1] and the last full set of population projections, the 2002-based set[2]. Results of the projections also appear in a number of other publications of the Office for National Statistics including *Population Trends*[3], *Social Trends*[4] and the *Annual Abstract of Statistics*.[5]

The chapters of this report give a summary of the results of the 2004-based national projections, together with a description of the methods employed and of the assumptions on which the projections are based. Details of how to obtain the results of the projections are given in **Chapter 11**. Full results are available on the GAD website at www.gad.gov.uk.

Projection period

The main focus of these projections is on the period to 2031. However, longer-term results to 2074 are available on the GAD website and are discussed in this volume where appropriate. In previous projections, results were published at United Kingdom and Great Britain level up to 70 years ahead, but only for 40 years ahead at England & Wales and individual country level. However, the long-term figures should be treated with great caution. Population projections become increasingly uncertain the further they are carried forward, and particularly so for smaller geographic areas.

Expert advisory group

One innovation for the 2004-based projections round was the creation of an expert academic group to discuss the assumptions underlying national projections. It is intended that this should become a regular part of the assumption setting process. The role of this expert group was strictly advisory; responsibility for final decisions on the assumptions remained with GAD and the Registrars General. A note of the meeting of this group is included in **Appendix C**.

Interim 2003-based population projections

Following publication in September 2004 of revised population estimates for England & Wales, an additional 'interim' 2003-based set of population projections was published later that month. The 2003-based projections took account of these revisions and also removed the allowance for unattributable population change that had been made in the 2002-based projections.[2] They were designated as interim projections as, apart from the allowance for unattributable population change, there was no change to the long-term assumptions for fertility, migration and mortality which were used in the 2002-based projections.

Population estimates for Scotland and Northern Ireland were unaffected by the above changes. However, in the interests of producing up to date results at UK level, interim 2003-based projections were produced for all countries. In addition, some short term changes were made to the assumptions of fertility and migration between the countries of the UK which affected all four countries.

As the 2003-based population projections were an interim set, no accompanying reference volume was produced. However, an article describing the interim projections was published in *Population Trends*.[1]

The comparisons in Chapter 4 of this report have been made between the last full projection set, the 2002-based, and this 2004-based projection set.

Subnational projections

Subnational population projections are the responsibility of the statistical offices of the individual countries. ONS are currently planning their publication of 2004-based subnational projections for England in Autumn 2006. The General Register Office for Scotland published 2004-based subnational projections, consistent with the national projections described in this article, on 20 December 2005.[6] The Northern Ireland Statistics and Research Agency will publish subnational projections for Northern Ireland in summer 2006. The Welsh Assembly Government Statistical Directorate issued regional 2003-based population projections in June 2005[7] and, in conjunction with local authorities and other interested parties in Wales, are reviewing the provision of future subnational projections.

Other related projections

A number of more specialised projections, all consistent with the national projections, are also prepared by government. These include labour force, household and marital status projections. Marital status projections, consistent with the interim 2003-based national projections, were published in March 2005.[8] ODPM published 2003-based household projections for England in March 2006.[9] 2004-based labour force projections for the period 2006 to 2021 were published by ONS in January 2006.[10] Population projections for other countries, carried out on a comparable basis, are produced by organisations such as Eurostat[11] and the United Nations.[12]

Further information

Additional information about the national projections may be obtained from the Office for National Statistics, National Population Projections Branch, Room D305, 1 Drummond Gate, London SW1V 2QQ.

Telephone: 020 7533 5222
E-mail: NatPopProj@ons.gsi.gov.uk

Further information on the subnational projections may be obtained from:
Office for National Statistics: www.statistics.gov.uk/cci/nugget.asp?id=995
General Register Office for Scotland: www.gro-scotland.gov.uk/statistics/library/popproj/index.html
National Assembly for Wales: www.wales.gov.uk/keypubstatisticsforwales
Northern Ireland Statistics and Research Agency: www.nisra.gov.uk/demography/

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12. *World Population Prospects: The 2004 Revision.* United Nations (2005).

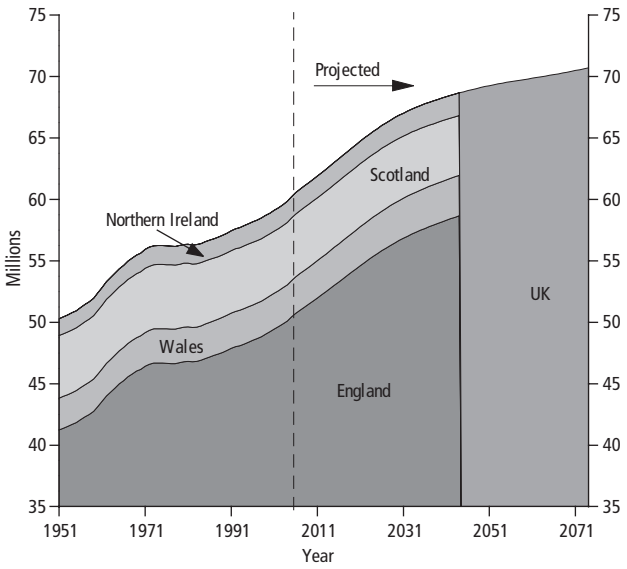
3 Results of the projections

Future size of the population

The population of the United Kingdom is projected to increase gradually from 59.8 million in 2004 to 67.0 million by 2031 (see **Table 3.1** and **Figure 3.1**). Longer-term projections suggest the population will continue rising beyond 2031, and still be rising at the end of the projection period, but at a much lower rate of growth.

Figure 3.1

Actual and projected population of the United Kingdom and consistuent countries, 1951–2074



Actual and projected numbers of births and deaths are shown in **Figure 3.2**. With the single exception of 1976, the United Kingdom gained population through natural increase (births *less* deaths) throughout the 20th century. However, it is projected that deaths will begin to outnumber births in the mid 2030s. In the longer-term, the number of deaths is expected to continue rising until the mid 2050s, when the smaller cohorts of the 1970s and onwards reach old age, and then to fall back slightly.

Of course, projections that far ahead are very uncertain. In particular, it should be noted that the projected trend in births depends on the assumed future level of fertility and, therefore, has a higher level of uncertainty attached to it than the projected trend in deaths which is strongly influenced by the age structure of the population alive today. The large projected rise in the number of deaths in the second quarter of the century reflects the size of the large cohorts born immediately after the Second World War and during the 1960s baby boom.

The projected trend in the size of the United Kingdom population is shown in **Table 3.1**. **Appendix II** provides a similar analysis for each individual country and is carried forward to 2044 (2074 for England). The population of Scotland is projected to increase slowly to 2019 then start to fall, when the negative natural change starts to exceed the assumed level of inwards migration. The population of Northern Ireland is projected to continue growing to the early 2030s, due partly to higher birth rates, but then will start to gradually fall as the assumed small net migration outflow starts to exceed the declining natural increase.

Table 3.1

Projected components of change: five year summary, 2004–2031 (annual averages)

United Kingdom **thousands**

	2004–06	2006–11	2011–16	2016–21	2021–26	2026–31
Population at start	59,835	60,533	61,892	63,304	64,727	66,002
Births	714	701	710	722	720	705
Deaths	590	579	573	583	609	648
Natural change	124	122	137	140	110	57
Migration	225	150	145	145	145	145
Total change	349	272	282	285	255	202
Population at end	60,533	61,892	63,304	64,727	66,002	67,013

The population of both England and Wales are still projected to be increasing beyond 2031, although at a much slower level for Wales, where natural increase is expected to become negative (more deaths than births) in the mid 2020s but will still be outweighed by the assumed level of net inwards migration. Natural increase is expected to remain positive until the 2040s in England, and even after that the assumed level of net migration is sufficient to keep the overall population increasing.

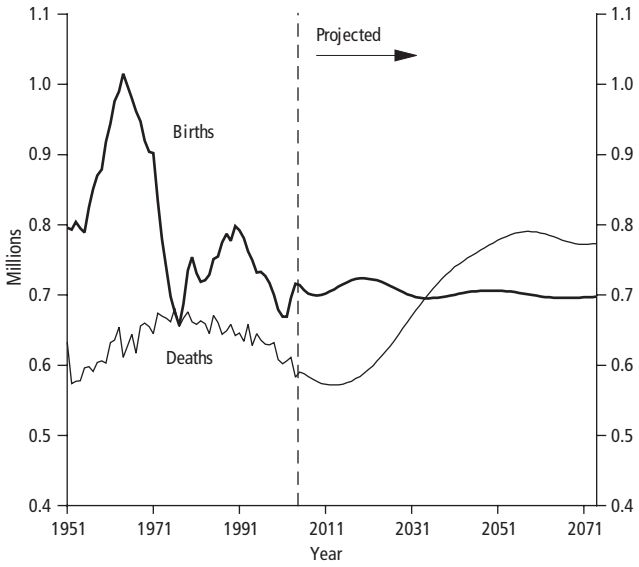
Births, deaths and migration

Figure 3.2 shows the effect of the fluctuation in the birth rates assumed for the next few years. Birth rates have increased in the last couple of years, but it is assumed that these will decline slowly to the long-term assumption of 1.74 children per woman (UK). Thus the number of births is projected to decline for a few years before showing an increase until around 2020. The increase is not due to an increasing birth rate but to an increase in the female population of childbearing age, partly due to increased levels of inwards migration for these age groups. The number of births is then projected to fall in the longer term as the number of women of childbearing ages starts to fall. This is in itself a consequence of the below replacement level fertility which the UK has experienced since the early 1970s and which is assumed to continue (see **Figure 6.1**).

Figure 3.2

Actual and projected births and deaths, 1951–2074

United Kingdom



The annual number of deaths has been declining in the last few years and is projected to fall a little further in the next ten years or so. Thereafter, as the large cohorts born immediately after the Second World War and during the 1960s baby boom begin to reach elderly ages, the trend is consistently, and fairly sharply, upward. In the last decade of the projection the number of deaths will start to drop, as the smaller cohorts of the late 20th century reach the elderly ages.

Table 3.2

Actual and projected population by age, 2004–2031

United Kingdom **thousands**

Age group	2004	2006	2011	2016	2021	2026	2031
0–14	10,867	10,731	10,498	10,552	10,683	10,780	10,760
15–29	11,379	11,793	12,251	12,115	11,700	11,471	11,527
30–44	13,471	13,299	12,587	12,299	12,821	13,265	13,135
45–59	11,517	11,757	12,310	13,090	12,945	12,268	12,017
60–74	8,054	8,298	9,307	9,864	10,448	11,038	11,779
75 & over	4,547	4,656	4,938	5,385	6,129	7,180	7,795
All ages	59,835	60,533	61,892	63,304	64,727	66,002	67,013
Mean age (years)	39.5	39.7	40.4	41.2	41.9	42.7	43.3
Under 16	11,646	11,529	11,231	11,224	11,399	11,487	11,483
Working age[1]	37,064	37,636	38,479	39,650	40,588	40,593	40,191
Pensionable age[1]	11,125	11,368	12,182	12,430	12,740	13,922	15,340
Dependants per 1,000 persons of working age							
Under 16	314	306	292	283	281	283	286
Pensionable age[1]	300	302	317	314	314	343	382
Total[1]	614	608	608	597	595	626	667

1 The 'working age' population is that aged between 16 and state pension age, and the 'pensionable age' population is that over state pension age The table takes account of the change in the present state pension age from 65 for men, and 60 for women, to 65 for both sexes, which will be phased in between April 2010 and March 2020.

Figure 3.3

Actual and projected age distribution, 1971–2074

United Kingdom

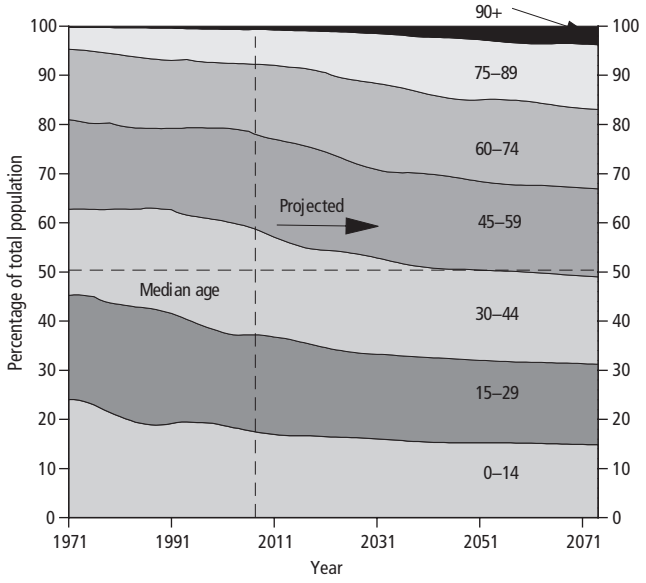
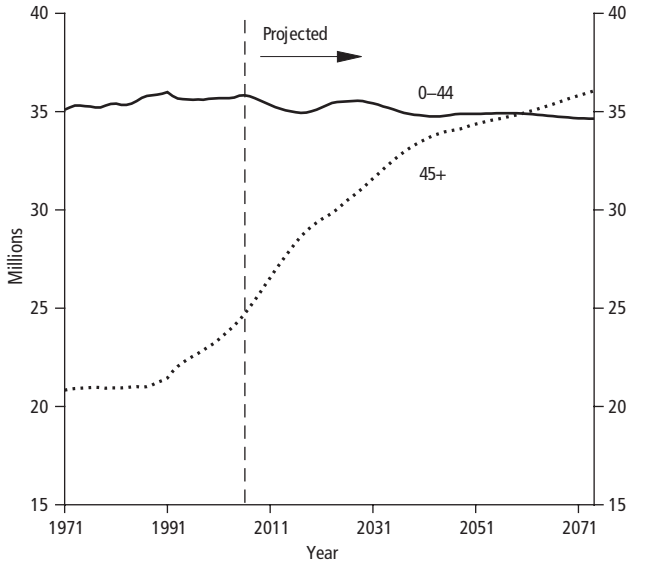


Figure 3.4

Actual and projected population aged under and over 45, 1971–2074

United Kingdom



Finally, it is assumed in the 2004-based projections that annual net inward migration into the United Kingdom will be 145 thousand persons per year from 2007–08 onwards. In the short-term, higher migration assumptions allow for the inflow of migrants from the EU Accession countries.

Of course, in practice, annual numbers of births, deaths and migrants will not follow such smooth patterns. Migration, in particular, can be expected to continue to exhibit unpredictable year-to-year fluctuations.

Age structure

The age structure of the population is projected to change in future years, mainly as a result of past and future fluctuations in the number of births, but also because of the effects of changes in mortality rates and because of the impact of migration. The main effects are summarised for broad age groups in **Table 3.2** and illustrated in **Figure 3.3**.

The age structure will become gradually older with the mean age of the population rising from 39.5 years in 2004 to 43.3 years in 2031. Longer-term projections show continuing ageing with the mean age reaching 45 years in the 2050s and rising very slowly from then onwards. **Figure 3.4** shows that the population aged under 45 is expected to fluctuate, with a slight drop of 0.3 million between 2004 and 2031. However, the number aged 45 and over is projected to increase by around 7.5 million over the same period. At present, there are nearly 50 per cent more people aged under 45 than there are aged 45 and over, but by the late 2050s the groups will be of similar size.

Appendix I gives the projected population by five year age groups for the UK and for each constituent country. Results are given to 2044 for Wales, Scotland and Northern Ireland and to 2074 for England and the combined countries. Results for individual ages are available on the GAD website.

Children and the population of working and pensionable ages

Projected future trends in the size of these three broad subgroups of the population are summarised in **Table 3.2** and illustrated in **Figure 3.5**. The Pensions Act 1995[1] announced a change in state pension age from 65 years for men and 60 years for women as at present, to 65 years for both sexes. This change is to be phased in between April 2010 and March 2020. **Table 3.2** takes account of this change and **Figure 3.5(a)** shows the figures for 2010 onwards under the new and old definitions. The detailed projection results on the GAD website show the projected working age and pensionable age populations for the period 2010 onwards based on the changed definition of state pension age.

The number of children under the age of 16 is projected to fall by around 4 per cent from 11.6 million in 2004 to 11.2 million by 2014, before rising slowly until the late 2020s. Figure 3.6 shows that the number of 16 year olds entering the working age population is projected to fall by 16 per cent, from 800 thousand in 2007 to a low of 673 thousand in 2018 before the larger cohorts of births of 2003 and 2004 result in a rise.

The working age population is projected to rise from 37.1 million now to 38.2 million in 2010. Allowing for the change in women's state pension age from 60 to 65 between 2010 and 2020, it will then rise further to 40.5 million by 2020. It is expected to remain at a similar level for the remainder of the projection period.

The working population will also become much older as the baby boom generations age. Although little change is projected in the number of adults under age 30, the size of the older age groups will change more substantially. The 30–44 age group is projected to fall from 13.5 million in 2004 to 12.3 million in 2016 before rising again to almost the same level, peaking at 13.3 million in the late 2020s. Conversely, the 45–59 age group is projected to increase by over 14% by 2018 to 13.2 million before beginning to fall.

The number of people of state pension age is projected to increase from 11.1 million in 2004 to 12.2 million in 2010. However, with the increase in women's state pension age, the population of pensionable age will then rise much more slowly until 2020. A faster increase will then resume with the number of state pension age expected to reach 15.3 million by 2031 and to continue rising for the whole of the longer-term projection. Without the change in women's state pension age, the population of pensionable age would have risen to 14.7 million by 2021, and would have reached over 21 million by the end of the projection period.

Dependency ratios

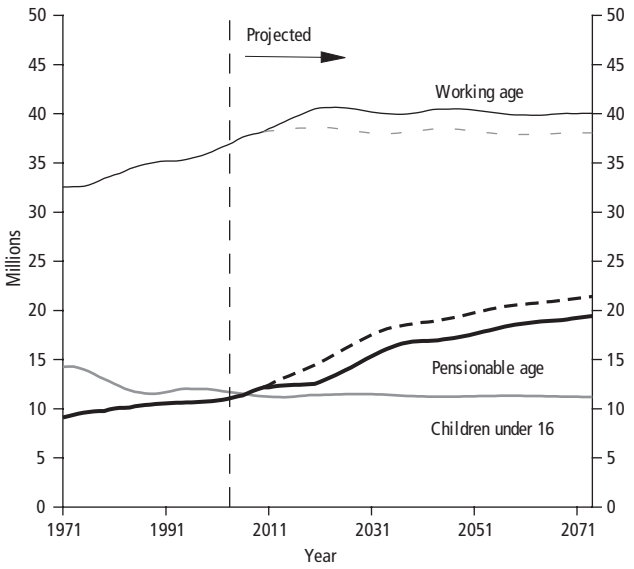
These changes in age structure will, in time, have a marked effect on the future proportion of dependants in the population. **Table 3.2** and **Figure 3.5(b)** show projected dependency ratios, that is, the number of children under 16 or the population of pensionable age (or the sum of the two) expressed as a percentage of the working age population. These are, of course, somewhat arbitrary boundaries as, in reality, full-time education ends, and retirement starts, at a range of ages. Further, research has shown that labour market changes have in the past been a more important factor than demographic trends in influencing real (economic) dependency.[2]

Figure 3.5

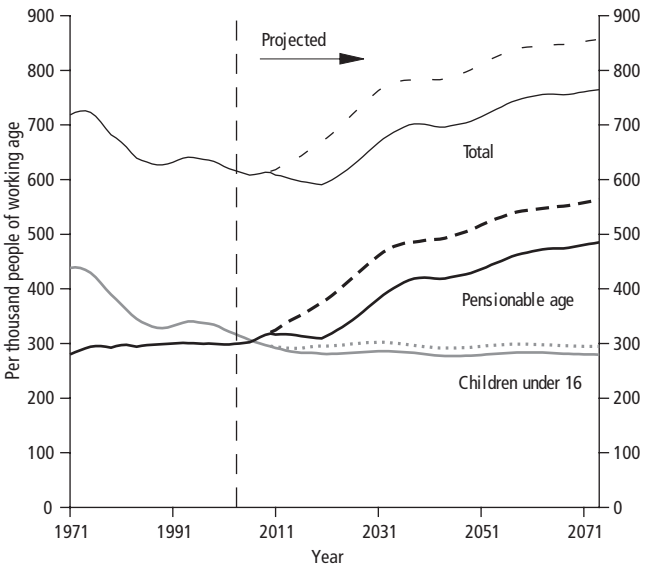
Actual and projected number of children, populations of working and pensionable ages, and dependency ratios, 1971–2074

United Kingdom

a) population by age group



b) dependency ratios

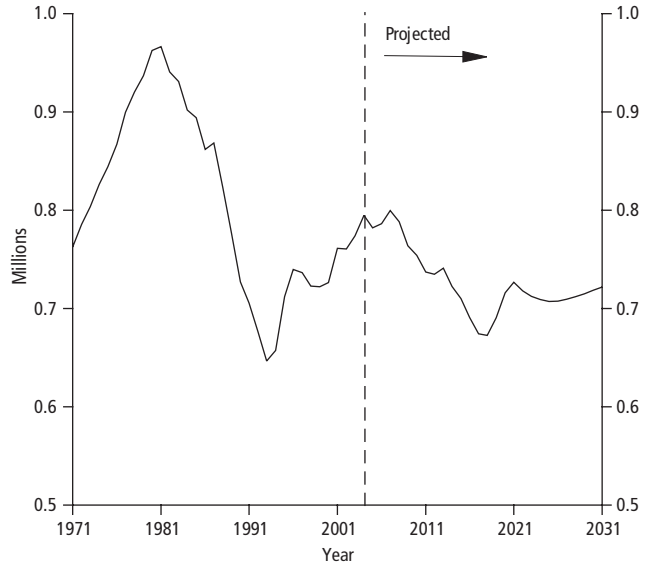


Note: The 'working age' population is that aged between 16 and state pension age. Between April 2010 and March 2020, state pension age will change from 65 years for men and 60 years for women, to 65 years for both sexes. The dotted lines show what the projected population at working age and pensionable age (and the resulting dependency ratios) would have been, had the present pension age applied throughout.

Figure 3.6

Actual and projected population aged 16, 1971–2031

United Kingdom



The 'total' dependency ratio is projected to fall fairly gradually from 614 dependants per 1,000 persons of working age in 2004 to about 590 per 1,000 in 2020 when the change in women's state pension age to 65 years is complete. It is then expected to increase rapidly for the next two decades, levelling off for a few years before rising again. This temporary levelling off is in part because of the small cohort of the 1980s reaching state pension ages. The longer-term projections suggest a total dependency ratio of around 755 per 1,000 in the early 2060s. In fact, this is not much higher than the total dependency ratio in the early 1970s, although then it was children who comprised the majority of dependants. Research suggests that the cost of supporting a person aged 65 and over is on average greater than that to support a child.[3]

The child ratio fell markedly during the 1970s and early 1980s and is projected to fall further over the next 15 years before stabilising. The pensionable age ratio is projected to rise gently until 2010, stay at about the same level for the 10 years that women's state pension age is increasing, but then to rise rapidly in a similar pattern to that of the total dependency ratio.

Of course, without the planned change in women's state pension age, the proportion of dependants would have risen earlier and further as indicated by the dotted lines in **Figure 3.5(b)**. At 2021, the total dependency ratio is now projected to be 595 dependants per 1,000 persons of working age, whereas it would have been 676 per 1,000 under the old definition. The projected pensionable age ratio at 2021 is now 314 per 1,000 (compared with 381 per 1,000 under the old definition) and the child ratio is 281 per 1,000 (compared with 295 per 1,000).

Figure 3.7

Actual and projected components of elderly dependency ratio, 1971–2051

United Kingdom

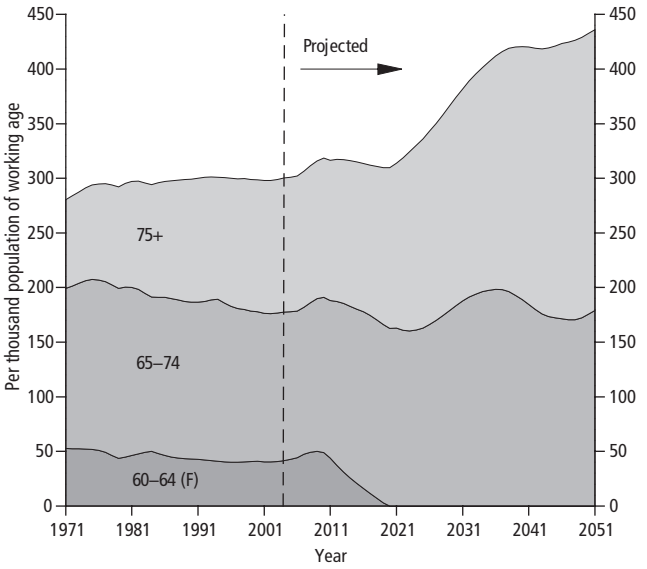


Figure 3.7 splits the pensionable age dependency ratio into three age bands (60–64, 65–70 and 75 and over). After rising up to 2010, the ratio declines slightly between 2010 and 2020 as the change in women's state pension age offsets growth in the numbers aged 65–74. After the pension age change is complete, there is a steep increase, with the biggest percentage increase amongst those aged 75 and over.

Population ageing will be experienced to a greater or lesser extent in all Western countries. Indeed, the latest Eurostat projections[4] show that in the year 2020, compared with the EU as a whole, the UK will have proportionately fewer older people, although the overall dependency ratio will be around the EU average.

Projections to 2074

The main focus of the projections is on the period to 2031. However, longer-term projections have been discussed where appropriate in this chapter. Clearly, projections become increasingly uncertain the further into the future they are carried. However, to meet the needs of those concerned with the provision of retirement income for the present working generations, the projections have been carried forward to 2074.

The population of the United Kingdom is projected to continue rising throughout the longer-term projection period. The annual number of deaths is expected to exceed the number of births from the mid 2030s and is projected to reach a peak of just under 800 thousand in over fifty years' time. The annual number of births is projected to stabilise in the mid 2030s and, with

some fluctuation, stay at a similar level for the remainder of the projection period. The excess of deaths over births is projected to reach a peak of around 90 thousand in about 2060 before reducing. This projected negative natural change is less than the assumed level of net inward migration and the population continues to rise, reaching 70.9 million by the end of the projection period.

Population increases are greatest at the oldest ages. The number of people aged 60 and over is projected to rise throughout the projection period, with approaching twice the number aged 60 plus at 2074 compared with 2004 (23.4 million compared to 12.6 million). However, the number of persons aged over 75 is increasing even faster and is projected to have doubled by 2040, while the number aged 90 and over will have more than tripled by the same year.

Although these very long-term figures are subject to great uncertainty, they show the consequences that would follow if the long-term assumptions of fertility, mortality and migration were to be realised in practice.

References

1 *Pensions Act 1995* Chapter 26 Part II Section 126 and Schedule 4 (see also www.gad.gov.uk/Population/2004/methodology/pensionage.htm)

2 Johnson P and Falkingham J. *Ageing and economic welfare*. Sage publications (1992).

3 *Replacement migration: is it a solution to declining and aging populations?* United Nations (2000).

4 Eurostat (2005). 2004 EU Population Projections. Available at epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136184,0_45572595&_dad=portal&_schema=PORTAL.

4 Comparison with 2002-based projections

Introduction

In this chapter, the assumptions and results for the 2004-based projections are compared with the previous (2002-based) set of 'full' projections which were fully described in the preceding volume of the PP2 series.[1] However, as mentioned in **Chapter 2**, an additional set of 'interim' 2003-based projections was published following revisions to the population estimates for England & Wales.[2] Comparisons between the 2004-based and interim 2003-based projections are discussed elsewhere.[3]

Changes in assumptions

Chapters 6 to 8 describe the fertility, mortality and migration assumptions adopted for the 2004-based projections. Key summary indicators of these assumptions are compared with the assumptions for the 2002-based projections in **Table 4.1**. In the medium-term, the main change is an increase in the assumptions made about future net migration. But, beyond 2029, changes made to the long-term mortality assumptions become of gradually increasing significance.

Fertility

The long-term assumptions of average completed family size are unchanged for each country. However, in 2003 and 2004, there were increases in total fertility rates in all countries of the UK to levels at or above the long-term assumptions.[4] It is too soon to judge whether these higher fertility levels will be sustained for sufficiently long to have a significant effect on long-term completed family size. However, although long-term assumptions have been left unchanged, short-term assumptions have been increased compared with the 2002-based projections. Revised assumptions about the future number of female migrants also contribute to changes in the projected numbers of future births (see **Table 4.3**).

Table 4.1

Comparison of 2002-based and 2004-based projection assumptions

		United Kingdom	England	Wales	Scotland	Northern Ireland
Fertility -	Long-term average number of children per woman					
	2004-based	1.74	1.75	1.75	1.60	1.80
	2002-based	*1.74*	*1.75*	*1.75*	*1.60*	*1.80*
Mortality -	Expectation of life at birth in 2029*					
Males	2004-based	81.2	81.4	80.9	78.9	80.8
	2002-based	*80.8*	*81.0*	*80.4*	*78.7*	*80.3*
Females	2004-based	84.9	85.0	84.6	83.5	84.7
	2002-based	*84.8*	*84.9*	*84.5*	*83.4*	*84.4*
Net Migration† -	Annual net flow from 2007-08 onwards					
	2004-based	145,000	130,000	11,500	4,000	–500
	2002-based	*130,000*	*124,000*	*8,000*	*–1,500*	*–500*
Other changes** -	Annual adjustment					
	2004-based	-	-	-	-	-
	2002-based	*–27,000*	*–25,000*	*–2,000*	-	-

* *Expectations of life for 25 years ahead given as specimen year. Note these are period expectations of life based on the mortality rates assumed for the year 2029 and do not take account of the continuing improvement in mortality projected beyond 2029*

† *Includes international migration and cross-border migration between the countries of the UK.*

** *Adjustment for unattributable population change (see main text)*

Mortality

Short and medium-term period life expectancies are generally slightly higher than in the previous projections, especially for males. But, beyond 2029 (the 25th year of the projection period), the differences are greater. The new projections assume that mortality rates at each age will converge to a common rate of improvement of 1 per cent a year at 2029 and continue to improve at that constant rate thereafter. In the 2002-based projections, the rate of improvement was assumed to halve every subsequent twenty-five years, that is, from 1 per cent in 2027 to ½ per cent a year by 2052 etc. This means that period life expectancies at birth for the UK at 2051, for example, are about 1.1 years higher for males and 0.7 years higher for females in the 2004-based projections than in the previous projections. There is therefore relatively little impact on projected deaths in the period to 2031 (see Table 4.3) but, in the longer-term, there are significant decreases in the projected number of future deaths in a given year and corresponding increases in the projected number of people at elderly ages.

Migration

The new long-term assumption for net migration to the United Kingdom is +145 thousand each year compared with +130 thousand a year in the 2002-based projections. This increase follows two further years (2002 and 2003) where net migration remained at historically high levels. In addition to the revised assumption of international migration to the UK, there have also been some changes to the assumptions made about cross-border migration flows between the four countries of the UK. The overall result of these changes is that the assumed level of net migration has been increased in England, Scotland and Wales but is unchanged in Northern Ireland.

Assumptions for the first three years are considerably higher than those made in the previous projections, mainly because of a short-term allowance for additional net migration from the accession countries which joined the European Union in May 2004 (see **Chapter 8** for further details).

In Scotland, both the 2002-based and 2004-based projections (as well as recent mid-year estimates) include an adjustment to the migration component of –1,500 per year which was derived following analysis of the 2001 Census. The Census indicated that the previously published mid-year estimates had been overestimated and so this adjustment is included in estimates and projections while a review of migration is ongoing. Similar adjustments made for England & Wales in the 2002-based projections are discussed in the following section.

Other changes

The other significant change since the 2002-based projections is the removal of the allowance made for 'unattributable population change' for England and Wales. This annual downward adjustment of 27 thousand was included in the 2002-based projections after the Office for National Statistics (ONS) had made a similar adjustment for the original mid-2002 population estimates in respect of the unexplained intercensal discrepancy which had accumulated in population estimates between the 1991 and 2001 Censuses (see Chapter 9 of the preceding volume in the PP2 series[1] for further details).

Following the results of local authority population studies published in July 2004,[5] the size of the unexplained intercensal discrepancy has reduced. ONS therefore reviewed the continued need for the adjustment for unattributable population change in the light of this reduction, ONS's plans to improve the quality of population estimates and in response to comments made about the adjustment made for the mid-2002 estimates. ONS concluded from this further research that it is now not possible to demonstrate that such an adjustment will produce more reliable population estimates, either nationally or subnationally.[6] Consequently, subsequent population estimates have not included any allowance for unattributable population change and no allowance has been made in the 2004-based projections.

Base population

As shown in **Table 4.2**, the population of the United Kingdom at mid-2004 was 222 thousand (0.4 per cent) higher than envisaged in the 2002-based projections. This is largely a consequence of the subsequent upward revisions to the original estimate of the population of England & Wales which had been the base for the 2002-based projections and the associated removal of the allowance for unattributable population change (see above) made in the 2002-based projections. However net migration to the UK and births during the period 2002–04 were also underprojected.

The overprojection of the total population varied from 0.8 per cent in Scotland to 0.1 per cent in Northern Ireland. The underprojection of net cross-border migration flows from the rest of the UK to both Scotland and Wales also contributed to the discrepancy for both countries.

Table 4.2

Population change 2002-2004: actual change compared with 2002-based projected change, United Kingdom

United Kingdom

	Mid-year estimates 000s	2002-based projections 000s	Difference	
			000s	%
Population at mid-2002	59,322	59,229	93	0.2%
Components of change (2002-2004)				
Births	1,389	1,365	24	1.7%
Deaths	1,208	1,207	1	0.0%
Natural change	181	158	23	--
Net migration	327	280	47	--
Other changes	6*	–54**	60	--
Total change	513	384	130	--
Population at mid-2004	59,835	59,613	222	0.4%
England	50,094	49,935	159	0.3%
Wales	2,952	2,931	21	0.7%
Scotland	5,078	5,038	41	0.8%
Northern Ireland	1,710	1,709	2	0.1%

* *Net movements of Armed Forces and other smaller changes.*
** *Adjustment for unattributable population change (see main text).*

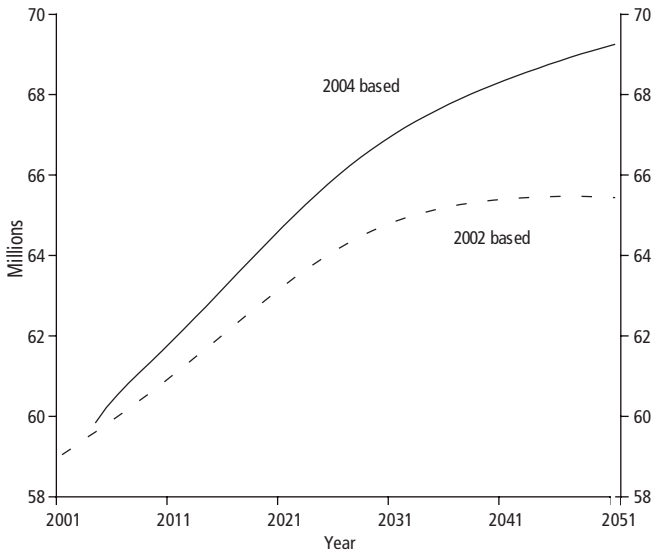
Total UK population

The 2004-based projection of the total population of the United Kingdom is compared with the 2002-based projections in **Figure 4.1**, as noted above. The base population at mid-2004 is 222 thousand higher than envisaged in the 2002-based projections. The differential continues to increase thereafter due to a combination of more migrants, more births and fewer deaths. The assumed annual number of migrants is higher than in the previous projections. The projected number of births is higher both because of higher short-term fertility rate assumptions (although the long-term assumption of average family size is unchanged) and because the higher assumption of net migration increases the number of women of childbearing age. The change in the projected number of deaths is less significant in the medium-term, but the higher long-term assumptions of life expectancy have an increasing impact beyond 2029.

The population is now projected to continue rising for the whole of the projection period, rather than peaking in 2047 as in the 2002-based projections. However, as shown in **Chapter 9** on variant projections, whether the population actually does continue to grow, or reaches a peak during the projection period, is still very uncertain.

Figure 4.1

Projected population of the United Kingdom, 2002–2051, 2002-based and 2004-based projections



The projected total population of each country is compared with the 2002-based projections in **Table 4.3.** The difference between the two projections is broken down into changes in the base population; changes in the projected numbers of births, deaths and migrants; with the removal of the adjustment for unattributable population change (see above)

Table 4.3

Change in projected population compared with 2002-based projections

thousands

Country	2004-based projection	2002-based projection	Total change	Change due to: base population*	projected births	projected deaths†	projected migrants	removal of adjustment for unattributable population change#
(a) Population at 2011								
England	51,967	51,315	652	159	115	19	184	175
Wales	3,037	2,971	66	21	4	–1	27	14
Scotland	5,120	4,984	135	41	27	–2	70	--
Northern Ireland	1,767	1,751	17	2	3	2	10	--
United Kingdom	61,892	61,022	870	222	150	19	290	189
(b) Population at 2021								
England	54,605	53,478	1,126	159	210	88	244	425
Wales	3,165	3,038	127	21	12	–2	62	34
Scotland	5,127	4,911	216	41	54	–4	125	--
Northern Ireland	1,830	1,811	19	2	4	4	10	--
United Kingdom	64,727	63,239	1,488	222	280	86	440	459
(c) Population at 2031								
England	56,832	55,158	1,673	159	350	186	304	675
Wales	3,256	3,066	190	21	23	–6	97	54
Scotland	5,065	4,770	294	41	83	–9	180	--
Northern Ireland	1,860	1,840	20	2	4	5	10	--
United Kingdom	67,013	64,835	2,178	222	460	176	590	729

** Differences between the estimated population at mid-2004 and the 2002-based projection of the population at mid-2004 (see Table 4.2).*
† Reductions in the projected number of deaths (as compared with the 2002-based projections) are shown as positive numbers in this table as they contribute to an increase in the size of the population.
 # An annual downward adjustment of 27,000 for unattributable population change was made in the 2002-based projections but has been removed for the 2004-based projections (see main text).

shown separately. Reductions in the projected number of deaths (as compared with the 2002-based projections) are shown as positive numbers in the table as they contribute to an increase in the size of the population.

Populations are higher than in the 2002-based projections for each country. The largest increases at 2031 are for Scotland and Wales (both 6.2 per cent) where the increase in migration assumptions has been relatively the greatest. The projected populations of England and Northern Ireland at 2031 are 3.0 per cent and 1.1 per cent higher, respectively, than in the 2002-based projections.

Distribution by age and sex

The change in the projected size of the United Kingdom population in particular age-groups is shown in **Table 4.4.** Compared with the 2002-based projections, the UK population at 2031 is higher in all age groups. However, increases are greatest for the working ages. The size of these age groups are affected by the higher migration assumptions, the higher short-term fertility assumptions, the subsequent upward revisions to the base population used for the 2002-based projections and the associated removal of the adjustment for unattributable population change.

The population aged 75 and over has increased a little because of the slightly higher medium-term assumptions of life expectancy. However, for the UK as a whole, the population aged 60-74 is initially slightly lower than previously projected. This results from the new projections assuming small net migration outflows at most older working ages and particularly around retirement age. But by 2031 this is offset by the upward effect of some of the other changes to assumptions mentioned above spreading to older age groups as the population ages.

The changes at individual ages and for each sex at the year 2031 are shown in **Figure 4.2**. This shows that the increase in

Table 4.4

Change in projected population by age: 2004-based projections compared with 2002-based projections.

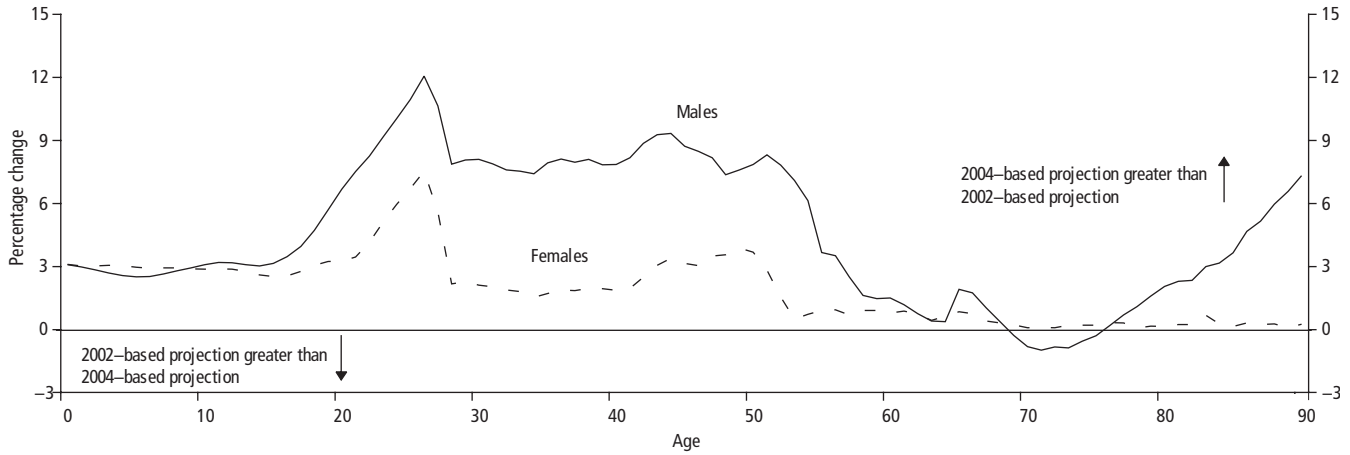
United Kingdom

	2004		2011		2021		2031	
Age group	000s	%	000s	%	000s	%	000s	%
Under 16	73	0.6	250	2.3	309	2.8	323	2.9
16 – 29	101	1.0	351	3.1	447	4.2	612	6.0
30 – 44	45	0.3	210	1.7	539	4.4	634	5.1
45 – 59	8	0.1	90	0.7	207	1.6	464	4.0
60 – 74	–12	–0.2	–40	–0.4	–40	–0.4	51	0.4
75 & over	8	0.2	9	0.2	27	0.4	94	1.2
All ages	222	0.4	870	1.4	1,488	2.4	2,178	3.4

Figure 4.2

Change in projected population at 2031 by age and sex: 2004-based projections compared with 2002-based projections

United Kingdom



population at working ages compared with the 2002-based projections is much greater for males than females. This is a result of the removal of the downward adjustment for unattributable population change which was heavily concentrated amongst males. Overall, at 2031, the male population of the UK is 4.8 per cent higher than in the 2002-based projections, whereas the female population is 2.0 per cent higher.

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1. Office for National Statistics (2004) *National population projections: 2002-based. S*eries PP2 no. 24. The Stationery Office: London.

2. Shaw C (2004) Interim 2003-based national population projections for the United Kingdom and constituent countries. *Population Trends* **118**, pp 6–16.

3. Shaw C (2006) 2004-based national population projections for the United Kingdom and constituent countries. *Population Trends* **123**, pp 9–20.

4. Office for National Statistics (2005) Annual Update: Births in 2004 in England and Wales. *Population Trends* **122**, pp 87–91.

5. Office for National Statistics (2004) *Results of 2001 Census based Local Authority Population Studies*. ONS News Release (8 July 2004). Available at www.statistics.gov.uk/pdfdir/census0704.pdf

6. www.statistics.gov.uk/about/Methodology_by_theme/downloads/Changes_Estimates.pdf

5 Base population

Definition

The projections are based on the Registrars General's estimate (published in August 2005) of the resident population of the United Kingdom at mid-2004 of some 59.8 million. This estimate is based upon 2001 Census results, with allowance for subsequent births, deaths, migration and ageing of the population.[1] This estimate does not take account of the further small correction to the mid-2004 estimates for England made by the Office for National Statistics on 20 December 2005.[2]

The population includes all usually resident persons, whatever their nationality. Members of HM armed forces in the United Kingdom are included, but members of HM armed forces and their families who are abroad are excluded and are treated as migrants when they return home. The opposite applies to foreign armed forces in the United Kingdom.

Base populations for individual countries

The estimates of the population at mid-2004 on which these projections are based are as follows (in thousands):

England	50,094
Wales	2,952
Scotland	5,078
Northern Ireland	1,710
United Kingdom	59,835

A breakdown by age and sex for each country is given in **Appendix I**.

Estimates of the population aged 90 and over

Official mid-year population estimates produced by the Registrars General are prepared by individual age to age 89 with an upper age band for all those aged 90 and over. The Government Actuary's Department has prepared estimates of the population aged 90 to 94, 95 to 99 and 100 and over using the Kannisto Thatcher survivor ratio method[3] with the results controlled to agree with the official estimates of all those aged 90 and over.

References

1 Mid-2004 estimates for constituent country of the UK are available from the National Statistics website at www.statistics.gov.uk/statbase/Product.asp?vlnk=601.

2 www.statistics.gov.uk/downloads/theme_population/Correction_Population_Estimates_Dec2005.pdf

3 Thatcher AR, Kannisto V and Andreev K (2002) *The Survivor Method for Estimating Numbers at High Ages*. Demographic Research – Max Planck Institute online journal, Vol. 6–1. From www.demographic-research.org

6 Fertility

Introduction

The assumptions underlying the fertility projections are based on an analysis of recent demographic trends. For the United Kingdom as a whole the key assumption for the future is that average completed family size, which has been falling from a peak of nearly 2.5 children per woman for women born in the mid 1930s, will level off at 1.74 children for women born at the start of the 1990s. The 'target' assumption is unchanged from the previous (2002- and interim 2003-based) projections, although it is expected to be reached for women born in later years than in the previous projections.

Assumptions are set for each of the UK's constituent countries separately, and then for the UK as a whole. These assumptions were informed by an assessment of recent trends and a consideration of their implications for future completed family sizes. This is summarised in the section 'Assumption setting'.

Assumed average completed family size

United Kingdom

Fertility assumptions are formulated in terms of the average number of children that women born in particular years will have. These *cohort* fertility rates are more stable than calendar year or *period* rates (such as the total fertility rate). This is because cohort rates are affected only by changes in the total number of children women have and not by the timing of births within women's lives. Period rates, in contrast, may rise or fall if births are brought forward or delayed for any reason.[1]

Figure 6.1 summarises recent period and cohort fertility rates. The total fertility rate (TFR) measures the average number of children who would be born to women if they were to experience the age-specific fertility rates of the year in question throughout their childbearing lives. The TFR for the United Kingdom fell sharply from the 'baby boom' peak of 2.97 in 1964 to a trough of 1.69 in 1977. During the 1980s, it stayed relatively stable around 1.80. In the first half of the 1990s it fell to around 1.70. The turn of the century saw further falls with the lowest figure ever recorded, 1.63, in 2001. Since then, fertility rates have risen each year and, in 2004, the TFR was 1.77.

Also shown on the graph are the corresponding cohort figures: the average completed family sizes (CFS) of women born in particular years. This is plotted against the year at which the women were, or will be, aged 28 (this being approximately the mean age at childbearing). Assumed CFS is given for cohorts who have not yet completed childbearing.

Average family size has fallen steadily from around 2.45 children per woman for women born in the mid 1930s, who would have been in their peak childbearing ages in the early to mid-1960s. For women born in the late 1950s, who have now effectively completed their childbearing, average family size was two children per women and it will inevitably fall below this level for women born in the 1960s.

Average completed family size has been assumed to eventually level off at 1.74 children per woman, for cohorts born in 1989 and later. This is later than in the 2002-based projection round, when the long-term assumption of 1.74 was expected to be reached for cohorts born in 1987 and later.

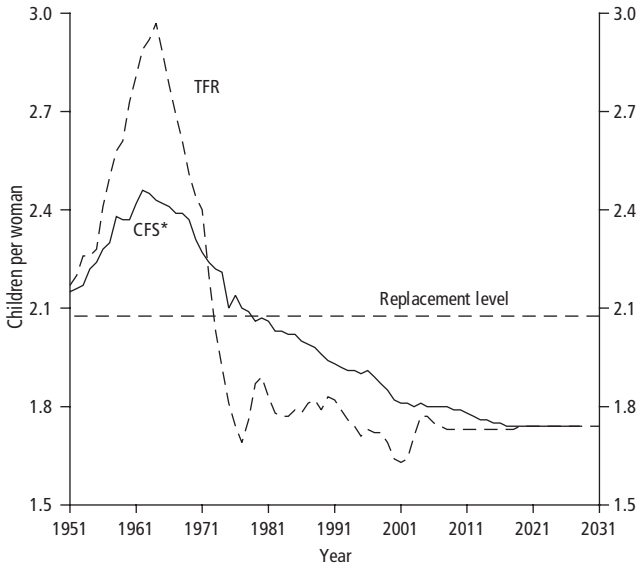
The 'replacement level' family size of 2.075 shown in **Figure 6.1** represents, approximately, the level of fertility which would lead to the long-term 'natural' (that is, ignoring migration) replacement of the population. The TFR in the UK has been below replacement level since the early 1970s and the average family size assumed for the long-term falls about 15 per cent below replacement level.

Table 6.1 and **Figure 6.2** show the achieved family sizes of selected cohorts at successive ages. By their 30th birthday, the

Figure 6.1

Actual and assumed total fertility rate (TFR) and average completed family size (CFS)*, 1951–2031

United Kingdom



** CFS for cohorts born 28 years earlier (see text)*

1975 cohort had averaged 0.98 children each. Assuming a continuation of recent trends, it is likely that their completed family size will be around 1.80.

Fertility rates below age 30 have been falling rapidly in recent years. The 1975 cohort, by their 30th birthday, already averages 0.11 children fewer than the 1970 cohort at the same age. Continued lower fertility rates in the late 20s would increase this differential for subsequent cohorts. However, there is also evidence from past cohorts that reductions in fertility at younger ages have been followed by some recovery of fertility at older ages (recuperation). **Figure 6.2(b)** illustrates this falling behind and recuperation more clearly by rearranging the data in **Figure 6.2(a)**. The fertility of the selected cohorts is shown relative to the level of the 1955 cohort, who completed their fertility at just over two (2.03) children per woman. Beyond teenage years, cohorts born prior to 1955 had higher fertility at younger ages than the 1955 cohort, but the difference diminished at older ages. Conversely cohorts born since 1955 have had lower fertility at younger ages, but there is evidence of some recuperation towards the level of the 1955 cohort at ages above 30, although clearly the younger cohorts will not reach the final level of the 1955 cohort.

Table 6.1

Average achieved family size by age and year of birth of woman, women born 1940-1980

United Kingdom

Year of birth	Achieved family size by age (completed years)						
	19	24	29	34	39	44	Final
1940	0.16	1.05	1.91	2.27	2.37	2.39	2.39
1945	0.21	1.06	1.79	2.09	2.20	2.22	2.22
1950	0.23	0.93	1.56	1.93	2.06	2.09	2.09
1955	0.22	0.78	1.43	1.83	2.00	2.03	2.03
1960	0.16	0.68	1.31	1.75	1.94	1.98	
1965	0.13	0.59	1.18	1.64	1.85		
1970	0.15	0.57	1.09	1.56			
1975	0.15	0.51	0.98				
1980	0.15	0.50					

	Average number of children between given ages						
	< 20	20–24	25–29	29–34	35–39	40–44	45 and over
1940	0.16	0.90	0.85	0.36	0.10	0.02	0.00
1945	0.21	0.85	0.72	0.30	0.11	0.02	0.00
1950	0.23	0.70	0.63	0.36	0.13	0.03	0.00
1955	0.22	0.56	0.65	0.40	0.16	0.03	0.00
1960	0.16	0.53	0.63	0.44	0.19	0.04	
1965	0.13	0.46	0.59	0.45	0.22		
1970	0.15	0.42	0.52	0.47			
1975	0.15	0.36	0.47				
1980	0.15	0.35					

Constituent countries of the United Kingdom

Figures 6.3(a) and **(b)** show the actual and assumed trend in the CFS and TFR in the individual countries of the UK. Fertility

Figure 6.2(a)

Average achieved family size by age and year of birth of woman, women born 1940–1980

United Kingdom

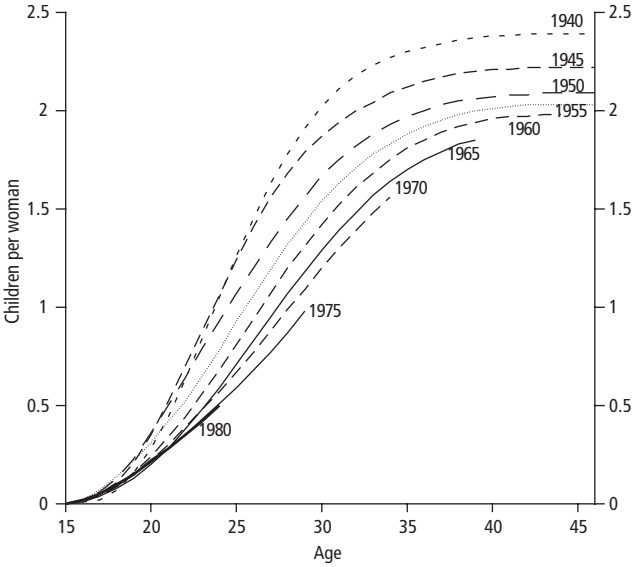
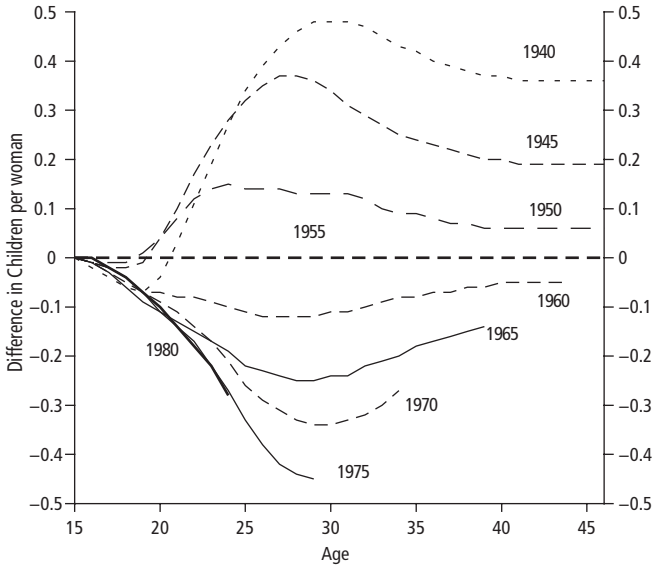


Figure 6.2(b)

Difference between average achieved family size by age and year of birth of woman, 1955 cohort compared with women born 1940–1980

United Kingdom



levels in Scotland have been low for many years and, in 2000, the TFR fell below 1.50 for the first time. Scottish TFRs were higher than those in England until the early 1980s, but since then fertility has fallen fairly steadily in Scotland and, in recent years, the TFR in Scotland has consistently been between 0.15 and 0.20 lower than that in England. Conversely, fertility in Northern Ireland remains higher than elsewhere in the UK but **Figure 6.3** shows a convergence toward the levels in the other countries.

The achieved family sizes to date in the individual countries for selected cohorts are shown in **Table 6.2**. For the 1950 cohort, average family sizes were similar in England, Wales and Scotland. But, for younger cohorts, achieved family size to date is higher in Wales, and lower in Scotland, compared with England. Because fertility at ages over 30 is currently much higher in England than in either Wales or Scotland, the differential for younger cohorts between England and Wales can be expected to narrow, whereas the differential between England and Scotland is likely to widen. In Northern Ireland achieved family size is relatively high for all but the youngest cohorts, reflecting the fact that fertility rates are consistently higher at older ages in Northern Ireland than elsewhere in the UK.

Figure 6.3(a)

Actual and assumed completed family size, constituent countries of the United Kingdom, women born 1940–1995

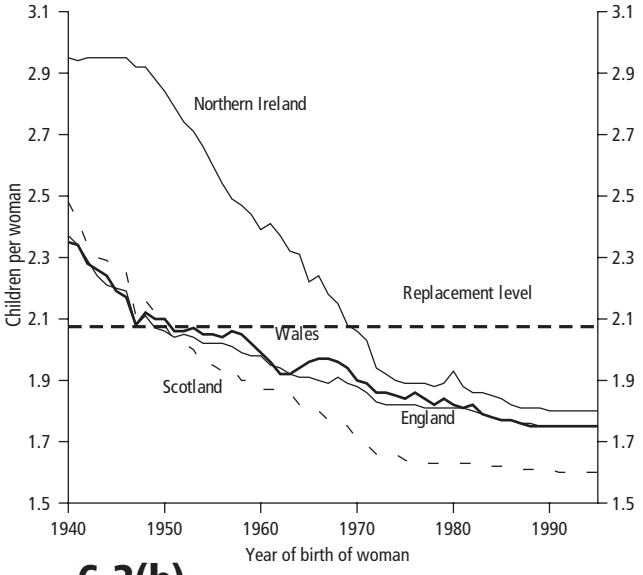


Figure 6.3(b)

Actual and assumed total fertility rates, constituent countries of the United Kingdom, 1971–2025

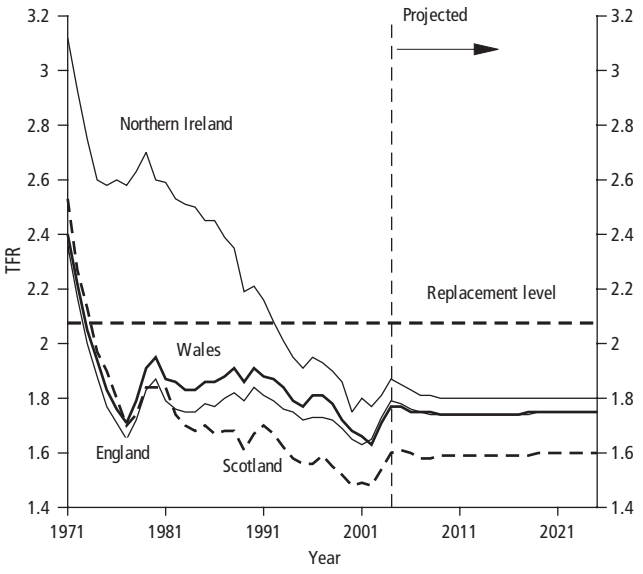


Table 6.2

Achieved family size by 2004, constituent countries of the UK, women born 1940–1980

Year of birth of woman	Age	Achieved family size: United Kingdom	England	Wales	Scotland	Northern Ireland
1940	Complete	2.39	2.37	2.35	2.48	2.95
1945	Complete	2.22	2.20	2.19	2.26	2.95
1950	Complete	2.09	2.06	2.10	2.08	2.84
1955	Complete	2.03	2.02	2.05	1.95	2.60
1960	Age 44	1.98	1.98	1.99	1.87	2.39
1965	Age 39	1.85	1.85	1.91	1.75	2.17
1970	Age 34	1.56	1.56	1.65	1.43	1.75
1975	Age 29	0.98	0.98	1.11	0.89	1.00
1980	Age 24	0.50	0.51	0.58	0.44	0.51

Table 6.3

Actual and assumed average family size for the constituent countries of the United Kingdom, women born 1950–1995

Year of birth of woman	United Kingdom	England	Wales	Scotland	Northern Ireland
1950	2.09	2.06	2.10	2.08	2.84
1955	2.03	2.02	2.05	1.95	2.60
1960	1.98	1.98	1.99	1.87	2.39
1965	1.91	1.91	1.96	1.80	2.22
1970	1.87	1.88	1.90	1.71	2.06
1975	1.80	1.82	1.84	1.64	1.89
1980	1.80	1.81	1.82	1.63	1.93
1985	1.76	1.77	1.77	1.62	1.84
1990	1.74	1.75	1.75	1.61	1.80
1995 & later	1.74	1.75	1.75	1.60	1.80

For the 2004-based projections, the long-term fertility assumptions used in the 2002-based (and interim 2003-based) projections have been retained. For **England** and for **Wales**, the assumed TFR is 1.75 children per woman, for **Northern Ireland** 1.80, and for **Scotland** 1.60.

Figure 6.3(b) and **Table 6.3** illustrate, for each constituent country of the United Kingdom, the assumed progression from current fertility levels to those assumed for the long-term.

Assumed age-specific fertility rates

Although the same overall assumptions of completed family size were used in these projections the age distribution assumed was re-examined. The fertility assumptions for the UK by five-year age group are summarised in **Table 6.4**. The projections assume a further slight fall in the fertility of women in their twenties, but continuing rises in fertility at older ages. The mean age at motherhood for the United Kingdom as a whole is assumed to rise gradually from 26.4 years for the 1950 cohort who have now completed their childbearing to 29.4 years for women born in or after 1990. Among the constituent countries of the United Kingdom, the assumed long-term mean age at motherhood varies: from 28.6 years in Wales, and 29.4 years in both England and Scotland, to 29.7 years in Northern Ireland.

Assumed sex ratio at birth

It is assumed that there will be 105 boys born for every 100 girls. This is in line with the actual sex ratios recorded during the last decade in the UK, which averaged 105.3. The levels in each constituent country are similar, although there have been substantial fluctuations over the past two decades, particularly in Scotland, Wales and Northern Ireland. Varying the sex ratio to reflect small changes in the sex ratio over the last decade, or the differences between countries, would have a relatively small effect on the resultant UK population projections. Thus the ratio of 105 assumed in the 2002-based projections is maintained in all UK countries.

Distribution of completed family size

The assumptions for these projections have been informed by the use of a birth order probability model maintained by the Office for National Statistics (ONS).[2] This model also provides details about the distribution of family sizes, including, for example, the proportion of women who will remain childless.

The proportion of women still childless at any given age is increasing.[3,4] **Table 6.5** shows a distribution of women by number of children consistent with the fertility assumptions used for the 2004-based projections. It is estimated that for the 1955-born cohort, 16 per cent of women are childless. For cohorts born in the mid 1980s this is likely to rise to 21 per cent. It has been the rise in childlessness that has been the main factor in the reduction in completed family size for cohorts born in the late 1940s through to the early 1960s. The average number of children for women who do not remain childless has remained stable for these cohorts at around 2.4. The drop in completed family size assumed in the projections

Table 6.4

Actual and assumed births per 1,000 women by age and cohort, women born 1950–1995

United Kingdom — rates per 1,000 women

	Year of birth of woman									
Age group	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995 and later
Under 20	231	220	155	133	152	147	154	135	126	124
20–24	699	561	527	457	419	361	350	343	335	335
25–29	634	650	630	594	523	473	473	450	448	448
30–34	364	403	438	454	466	496	495	498	499	499
35–39	132	163	190	216	251	263	264	268	269	269
40 and over	28	36	43	54	61	64	64	65	65	65
Average family size	2.09	2.03	1.98	1.91	1.87	1.80	1.80	1.76	1.74	1.74
Mean age at motherhood (years)	26.4	27.1	27.8	28.4	28.7	29.1	29.1	29.3	29.4	29.4

Note: figures to the right of the stepped line are partly or wholly projected. A very small number of births to women aged 45 and over born in 1960 are also projected.

Assumption setting

The assumptions about completed family size, which underlie this projection round, are based on family building patterns to date and other relevant data. The methodology of setting assumptions in each country is broadly the same as was used in the 2002-based projections. This was described in detail in the article 'Fertility assumptions for the 2002-based national population projections'.[5]

Other research was also taken into account. This included research into changes in intended family size using data from the General Household Survey, and the postponement of fertility among women with higher educational qualifications from the ONS Longitudinal Study.[6]

Rationale for keeping the long-term fertility assumption at 1.74

All constituent countries of the UK saw two consecutive years of rising fertility in 2003 and 2004, leading to a UK TFR of 1.77 children per woman, and continuing the rise which followed the lowest ever UK TFR of 1.63 in 2001. The rises in fertility among women in their twenties in these two years were not in line with previous (downwards) trends, and at older ages were stronger than recent trends. The overall effect is that the rise in fertility in the last two years has been accompanied by continued rises in mean age at childbirth.

It was considered too early to judge whether the recent upward rise is a temporary phenomenon or indicative of a sustained higher level. At the time of setting the long-term assumption for this projection round, early indications for the first quarter of 2005 suggested the upward rise might not be continuing, which supported a cautious interpretation of the very recent trend in fertility.

Thus no changes were proposed to the ultimate completed family size for any of the four countries. However, the stronger rise in fertility at older ages and the cessation of the falling trends at ages 20 to 29 led to the assumption that the point at which completed family size would fall to its assumed long-term level in each country would be reached later than in the previous projections.

But, if recent changes in trends continue for the next two years, then there is likely to be a case to be made for raising the UK long-term fertility assumption in the next projection round. However until the reversal of trends at younger ages and the stronger trends at older ages are established there is insufficient evidence to make a change. If the trend towards later motherhood continues, it may suggest that fertility recovery at older ages is somewhat stronger than had been previously assumed.

Views on future fertility levels

In reviewing other factors affecting fertility in the UK, the UK Expert Advisory Group (see Appendix III) noted that almost all of the standard explanations for low fertility in western countries might be expected to continue to influence rates down rather than up.

There are a number of common explanations for changes in fertility behaviour and, in particular, the reductions to below replacement level fertility in most European countries. These include: the growth of female labour market participation and the difficulty of combining work and parenthood; rising female education leading to postponement of marriage and parenthood; rising instability of relationships; and changes in the relative values attached to family life and individual aspirations. All of these factors, and others, may have contributed to fertility decline. This is firstly because they will tend to lower the number of children that women have, and secondly because they are likely to lead to childbearing at later ages. Although the economic, social and cultural trends which have brought about these changes to fertility may eventually slow or stabilise, it seems unlikely that they will reverse.

However, one significant factor which could cause UK fertility rates to rise is the expected increase in the ethnic minority population. Most non-White ethnic groups have higher fertility rates than the White population. There are many uncertainties such as: how the size of the ethnic population might grow, how much higher their fertility may be, and whether and how quickly entrants into the UK would tend towards 'national' fertility rates.

Latest Eurostat and UN projections

Both UN[7] and Eurostat[8] published projections in 2005 which covered the United Kingdom. Eurostat's long-term assumption for the UK is 1.75 children per woman, which is almost identical to the assumption used in the official UK projections produced by GAD. UN projections are much broader and make the uniform assumption of a long-term fertility rate of 1.85 in Western European countries.

Table 6.5

Actual and assumed distribution of women by number of children, consistent with 2004-based projections

England & Wales

Cohort born	Average family size all women	Average family size of women who have children	Number of children (percentages)				
			0	1	2	3	4 or more
1945	2.19	2.43	*10*	*14*	*43*	*21*	*12*
1950	2.07	2.39	*13*	*13*	*44*	*20*	*10*
1955	2.02	2.40	*16*	*13*	*41*	*20*	*10*
1960	1.98	2.43	*18*	*13*	*38*	*20*	*10*
1965	1.91	2.35	*19*	*15*	*38*	*19*	*10*
1970	1.88	2.31	*19*	*17*	*37*	*18*	*9*
1975	1.81	2.26	*20*	*18*	*37*	*16*	*9*
1980	1.81	2.26	*20*	*18*	*37*	*16*	*9*
1985	1.77	2.23	*21*	*19*	*37*	*15*	*8*
1990 and later	1.75	2.21	*21*	*19*	*37*	*15*	*8*

for later cohorts is consistent with both further increases in childlessness and a decrease in the average completed family size of women who have children.

Further details

The projected numbers of births (which depend also on the assumptions made about future migration and, to a lesser extent, mortality) are discussed in **Chapter 3**. Comparisons with the previous (2002-based) projections are made in **Chapter 4**, while **Chapter 9** presents the results of variant projections based on alternative assumptions about future fertility. The detailed age specific rates assumed in the principal and variant projections for each country are available on the GAD website.

References

1 Murphy M (1993) Time-series approaches to the analysis of fertility change. From *New perspectives on fertility in Britain*. Ed. Ni Bhrolchain. HMSO: London.

2 Werner B and Chalk S (1986) Projections of first, second, third and later births. *Population Trends* **46**, pp 26–34).

3 Smallwood S (2002) New estimates of trends in births by birth order in England and Wales. *Population Trends* **108**, pp 32–48.

4 Chamberlain J and Gill B (2005) Chapter 5, Fertility and Mortality, *Focus on People and Migration*, Table 5.12. Palgrave Macmillan: Basingstoke.

5 Smallwood S (2003) Fertility assumptions for the 2002-based national population projections. *Population Trends* **114**, pp 8–18.

6 Randell M and Smallwood S (2005) First births by age and education in Britain, France and Norway. *Population Trends* **121**, pp 27–34.

7 esa.un.org/unpp/

8 epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136184,0_45572595&_dad=portal&_schema=PORTAL

7 Mortality

Past trends in life expectancy

During the 20th century, the United Kingdom saw a continuation of the pattern of falling death rates that began around the beginning of the 19th century. Over these two centuries there has been a change from a regime of high infant and child mortality, with a preponderance of acute and infectious diseases, to a new pattern in which adult mortality predominates and chronic and degenerative diseases are the most common causes of death.[1] The pattern has been broadly similar in England, Scotland, Wales and Northern Ireland.[2,3,4]

One measure of the death rates in a particular year is the period expectation of life at birth, that is, the average number of years of life that a new-born baby would survive, calculated using the death rates for that year. **Figure 7.1(a)** shows that there was a fairly steady increase in this measure throughout the 20th century. However, progress was slower between 1950 and 1965, particularly for males, and until 1950, epidemics and severe winters caused significantly higher death rates in some years.

Much of the increase in the period expectation of life at birth in the first half of the 20th century can be attributed to the reduction of infant and child mortality to very low levels by about 1950. Infant and child death rates have now fallen to such low levels that further reductions can have little effect on the expectation of life at birth, which has thus come closer to being a measure of the normal life span. Since about 1940, the increasing control of infectious diseases has considerably reduced the number of early adult deaths, and there has recently been a reduction in the number of those dying early from circulatory diseases.[2,3,4] The greatest decline in death rates at advanced ages has occurred since the 1970s. However, in general, mortality rates at the oldest ages declined less over the 20th century in relative terms than those at younger ages.

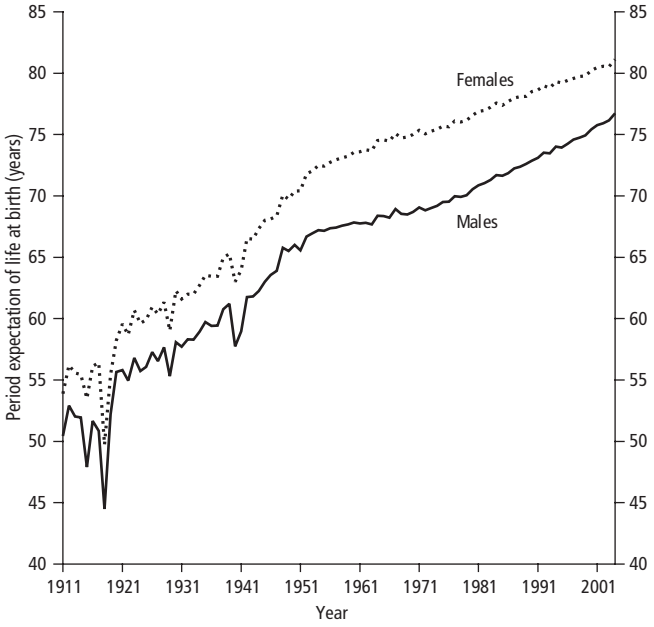
Figure 7.1(b) shows that period life expectancy at age 65 also rose during the 20th century. For females, the annual increase was relatively constant over the 20th century whereas for males, after an initial period of increasing longevity, period life expectancy at 65 remained almost constant over the period 1940 to 1970. Since 1970 there has been a rapid decline in

Figure 7.1

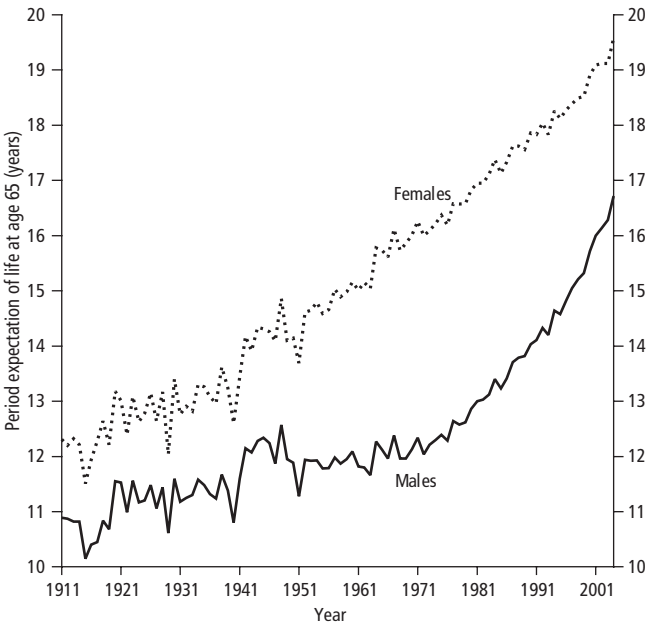
Period expectation of life at birth and at age 65 according to mortality rates experienced in given years, 1911–2004

United Kingdom

a) Period expectation of life at birth



b) Period expectation of life at age 65



death rates at advanced ages, particularly for males for whom mortality is currently improving more rapidly than female mortality. As a result, the age differential in period life expectancy at age 65 between male and females has reduced from around 4.0 years during the 1970s and early 1980s to 2.8 years in 2003. A partial explanation for this may be the different historical patterns in cigarette smoking between men and women, with a higher proportion of males smoking in the past than females and the peak consumption for males being earlier (1940–1960) than for females (around 1960). This might suggest that the rate of increase in female expectation of life at 65 may experience a further slowing down relative to that for males over the next few years.

In many contexts it is more meaningful to calculate the expected average lifetime taking into account known or assumed improvements in death rates in the future (such expectations of life are often referred to as 'cohort' expectations of life). Cohort life expectancies are discussed in greater detail later in this chapter.

A number of publications provide reviews of long-term mortality trends in the United Kingdom.[1,2,3,4,5,6,7]

Future prospects for life expectancy

Since the 1980s, the period expectation of life at birth in the UK for females has increased by about 1.7 years per decade, whilst male life expectancy has increased by around 2.5 years per decade. However, there are diverse opinions amongst demographers as to the level of longevity that might reasonably be expected to be reached.[7,8,9,10] One can point to Japan, where the period expectation of life at birth in 2003 was about 85.3 years for females and 78.4 years for males, and to other countries in Europe, such as Iceland, Italy, Norway, Sweden and Switzerland, which also currently have higher period expectations of life than the United Kingdom for both males and females.[11] There are also considerable variations in period life expectancy within the United Kingdom; for example, the difference between the highest and lowest period life expectancy at birth by local authority area in England & Wales in 2002–04 is 8.5 years for males and 7.9 years for females.[12] There is also the possibility of lower incidences of cancer, heart disease and strokes through changes in lifestyle and, through medical advances, greater control of these when they do occur. In particular, mortality rates for heart disease and strokes have already fallen quite rapidly and steadily over the 1990s for males and females aged 40 to 64 and to a lesser extent for older men and women.[13]

On the other hand some demographers believe that, despite the possibility of advances in medical practices and of encouraging healthy lifestyles, a law of diminishing returns will apply to death rate reductions at advanced ages, partly because no more than a minority of the population will adopt truly healthy lifestyles. It is also possible that new diseases, or the re-emergence of existing diseases such as tuberculosis, may serve to temper future improvements in mortality.

National Statistics quality review

A review of the methodology for projecting mortality rates in the national population projections for the United Kingdom and constituent countries, carried out under the National Statistics Quality Assurance programme, was published in December 2001.[14] The main object of the review was to assess whether the methodology used for projecting mortality rates in the national population projections met the needs of the wide range of users of the projections, met best practices and was founded on good basic data. The review concluded that none of the alternative methodologies assessed would be likely to outperform the methodology used for projections during the 1990s and that the existing methodology should be retained. However, the assumed values for the key parameters used would be reviewed for each new projection round. A number of recommendations for improving the methodology were made in the review, nearly all of which have been incorporated in recent projections.

Methodology and derivation of United Kingdom base death rates

Rather than focusing directly on expectations of life in formulating the mortality assumptions for population projections, the prospects for death rates at different ages, and for different generations, have been considered separately. In this chapter, the assumptions for the projections are given in the form of central death rates (m_x). The difference between these and the probabilities of dying (q_x) used to carry out the actual projections is described in **Chapter 10**. The latter figures are shown on the GAD website.

Death rates for the United Kingdom in each calendar year in the period 1961 to 2003 have been graduated using a method similar to that used for graduating the English Life Tables No. 15.[15] Population estimates by age for those aged 90 and over from 1979 onwards (and retrospective estimates for earlier years, back to when these persons were aged 80) were calculated using the Kannisto-Thatcher survivor ratio method which is a modified form of the method of extinct generations.[16] The retrospective estimates back to age 80 have been found to give more reliable results than using the official population estimates made at the time.

Table 7.1

Assumed base death rates (m_x) per 100,000, for individual countries of the United Kingdom, 2004

Age	Males				Females			
	England	Wales	Scotland	Northern Ireland	England	Wales	Scotland	Northern Ireland
0	541	485	539	566	464	413	459	436
2	28	27	29	30	20	18	21	15
12	16	12	20	21	9	8	12	10
22	76	95	116	98	28	29	40	30
32	101	124	166	99	48	53	58	45
42	181	187	259	181	115	127	146	137
52	430	451	583	454	291	295	372	292
62	1,185	1,259	1,658	1,259	720	792	961	747
72	3,210	3,435	3,930	3,452	2,039	2,215	2,518	2,120
82	9,101	9,351	10,077	9,399	6,444	6,735	7,226	6,802
92	24,549	24,577	24,715	26,245	20,863	21,419	21,594	22,588
102	51,213	51,213	51,213	51,213	46,686	46,686	46,686	46,686

The graduation process leaves considerable fluctuations from year to year at the older ages due to the effect of 'epidemic' or 'severe winter' years, and at both the oldest and youngest ages due to the small numbers of deaths. Removal of these fluctuations is beyond the scope of the age-graduation method employed. An exponential smoothing method was used to smooth the year to year fluctuations and to 'project' the base death rates for 2004, based on the trends in mortality up to 2003, but giving more weight to recent figures than to earlier data. Actual death rates for 2004 did not become available until after the mortality assumptions for these projections were finalised.

Base death rates for individual countries

Base death rates for the calendar year 2004 were initially calculated for the United Kingdom, as described above. Base death rates for the four individual countries of the United Kingdom were obtained by adjusting the United Kingdom figure at each age in proportion to the particular country's experience relative to the United Kingdom in the three years 2001 to 2003. These rates for individual countries are shown for selected ages in **Table 7.1**. The mortality improvement factors described below were then applied to the projected base death rates for 2004 for each country to obtain the projected mortality rates for future years.

Trends in mortality by age

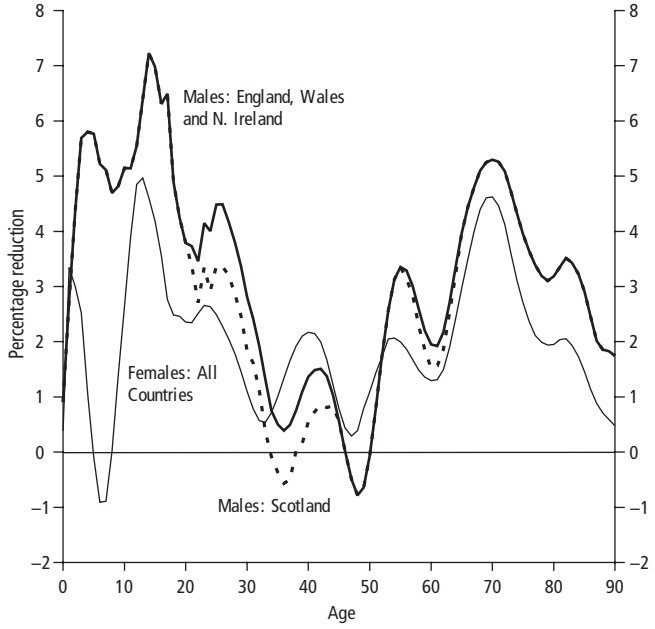
The smoothed, graduated death rates for the United Kingdom reveal oscillations between increases and reductions at older ages for men up to the mid-1970s, as well as temporary increases at middle ages in the 1960s and amongst young men in the 1960s and the early 1970s. Death rates for men aged 15 to 40 generally rose during the mid-1980s to the mid-1990s. These more recent increases have been partly attributable to deaths caused by HIV infection and AIDS.[17] Suicide rates and alcohol-related mortality also increased for men at young ages until the late 1990s.[18] Recent years have also seen little improvement in mortality rates for males in their mid- and late-forties. Apart from increasing mortality rates for women aged between 45 and 60 during the 1960s and early 1970s, death rates have generally fallen for women of all ages, with the recent trends of rising death rates during the 1990s for women aged 15 to 30 having been reversed.

It was assumed that the trends apparent during the period 1961 to 2003 (mostly of falling death rates) would initially continue at similar rates. The changes between the projected base mortality rates for 2004 compared to the smoothed, graduated mortality rates for 2003 were determined. After further smoothing, the resulting percentage changes by age and gender were then taken as the base from which the projected improvements in future years would be derived. These assumed smoothed changes in death rates between 2003 and 2004 are shown in **Figure 7.2**.

Comparisons of the rates of improvement experienced in each individual country with those experienced in the United Kingdom as a whole suggested that the assumed initial rates of improvement by age and gender for the United Kingdom could be adopted for each individual country, except for Scotland. Mortality for Scottish males at some ages (notably those aged 21 to 44 and, to a lesser extent, those in their late fifties and

Figure 7.2

Assumed smoothed percentage changes in death rates between 2003 and 2004 by age



early sixties) has been improving more slowly (or worsening at a higher rate) than elsewhere in the United Kingdom in recent years. As a result, separate initial rates of mortality improvement were assumed for Scottish males at these ages, as shown in Figure 7.2.

The peak levels of reduction in death rates (of over 4 per cent a year) for both males and females currently in their late sixties and early seventies is consistent with recent trends and appears to be a special feature of the generations born between 1925 and 1945 (centred on the generation born around 1931). It is not understood precisely why the members of the generation born around 1931 have been enjoying higher rates of mortality improvement throughout their adult life than preceding generations, or why the rate of improvement slowed down for following generations. It is, however, relevant that this generation was the first to benefit from a combination of better childhood health, the conquest of infectious diseases affecting young and middle-aged adults and, in later middle-age, improvements in the treatment of circulatory diseases. Additionally, the men, in particular, have smoked fewer cigarettes than those in preceding generations.

Future improvements in age-specific death rates

Consideration was then given to how the trends might change in the future. In the methodology used for mortality projections in the United Kingdom, 'target' rates of mortality improvement are assumed for a specific future year. Following the recommendations of the National Statistics Quality Review,[14] the target year was taken to be 25 years ahead of the base year for the projections.

The average annual rate of mortality improvement over the period 1961 to 2003 has been around 1.4 per cent a year for males and 1.2 per cent a year for females. These rates of improvement are derived from aggregate mortality rates calculated using the 2001 population estimates for the United Kingdom as the standard population. Whilst the rate of improvement for females over this period was relatively stable, the rate of improvement for males over the latter half of this period was much higher than over the first half. Part of the reason for this is the differential trends in smoking behaviour between males and females, where relatively high numbers of males have now given up smoking and mortality rates for males at older ages have shown large rates of improvement in recent years.

The average annual rate of improvement over the whole of the 20th century was around 1.0 per cent for both males and females although the improvement rates vary by age. In particular, those born during the period 1925–1945 (and centred around 1931) have exhibited greater rates of improvement relative to previous generations than those born earlier or later. As the 1925–1945 generations age, the rates of mortality improvement at older ages have been increasing, whilst those at younger ages have tended to decline. As these older cohorts continue to age over the next 25 years, the contribution of their lower mortality to the overall rate of improvement is likely to lessen. Hence, other things remaining equal, it might be expected that the rates of improvement at the relevant ages would decline as these cohorts become very old.

There remains considerable debate as to whether the impact of future technical, medical and environmental changes will have a greater or lesser effect on improvements in mortality in the future than they had over the 20th century. Past official projections, both in the UK and other industrialized countries, have tended to assume that the high rates of improvement seen over the 20th century as a result of these changes were unlikely to be sustained indefinitely. However, expectations of life at birth have continued to rise at relatively constant rates over the last twenty years for both males and females, suggesting that, based on current trends, previous long-term assumptions were too pessimistic.

Taking these various factors into consideration, the target rate of improvement for 2029 (the 25th year of the 2004-based projections) has been assumed to be 1 per cent at all ages

Table 7.2

Assumed percentage reduction in death rates, m_x, between consecutive calendar years in the projection period and the total reduction over 25 years

Percentages

	Age	2004–05	2011–12	2021–22	2028–29	Reduction over 25 years
Males (England, Wales and Northern Ireland)						
	0	0.91	0.95	0.99	1.00	*21.5*
	2	4.17	2.89	1.50	1.00	*43.9*
	12	5.28	3.55	1.67	1.00	*50.1*
	22	3.31	2.38	1.36	1.00	*38.7*
	32	1.86	1.52	1.14	1.00	*28.8*
	42	1.48	1.28	1.08	1.00	*25.9*
	52	0.80	0.75	0.93	1.00	*16.0*
	62	1.87	2.19	0.93	1.00	*28.5*
	72	5.01	2.31	1.32	1.00	*41.3*
	82	3.22	2.86	1.35	1.00	*41.2*
	92	1.47	2.25	1.49	1.00	*33.7*
Males (Scotland)						
	0	0.91	0.95	0.99	1.00	*21.5*
	2	4.17	2.89	1.50	1.00	*43.9*
	12	5.28	3.55	1.67	1.00	*50.1*
	22	2.61	1.96	1.25	1.00	*34.0*
	32	1.12	1.07	1.02	1.00	*23.1*
	42	0.87	0.92	0.98	1.00	*21.2*
	52	0.80	0.75	0.93	1.00	*16.0*
	62	1.53	2.19	0.93	1.00	*27.4*
	72	5.01	2.24	1.32	1.00	*40.8*
	82	3.22	2.86	1.33	1.00	*41.2*
	92	1.47	2.25	1.49	1.00	*33.7*
Females (all countries)						
	0	0.40	0.53	0.75	1.00	*15.1*
	2	2.94	2.53	1.82	1.00	*41.7*
	12	4.74	3.94	2.58	1.00	*55.5*
	22	2.47	2.15	1.62	1.00	*37.5*
	32	0.58	0.67	0.82	1.00	*17.3*
	42	1.97	1.76	1.41	1.00	*32.6*
	52	1.42	0.83	0.91	1.00	*19.7*
	62	1.30	1.81	0.91	1.00	*25.5*
	72	4.37	2.07	1.44	1.00	*39.5*
	82	2.01	2.61	1.58	1.00	*40.6*
	92	0.30	1.56	1.87	1.00	*30.1*

Notes: Above the stepped line, projections are made by calendar year. Below the line, projections are made by cohort (see text for further details). The first column shows the reductions not from the actual death rates from 2004, but from the base death rates for 2004, projected from trends in preceding years.

Table 7.3

Actual and assumed overall average annual rates of mortality improvement

England & Wales Per cent

	Males		Females	
	Past (actual)	Future (assumed)	Past (actual)	Future (assumed)
Last/next 22 years	*2.02*	*1.90*	*1.34*	*1.79*
Last/next 42 years	*1.46*	*1.47*	*1.26*	*1.42*
Last/next 72 years	*1.17*	*1.27*	*1.22*	*1.25*

Note: Analysis relates to England & Wales. Historic estimates are based on comparison of latest (2002–04) interim life tables with English Life Tables for 1930–32, 1960–62 and 1980–82.

(equivalent to the average annual rate of improvement over the whole of the 20th century), the same target rate as in the previous 2002-based (and interim 2003-based) projections. However, the annual rates of improvement are now assumed to remain constant at 1 per cent for each future year after the target year (2029), rather than halving over every 25 years thereafter, as was assumed in the 2002-based projections.

The transition from the assumed rates of mortality improvement by age and gender for the first year of the projection to the target rate in the 25th year of the projection is not assumed to take place linearly, but more rapidly at first for males, and less rapidly for females, as shown in **Table 7.2**. Slightly smaller overall improvements in the period to 2029 are assumed at some ages for Scottish males than for males elsewhere in the UK.

Taking into account that the rates of improvement assumed prior to 2029 are generally higher than 1 per cent, these assumptions produce average annualised rates of mortality improvement of nearly 1.3 per cent for both males and females over the whole 70 year projection period. As **Table 7.3** shows, the new projections generally assume slightly higher average rates of improvement for the future than experienced over corresponding periods in the past.

Making projections of death rates is speculative and users of projections of numbers of the elderly must bear in mind that the range of possibilities is wide. Variant projections using alternative assumptions for the future reduction in mortality are considered in **Chapter 9**.

Calendar year and cohort methodology

Table 7.2 shows the reductions in death rates assumed for selected years in the future and the total reduction over the next twenty-five years for each country of the United Kingdom.

It is assumed that at each age the rate of reduction will gradually change from that projected for 2003 to 2004 to 1 per cent a year by 2029. So, at ages where mortality rates are at present increasing (see **Figure 7.2**), it is assumed that the trend will be reversed. The special features of the generation born around 1931 have been mentioned earlier. In previous projections, convergence to the target rate was projected by cohort for those born before 1947 because of the strong evidence of generational effects in the relative rate of mortality improvement for these cohorts. However, there is now growing evidence of similar generational effects for slightly younger cohorts. It has, therefore, been assumed that these cohort effects will continue for all those born before 1960. Thus the reductions for those aged 45 and over in 2004 (that is, those below the stepped lines in Table 7.2) have been projected by *cohort*, that is, diagonally downwards in that table.

For generations born since 1960 (that is, those above the stepped line) a different approach has been taken. There is little evidence of generation effects for these cohorts to date and reductions in death rates have accordingly been projected by *calendar year*, that is, horizontally in **Table 7.2**. Of course, at young ages death rates are already at low levels and the precise assumptions made for future mortality have a relatively minor impact on the projections.

Effect of assumptions

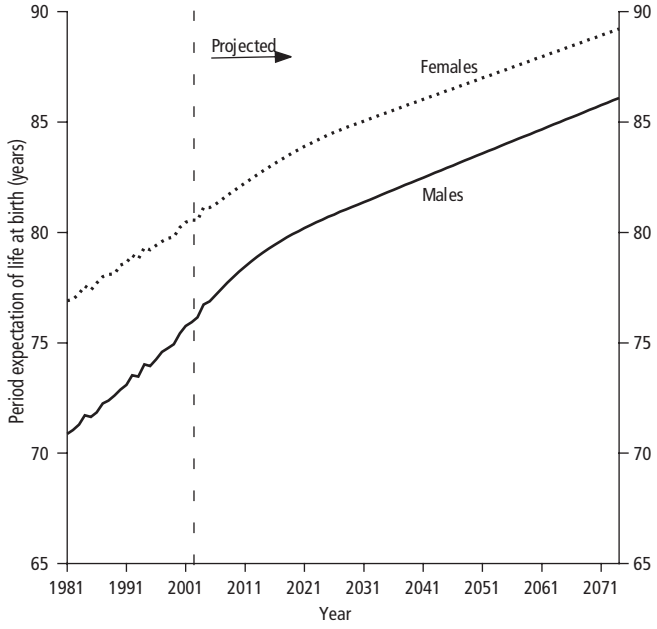
The implications of these assumptions in terms of the period expectation of life at birth are shown in **Figure 7.3(a)** and **Table 7.4. Figure 7.3(b)** also shows the implications for period expectations of life at age 65. As can be seen from Table 7.4, the actual period expectations of life at birth for males and females in the United Kingdom in 2004 were higher than the underlying trend figures, suggesting that 2004 was a year of comparatively low mortality for both males and females.

Figure 7.3

Actual and projected period expectation of life at birth and at age 65 according to death rates for the given year, 1981–2074

United Kingdom

a) Period expectation of life at birth



b) Period expectation of life at age 65

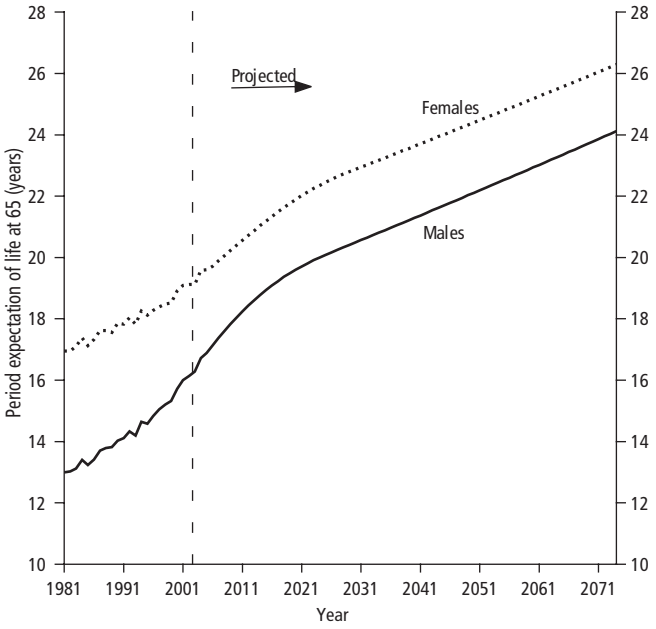


Table 7.4

Actual and projected period expectation of life at birth according to death rates for the given year, and ratios of standardised death rates, 1981–2061

United Kingdom

Year	Period expectation of life at birth (years)		Ratios of standardised death rates[1] (2000–2002 = 1.00)	
	Males	Females	Males	Females
Actual				
1981	70.9	76.9	1.48	1.30
1986	71.9	77.7	1.38	1.22
1991	73.1	78.6	1.25	1.13
1996	74.2	79.4	1.14	1.06
2001	75.8	80.5	0.99	0.99
2004 (actual rates)	76.7	81.1	0.91	0.94
2004 (trend rates)	76.6	80.9	0.93	0.97
Projected				
2011	78.5	82.2	0.77	0.85
2021	80.2	83.9	0.64	0.70
2031	81.4	85.0	0.58	0.62
Longer-term projections				
2041	82.5	86.0	0.52	0.56
2051	83.6	87.0	0.47	0.51
2061	84.7	88.0	0.43	0.46

[1] *Standardised on 2001 population estimates.*

Table 7.5

Expectation of life for persons at various ages for the years 2005, 2011 and 2031

United Kingdom Years

Age	Males			Females		
	2005	2011	2031	2005	2011	2031
a) Period expectation of life						
0	76.9	78.5	81.4	81.1	82.2	85.0
15	62.4	64.0	66.8	66.6	67.7	70.5
60	20.8	22.2	24.6	23.8	24.8	27.3
65	16.9	18.2	20.6	19.6	20.6	22.9
75	10.1	11.1	13.1	12.0	12.7	14.8
85	5.4	5.9	7.3	6.3	6.6	8.1
b) Cohort expectation of life						
0	86.4	87.1	89.6	89.9	90.6	92.8
15	70.1	70.9	73.3	73.8	74.5	76.6
60	23.7	24.4	26.3	26.7	27.3	29.0
65	19.4	20.1	21.9	22.1	22.6	24.3
75	11.2	12.2	13.8	12.9	14.0	15.6
85	5.7	6.2	7.5	6.4	6.9	8.4

The effect of the changes in assumptions and the initial levels of mortality improvement at the start of the projections mean that, in general, the new projections assume lower mortality rates for the period to the target year of 2029 than the 2002-based projections for males except for the very youngest ages, those aged 36 to 42, those in their late forties to early sixties and those aged over 90. For females, mortality rates are broadly similar to those previously projected. These lead to period expectations of life at birth in 25 years time for the United Kingdom that are around 0.4 years higher for males and 0.1 years for females compared to those assumed in the previous projections. For age 65, the increase is around 0.5 years for males and 0.1 years for females. Beyond 2029 the new projections assume increasingly lower mortality rates than the 2002-based projections because the rates of improvement are no longer assumed to decline after the target year. After 50 years, the period expectations of life at birth are around 1.3 years higher for males and 0.9 years for females and at age 65, 1.1 years higher for males and 0.7 years higher for females.

Table 7.4 also gives ratios of standardised death rates for some future years, together with comparable figures for some past years. The *standardised death rate* is the overall death rate (that is, total number of deaths divided by total population) resulting from applying the age-specific death rates for a particular year to the population numbers for a standard year, taken here as the year 2001. The ratio of these overall death rates for selected years to that for a standard year (the average of three years, 2000–2002 in this case) is given in the table. This measure is sometimes called the comparative mortality figure and details of this index decomposed into age-group indices have been published for the United Kingdom.[19]

Expectation of life for generations

So far in this chapter, expectations of life have mainly been calculated on the basis of the death rates for a particular calendar year (period life expectancies). However, for some purposes, cohort life expectancies, which allow for future known or assumed changes in mortality, are more appropriate measures. **Table 7.5** shows projected period and cohort expectations of life at selected ages for three different years.

Table 7.5 shows that the projected period expectation of life at birth for a male in the United Kingdom is 76.9 years on the basis of the death rates assumed for 2005. However, taking into account assumed mortality improvements in later years, we would actually expect a male born in that year to live for 86.4 years. Similarly, the average man aged 65 in 2005 would live for a further 16.9 years based on the mortality rates projected for 2005. However, taking account of the assumed further mortality improvement after 2005, he would actually be expected to live for a further 19.4 years.

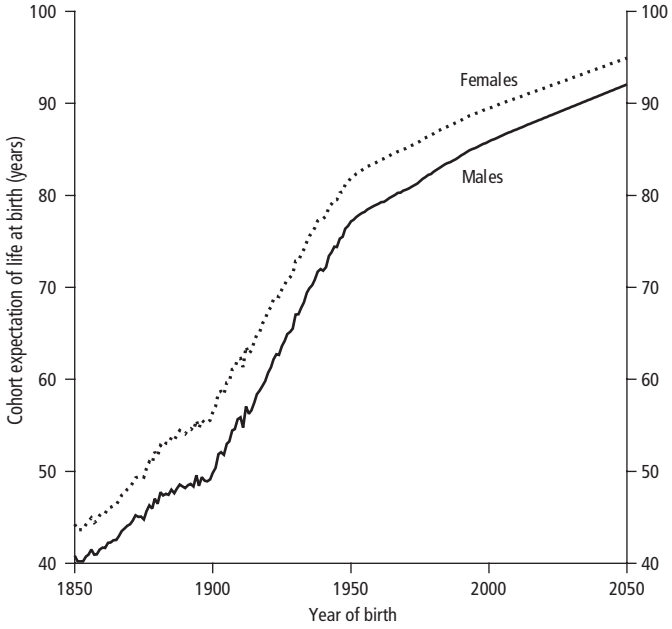
Figure 7.4 (a) shows the cohort expectation of life at birth for England & Wales and **Figure 7.4 (b)** shows the cohort expectation of life at age 65 based on the actual death rates

Figure 7.4

Cohort expectation of life at birth and at age 65 according to historic mortality and projected rates, 1850–2050

England & Wales

a) Cohort expectation of life at birth for generations born from 1850 to 2050



b) Cohort expectation of life at age 65 for generations who reach age 65 in the years 1850 to 2050

experienced in the past or assumed for the future for generations born from 1850 to 2050.

About half of the increase in cohort life expectancies at birth between generations born in 1850 and 1945 was due to the reduction in infant and child mortality to very low levels. Subsequent generations have benefited particularly from the almost complete elimination of deaths from acute and infectious diseases. Figure 7.4 (a) illustrates the point that, whilst current reductions in mortality rates at the older ages will continue to extend the average lifetime, once this reaches around 77 years for males and 82 years for females (that is, for men and women born in 1950), further progress will be much slower. The great majority of deaths will then be attributable to chronic and degenerative diseases.

Whilst the cohort expectation of life at age 65 for females has been increasing at a fairly steady rate since the 1930s, the cohort expectation of life at age 65 for males showed relatively little increase between 1930 and 1970 after which it began to increase more rapidly than for females. This is more likely to be a case of the mortality rates for older males falling to the levels they would have reached had they followed the reductions in female mortality rates experienced during the 1950s and 1960s, rather than a continuing convergence of male mortality rates to those for females. As discussed earlier, a partial explanation for this may be the different historical patterns in cigarette smoking between men and women.

Constituent countries of the United Kingdom

In principle, a different rate of mortality improvement could have been employed for each country of the United Kingdom, perhaps showing a convergence later in the 21st century. However, as discussed earlier, a comparison of mortality improvements for each country with those experienced in the United Kingdom suggested that the same rates of mortality improvement by age and gender could be assumed for each country of the United Kingdom, except for Scotland, where lower rates of improvement were assumed to 2029 for males at certain ages. The resulting projected death rates and expectations of life do vary between countries, of course, as shown in **Table 7.6**, because of the different starting death rates. Of the four countries, England shows the highest life expectancy and Scotland the lowest.

As can be seen from Table 7.6, compared with the 2002-based projections, period and cohort expectations of life at birth for males are higher throughout the first 25 years or so of the projection period, for each of the individual countries of the United Kingdom. Period expectations of life at birth for males are projected to be around 0.4 years higher for England, 0.5 years higher for Wales and for Northern Ireland and 0.3 years higher for Scotland by 2031. Cohort expectations of life at birth for males are projected to be a little over six years higher for each country of the UK by 2031. For females, period life expectancies at birth are broadly unchanged as a result of the

Table 7.6

Expectation of life at birth for the years 2005, 2011, 2021 and 2031

Corresponding results from the 2002-based projections are shown in brackets

a) Period expectation of life Years

Males	2005		2011		2021		2031	
England	77.2	*(77.0)*	78.7	*(78.5)*	80.5	*(80.1)*	81.6	*(81.2)*
Wales	76.5	*(76.4)*	78.2	*(77.9)*	80.0	*(79.5)*	81.1	*(80.6)*
Scotland	74.5	*(74.5)*	76.1	*(76.0)*	77.9	*(77.7)*	79.2	*(78.9)*
Northern Ireland	76.3	*(76.2)*	78.1	*(77.7)*	79.8	*(79.4)*	81.0	*(80.5)*
United Kingdom	76.9	*(76.7)*	78.5	*(78.2)*	80.2	*(79.9)*	81.4	*(81.0)*

Females	2005		2011		2021		2031	
England	81.3	*(81.3)*	82.4	*(82.5)*	84.1	*(84.1)*	85.2	*(85.1)*
Wales	80.8	*(80.8)*	81.9	*(82.0)*	83.6	*(83.6)*	84.8	*(84.7)*
Scotland	79.5	*(79.6)*	80.7	*(80.8)*	82.5	*(82.5)*	83.7	*(83.6)*
Northern Ireland	81.1	*(80.7)*	82.1	*(81.9)*	83.8	*(83.5)*	84.9	*(84.6)*
United Kingdom	81.1	*(81.1)*	82.2	*(82.3)*	83.9	*(83.9)*	85.0	*(84.9)*

b) Cohort expectation of life

Males	2005		2011		2021		2031	
England	86.6	*(83.3)*	87.3	*(83.5)*	88.5	*(83.8)*	89.8	*(83.9)*
Wales	86.1	*(82.7)*	86.9	*(83.0)*	88.1	*(83.3)*	89.4	*(83.4)*
Scotland	84.3	*(81.1)*	85.1	*(81.3)*	86.4	*(81.6)*	87.8	*(81.8)*
Northern Ireland	85.9	*(82.5)*	86.6	*(82.8)*	87.9	*(83.0)*	89.1	*(83.2)*
United Kingdom	86.4	*(83.1)*	87.1	*(83.3)*	88.4	*(83.6)*	89.6	*(83.8)*

Females	2005		2011		2021		2031	
England	90.0	*(87.1)*	90.7	*(87.3)*	91.8	*(87.4)*	92.9	*(87.6)*
Wales	89.7	*(86.7)*	90.3	*(86.9)*	91.4	*(87.0)*	92.5	*(87.2)*
Scotland	88.6	*(85.7)*	89.3	*(85.9)*	90.5	*(86.1)*	91.6	*(86.2)*
Northern Ireland	89.7	*(86.6)*	90.4	*(86.7)*	91.5	*(86.9)*	92.6	*(87.0)*
United Kingdom	89.9	*(87.0)*	90.6	*(87.1)*	91.7	*(87.3)*	92.8	*(87.5)*

changes in assumptions and initial rates of improvement discussed earlier, whilst cohort life expectancies are higher. Expectations of life at birth for females are projected to be around 0.1 years higher for England, Wales and Scotland and 0.3 years higher for Northern Ireland by 2031 on a period basis and around 5.3 years higher for England, Wales and Scotland and 5.6 years higher for Northern Ireland on a cohort basis.

The increases in cohort life expectancy by 2031, compared to the previous projections, are much higher than the increases in period life expectancy projected for 2031 since the former incorporate projected mortality improvements beyond 2031 whilst the latter do not. The differences in the projected rates of mortality improvement up to the target year of 2029 are not very different to those assumed in the previous projections, but after 2029 the rates of mortality improvement are assumed to remain constant rather than declining every 25 years. This change in assumptions has a much greater effect on cohort life expectancy than on period life expectancy for a given year.

Mortality differences between males and females

In common with other Northern European countries[1] the excess of period life expectancy at birth for females over males rose in the United Kingdom during the period 1900 to 1970. However, since 1980, in the United Kingdom it has fallen from 6.0 years to 4.4 years and it is projected to fall to about 3.7 years by 2012, remaining around that level for the next twenty years before

gradually falling to 3.1 years by 2074. One reason for this fall is the increasing incidence for women of lung cancer deaths, as compared with falling rates for men. In general, women took up smoking later than men and for them the peak of lung cancer deaths and other deaths related to smoking is still to come.

The changing life table

Figure 7.5 illustrates how the survival curve, which shows the proportion of those at birth in a given year surviving to each age, is getting progressively more rectangular in shape as more and more deaths occur at advanced ages. The charts are based on the average of male and female mortality in England and Wales. In **Figure 7.5 (a)**, the survival curves show the percentages at birth who would survive to successive ages if they experienced the mortality rates of the year shown with no allowance for known or projected changes in mortality rates for the years thereafter. The least rectangular curve represents the life table according to the death rates of the year 1851 and successive curves are given at twenty-year intervals, with the uppermost being the projected life table for the year 2031. From this chart it can be seen that the median age at death, that is, the age to which half of those born survive, was about 45 on the basis of the death rates of 1851, is now about 82 and is projected to increase to about age 86 by the year 2031.

Figure 7.5 (b) shows the proportions of those born in the years shown, surviving to each age allowing for known and projected future changes in mortality thereafter. Since mortality rates have, in general, been improving over past years and are projected to continue to improve, the survival curve for a given year in Figure 7.5 (b) lies to the right of that for the corresponding year in Figure 7.5 (a). From this chart it can be seen that, on a cohort basis, the median age at death for those born in 1851 was about 48, for those born now is about 91 and is projected to increase to about age 94 for those born in 2031.

It is clear from Figure 7.5 that recent improvements in expectation of life at birth have been due primarily to increases in survival to elderly ages. In contrast, increases in maximum lifespans have been comparatively small. There is limited scope for further reduction in mortality rates at young and middle ages. Any continuation of recent increases in expectation of life will only be achieved either through major falls in mortality at older ages or a significant extension in maximum lifespans or a combination of both.

Further details

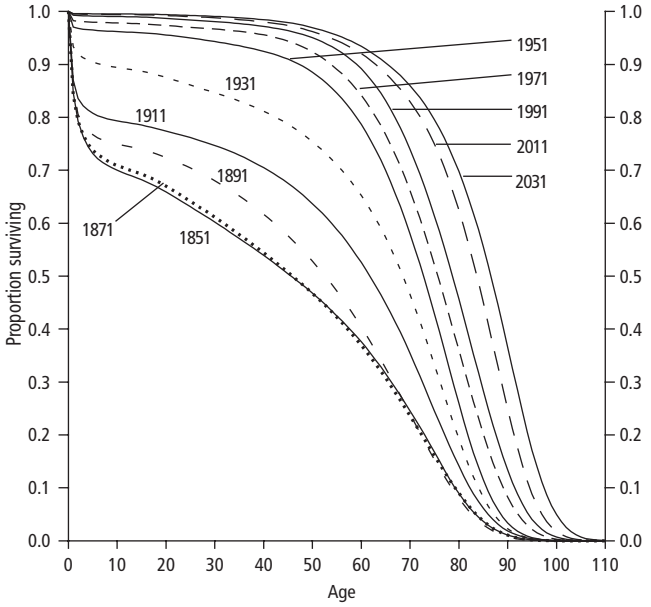
Projected numbers of deaths are discussed in **Chapter 3**. Comparisons with the previous (2002-based) projections are made in **Chapter 4**, while **Chapter 9** presents the results of variant projections based on alternative assumptions about future mortality. The detailed age specific rates assumed in the principal and variant projections for each country are given on the GAD website at www.gad.gov.uk.

Figure 7.5

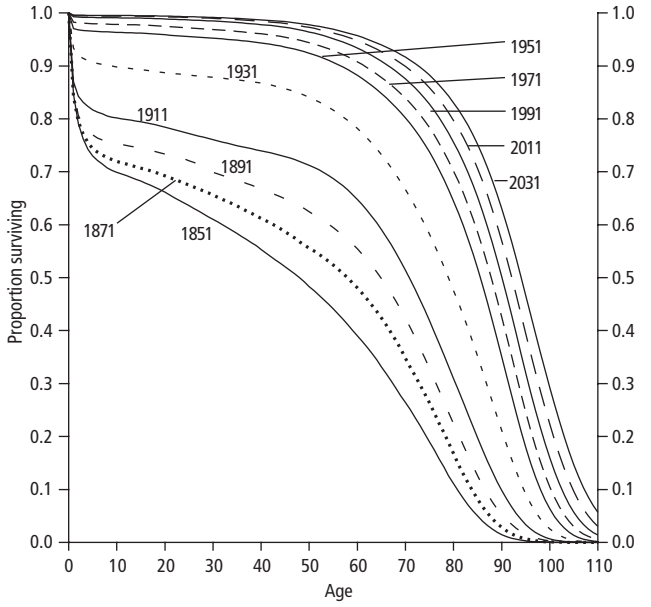
Proportion of persons surviving to successive ages, according to death rates experienced or projected, 1851–2031

England & Wales

a) Proportion surviving on a period basis



b) Proportion surviving on a cohort basis



Views on future levels of mortality improvements and expectations of life

Mortality projections prepared in other countries and by other agencies tend to be based largely on extrapolation of past trends in either rates of mortality improvement or in expectations of life. Expert opinion is often used to inform the assumptions made. It is therefore perhaps helpful to summarise some of the current arguments put forward by experts regarding future levels of mortality improvements and life expectancy, for the UK and for other developed countries.

Appendix III reports a meeting of the expert panel which advised on the assumptions for the 2004-based projections. In general the UK experts felt that the current high rates of mortality improvement were likely to continue into the future. Many events were occurring which would increase the chances of longevity going up (circumstances of housing, reduced overall levels of deprivation etc) and the improvement is a sum of these changes. All governments support increasing/improving wealth, health and incomes. However, there were factors which would work in the opposite direction. These include old and new 'international' diseases (for example, avian flu), obesity, HIV, hepatitis etc. As well as medical advances, other causes of increasing longevity are lifestyle-related which some sectors of the population may choose not to adopt.

As to the potential rates of mortality in the longer term, it was generally felt that the tailing off of improvements in mortality after 25 years assumed in the 2002-based projections was arbitrary and that there was no evidence to cause us to expect this.

Overall it was acknowledged that there are elements influencing mortality improvement in both directions and that these need to be considered together to determine if the overall effect will be positive or negative. However, it was felt that medical advances could be dramatic with long-term or permanent effects, while negative influences are more likely to be short-term.

For the United Kingdom, several factors have been identified amongst the likely drivers of future mortality change including the 'cohort effect', the 'ageing of mortality improvement' (the ages at which the highest rates of improvement have occurred have been increasing over time), increased uncertainty at younger ages, changes in prevalence of cigarette smoking, the effects of other lifestyle changes and medical advances. These are all discussed elsewhere in this chapter.

There is currently a wide range of opinion amongst demographers, gerontologists, epidemiologists, academics and others as to the likely future pattern of longevity.

Proponents of a biological maximal length to life discuss the 'Hayflick' limit – in the 1960s, Hayflick found that certain mammal cells could only divide up to a specific limited number of times, which were roughly linked with the typical lifespans of the organisms involved.[20] Others have argued that lifespan can be viewed as a kind of biological warranty period linked to the reproductive period with physiological decline in the post-reproductive period producing restraints on the duration of life.[21]

Amongst the 'optimists', Oeppen and Vaupel have observed that past predictions of limits to life expectancy have nearly all been broken afterwards.[10] They have noted that record life expectancy (the highest life expectancy observed in any country of the world at any particular time) has increased at a steady pace over the last 160 years or so and suggest that this is likely to continue into the future. However, Olshansky and others have argued that there will be countervailing trends to the high rates of mortality improvements seen in recent years, driven by increasing levels of obesity, sedentary behaviours and other adverse lifestyle factors.

Some scientists have suggested that medical advances could lead to engineered negligible senescence with radical consequences for future life expectancy. For instance, de Grey[22] believes that there are only seven mechanisms for accumulating damage to the human body and that therapies for reducing or reversing all of these types of damage are currently foreseeable. Given sufficient commitment and resources, the possibility of life expectancy of 150 years, or even longer, may be with us in the next 20 to 30 years.

Given this wide disparity of views as to the likely future course of longevity, users of the projections can gain some insight into the sensitivity of the results to the various views on future mortality by considering the high and low life expectancy variants (see **Chapter 9**), although these do not reflect the extremes of thinking on future mortality.

Latest Eurostat and UN projections

In their latest (2004-based) projections,[23] Eurostat assume an increasing period life expectancy at birth, though the rate of increase declines over time. Eurostat's assumptions were derived from looking at past rates of mortality improvement and assuming that continued rates of improvement would occur in future, but at a slower pace than those seen in the recent past. The Eurostat projections of period expectations of life at birth for males for the UK are lower than those in the 2004-based official national population projections produced by GAD but are broadly similar for females.

Both the national UK projections and the Eurostat projections assume higher projected period expectations of life at birth for the UK than the current United Nations 2004 Revision.[24]

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8 Migration

Introduction

The current methodology for determining assumptions of future migration was introduced for the 1991-based national population projections[1]. With some later modifications[2], this approach, which standardises the methods and procedures by which the assumptions are formulated, has been the basis of subsequent projections. This chapter summarises the assumptions adopted for the 2004-based population projections.

The new long-term assumption for net migration to the UK is +145 thousand each year compared with +130 thousand a year in the 2002-based projections. This increase follows two further years (2002 and 2003) for which net migration remained at historically high levels. International migration data for 2004 were not available when the long-term assumptions were decided. Estimates for 2004 have subsequently become available and show that net migration to the UK was 223 thousand in the calendar year 2004, a considerable rise compared with previous years.[3] However, although 2004 migration data were not available in time to inform the long-term assumptions, the assumptions for the first three years of the projection (2004–05 to 2006–07) were decided at a later stage and took account of provisional 2004 data.

Figure 8.1 compares the future migration assumptions with historical international migration estimates back to 1991. It is based on mid-year to mid-year, rather than calendar year, figures, so the latest actual data point shown is the estimated 175 thousand net inflow to the UK between mid-2003 and mid-2004. The graph also shows the assumptions made for the previous 2002-based projections.

Migrants are defined as individuals who change their country of usual residence for a period of at least a year, so that the country of destination becomes the country of usual residence. Migration figures are derived from several sources.[4] The principal source is the International Passenger Survey (IPS) and it became operational in 1964. Adjustments to IPS data are made for people who enter or leave the country initially for a short stay but subsequently decide to remain for a year or more ('visitor switchers'), and for people who intend to be migrants but in reality stay in the UK or abroad for less than one year ('migrant switchers').

Assumptions of migration between the UK and the Irish Republic are added to the IPS figures. Finally, the projections incorporate assumptions, based on advice from the Home Office, about the future net flows of asylum seekers (including dependants) not covered by the IPS.

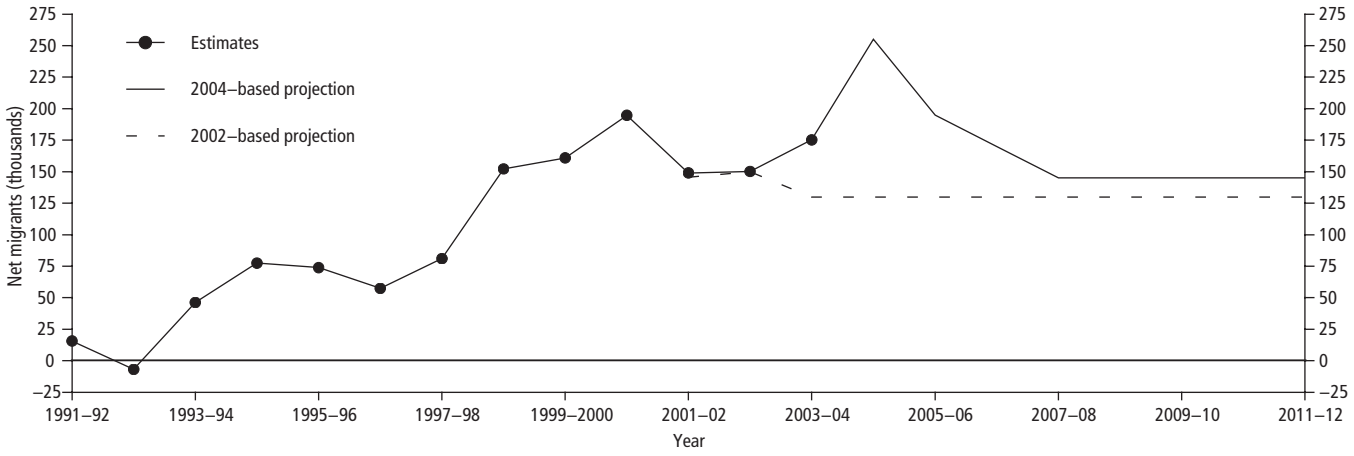
A breakdown of the overall long-term assumption into these component categories is given in **Table 8.1**.

For the individual countries of the United Kingdom, additional assumptions have to be made about the distribution of international migration, and about cross-border flows,

Figure 8.1

Actual and assumed total net migration, 1991–1992 to 2011–2012

United Kingdom



between the four countries. A summary of the assumptions for the individual countries is given in **Table 8.2**.

In the following sections of this chapter, the various component assumptions are considered separately.

Table 8.1

Long-term annual net international migration assumption by component category, 2007–2008 onwards

United Kingdom

	2004-based projections	2002-based projections
IPS	145,000	130,000
Visitor switcher adjustment	15,000	10,000
Migrant switcher adjustment	–20,000	–15,000
Asylum seeker adjustment	15,000	15,000
Irish Republic	–10,000	–10,000
Total	145,000	130,000

Table 8.2

Long-term annual net migration assumptions for the United Kingdom and constituent countries, 2007–2008 onwards

	2004-based	2002–based	Difference
International net migration			
England	138,000	128,000	10,000
Wales	5,000	4,000	1,000
Scotland	2,500	–1,500	4,000
Northern Ireland	–500	–500	0
United Kingdom	145,000	130,000	15,000
Cross-border net migration			
England	–8,000	–4,000	–4,000
Wales	6,500	4,000	2,500
Scotland	1,500	0	1,500
Northern Ireland	0	0	0
Total net migration			
England	130,000	124,000	6,000
Wales	11,500	8,000	3,500
Scotland	4,000	–1,500	5,500
Northern Ireland	–500	–500	0
United Kingdom	145,000	130,000	15,000

International migration

Migration covered by the International Passenger Survey

The assumption about future international migration as recorded by the IPS is illustrated in **Figure 8.2**. The IPS time-series was projected forward using a form of exponential smoothing but with the various trends gradually 'levelled off' to give constant level projections after ten years. However, to avoid giving an impression that we can accurately predict small year to year future changes, the average net flow projected for the next ten years is taken as the basis for the long-term assumption.

The model projection shown in Figure 8.2 was based on data up to 2003. Data for 2004 were not available when the long-term assumptions were finalised, although the short-term assumptions were decided at a later stage and did take account of provisional 2004 data. There was a considerable rise in the IPS inflow (and hence net flow) in 2004 as shown in Figure 8.2.

The same projection method has also been applied to flows between the United Kingdom and four different groups of countries: (a) the Old Commonwealth & USA; (b) the New Commonwealth; (c) the European Economic Area (EEA) and (d) Rest of the World.[5] All the flows are considered separately for British and non-British citizens. These projections are shown in **Figure 8.3**.

Figure 8.2

Actual and projected IPS migration to and from the United Kingdom, 1981–2013

United Kingdom

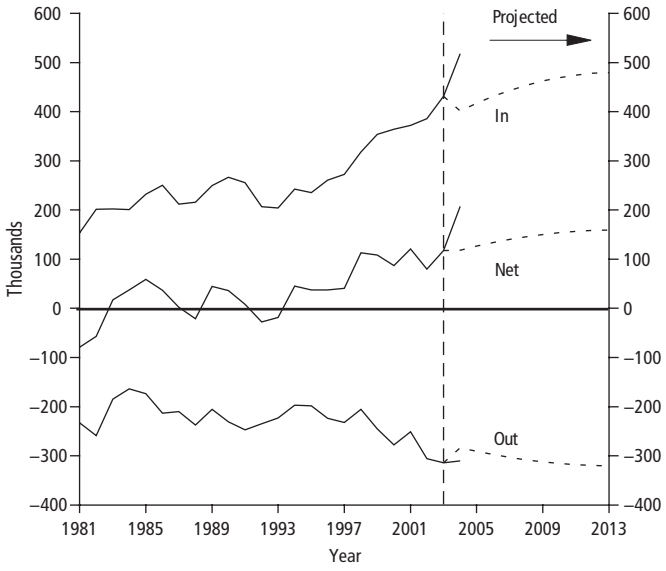
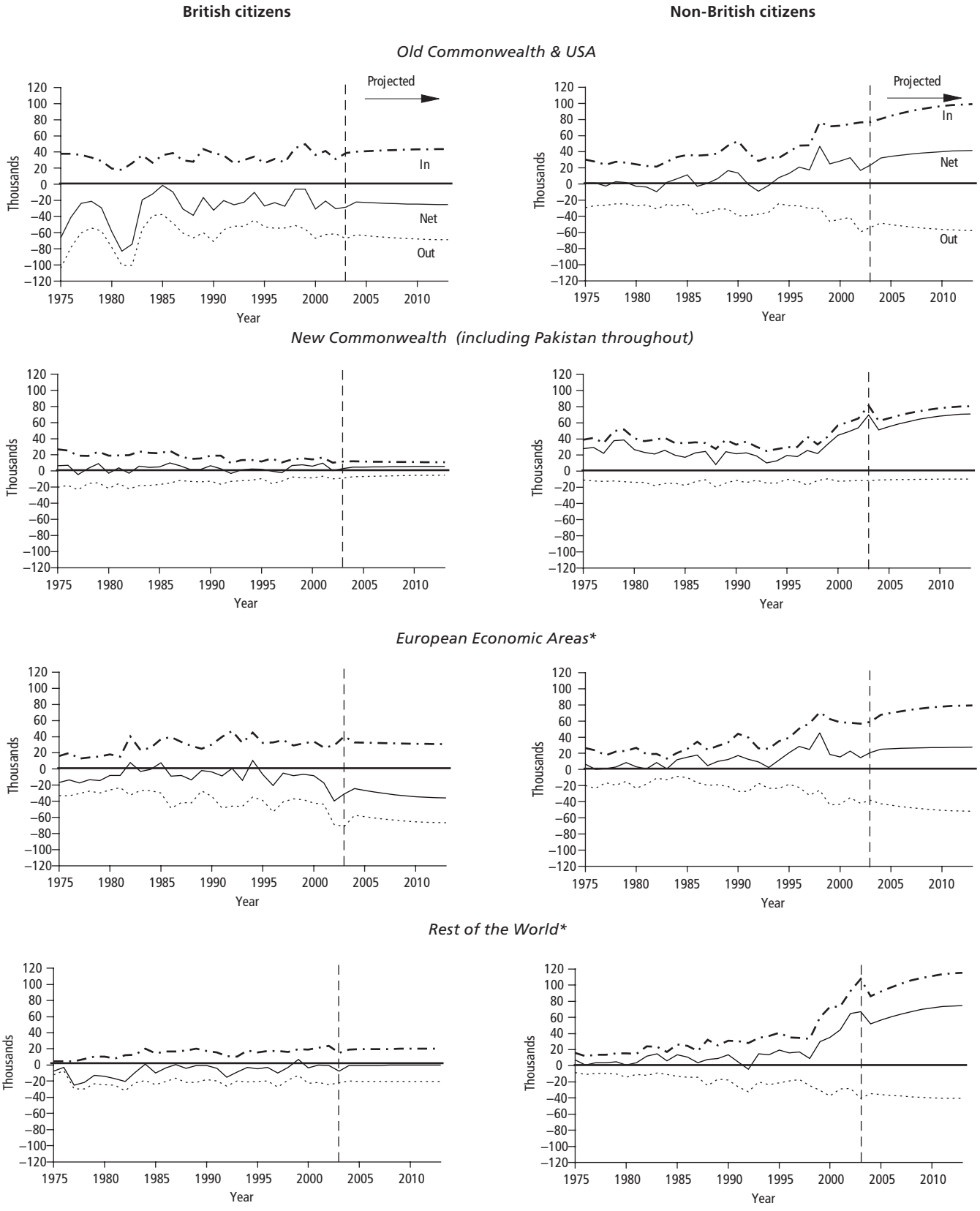


Figure 8.3

International migration to/from the United Kingdom by citizenship and country of origin/destination, 1975–2003 with projected trends to 2013



** Both categories exclude the Irish Republic.*

This projection method is additive, that is, the same results are produced by applying the method to each of the eight categories and summing the results as are obtained by applying the method directly to the total migration flows. The advantage of applying the method to these separate, relatively homogeneous, categories is that it may shed light on the key factors underlying the overall trends.

However when disaggregated in this way, IPS sample numbers can become quite small. Therefore, although the projections of the eight series shown in **Figure 8.3** all seem quite plausible, they are not so robust as those for the total flows and the breakdown of the overall IPS assumptions shown in **Table 8.3** should be regarded as purely illustrative. Nevertheless, it is clear that the overall projected IPS net inflow is a result of significant inflows from all the categories of non-British citizens, with some offsetting outflows of British citizens.

The overall annual projected IPS net inflow given by the model is 145 thousand. The corresponding figure from the 2002-based projections (based on data to 2001) was 130 thousand.

Table 8.3

Assumed annual long-term gross migration flows, 2007–2008 onwards

United Kingdom thousands

	Inflow	Outflow	Net flow
Illustrative breakdown of IPS component			
British citizens			
Old Commonwealth & USA	40	65	–25
New Commonwealth	10	5	5
EEA	30	65	–30
Rest of the World	20	20	0
Non–British citizens			
Old Commonwealth & USA	90	55	40
New Commonwealth	75	10	65
EEA	75	50	25
Rest of the World	105	40	65
Total IPS migration	450	305	145
Adjustment to IPS data (see text)			
Visitor switchers	35	20	15
Migrant switchers	–25	–5	–20
Asylum seekers	30	15	15
Irish Republic	10	20	–10
Total civilian migration	500	355	145

Note: Figures are independently rounded to nearest 5,000. Therefore, component figures may not sum to totals.

Visitor switchers and migrant switchers

As noted above, migrants are defined as individuals who change their country of usual residence for a period of at least a year. Therefore, adjustments to IPS data are required for people who originally intend to enter or leave the country initially for a short stay but subsequently decide to remain for a year or more (visitor switchers), and for people who intend to be migrants but in reality stay in the UK or abroad for less than one year (migrant switchers).

The adjustments made have been based on the allowances made by ONS for these categories in their international migration estimates for 1991 to 2003.[6] Broadly, these adjustments almost balance. The 2004-based projections assume an annual net inflow of 15 thousand visitor switchers, but a net deduction of 20 thousand is made to allow for migrant switchers. These are both slightly higher than the adjustments made for the 2002-based projections (see **Table 8.1**).

Irish Republic

The IPS has covered migrants to and from the Irish Republic since 1999. However, sample numbers are small and so estimates of flows continue to be based on Irish data sources including the Irish National Quarterly Household Survey. Prior to the 1990s, there tended to be a net inflow to the United Kingdom from the Irish Republic. However, since 1991, flows have normally been in the opposite direction with a consistent annual net outflow of around 10 thousand since 1997.[6] Following consultation with the Central Statistics Office in Ireland, an assumption of a future annual net outflow of 10 thousand has been made. This assumption is unchanged from the previous projections.

Asylum seekers

Asylum seeker assumptions are based on advice from the Home Office. The IPS excludes most, but not all, persons seeking asylum and some dependants of such asylum seekers. An adjustment for those not covered by the IPS is, therefore, necessary. In previous projections, the asylum seeker assumptions only related to those granted leave to remain in the UK. They therefore took no account of failed asylum seekers who remained in the UK for more than a year, nor of any subsequent departures from the UK of such failed asylum seekers. The assumption for the 2004-based projections covers the migration of all asylum seekers (including failed asylum seekers) not captured by IPS flows, and is now on a consistent basis with the annual estimates of asylum seeker migration made by the Office for National Statistics (ONS). However, offsetting this change of coverage, asylum seeker applications are now at a much lower level than that on which the previous

assumptions were based. Consequently, the net 15 thousand adjustment for asylum seekers is unchanged from the previous projections.

Gross migration flows

Gross migration flows (that is, inflows and outflows) are not required in order to produce the projections. The methodology used, therefore, focuses on net flows. **Table 8.3** does show gross flows for the various components (IPS, asylum seekers etc), but these should be treated with caution. For the IPS component, for example, it was noted above that the average net flow over the next ten years from the projection model is used as the basis for the (constant) long-term assumption. However, while it may be defensible to assume constant net flows (and this is common practice amongst national projection makers worldwide), it is less realistic to assume that gross flows will remain constant. The figures of 500 thousand and 355 thousand shown in Table 8.3 for total international migration inflow and outflow should be treated as nominal. In practice, both inflows and outflows have been rising in recent years and have exceeded these values in 2002, 2003 and 2004. It is quite likely (whether future net migration rises, falls or remains roughly constant) that gross flows will continue to rise in future years.

Allocation of international migration to the constituent countries of the United Kingdom

In general, the assumed flows of international migrants for each of the component categories shown in Table 8.3 were split between England, Wales and Scotland according to the estimated shares observed over the last ten years. These estimates were derived from the estimates of international migration for the years 1994 to 2003.

As in previous projections, a small allowance has been made for possible overestimation of immigration to England and underestimation for Scotland and Wales in the IPS. It is thought likely that some immigrants give a temporary address in the South East of England on arrival in the UK but then go on to settle in other areas. Estimated flows with Ireland have been split according to immigrant data from the 2001 UK Census and 2002 Irish Census. For asylum seekers, it has been assumed that 5 per cent will go to Scotland and the remainder are split between England and Wales according to their estimated shares between 1994 and 2003.

However, as with the 2002-based projections, it was decided that estimates of Northern Ireland's shares of the various components were not sufficiently robust to base the projection assumptions on them. Instead, the assumptions for Northern Ireland have been based on the total gross flows estimated by the Northern Ireland Statistics and Research Agency. Similarly, the calculation of the assumption for Scotland excluded some of the estimated components for that country but instead included an allowance for unmeasured migration similar to that made by the General Register Office for Scotland in the preparation of their mid-2004 population estimates. Following the recent Quality Review of International Migration Statistics,[4] ONS is examining ways of improving estimates of the geographical distribution of international migration flows in official statistics.

These calculations produce assumed annual long-term net inflows through international migration of 138,000 to England, 5,000 to Wales and 2,500 to Scotland and an assumed net outflow of 500 from Northern Ireland. Apart from Northern Ireland all these assumptions are higher than those used in the 2002-based projections.

Cross-border migration within the United Kingdom

Regular estimates of the movements of population between the countries of the UK are made by the offices of the Registrars General. These estimates are based on changes of residence recorded by the National Health Service Central Register (NHSCR). Two additional years of NHSCR data (for 2002–03 and 2003–04) had become available since the 2002-based projections were prepared.

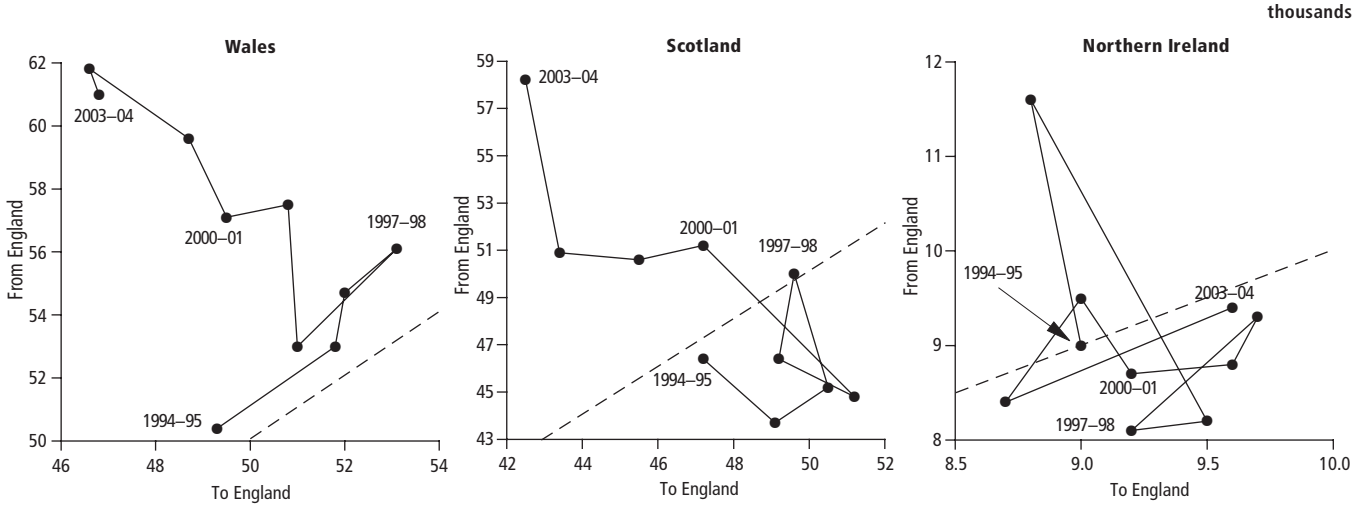
Numerically, the dominant flows within the United Kingdom are between the smaller countries and England. **Figure 8.4** shows the trend in these flows between 1994–95 and 2003–04. Moves from England are plotted against the vertical axes and moves to England are plotted on the horizontal axes. Therefore, points above the dashed line indicate a net outflow from England, while points below the line indicate a net inflow into England – and the greater the distance the points are from the dashed line, the greater is the net migration flow.

Figure 8.4 shows that **Wales** has experienced a net gain in population from England throughout the last ten years, with a generally rising trend in the most recent years. The net inflows of the last three years have been particularly high. However, there was a similar period of very high net inflows in the late 1980s which was not sustained. Nevertheless, the assumed long-term net inflow to Wales has been increased to 6,500 per year (from 4,000 in the previous projections), approximately equal to the average net flow over the last ten years.

The 2002-based projections assumed a long-term net balance of moves between England and **Scotland**. However, following a few years of Scotland losing population to England, the latest years have seen significant net flows in the opposite direction with a particularly high net inflow recorded in 2003–04.

Figure 8.4

Migration between England and the other countries of the United Kingdom, 1994–1995 to 2003–2004



For these projections, a long-term annual net flow to Scotland of 1,500 has been assumed, again roughly equivalent to the average over the last ten years.

With the exception of a relatively high net flow to **Northern Ireland** recorded in 1995–96, recent flows between England and Northern Ireland have been more stable than those between England and either Wales or Scotland. For these projections, it was decided to assume a long-term net zero flow between the two countries. This assumption is unchanged from the previous projections.

There are some interesting common features in the recent flows from England to both Wales and Scotland. In both cases, the recent trend has been toward higher net flows leaving England. Further, in both cases the lines in Figure 8.4 have moved to the top left indicating that trends in the net flow are due to a combination of more people leaving England *and* fewer people coming to England. Finally, the most recent net flows are exceptionally high. So despite the significant increases in the long-term assumptions, they are well below the figures currently being recorded. In view of these current high net flows, the assumed net inflows to Wales and, especially, Scotland in the first three years of the projection period are above the level of the long-term assumption (see below).

Flows between the three smaller countries are, of course, numerically much less significant than those with England. For these projections, net zero flows have been assumed in each case, in line with the average size of the flows over the past ten years. These assumptions are unchanged from the 2002-based projections.

The overall assumptions for cross border migration with the rest of the United Kingdom are summarised in **Table 8.2**.

Total long-term migration assumptions

The overall long-term assumptions of net migration for the United Kingdom and constituent countries, and the corresponding assumptions from the 2002-based projections, are also given in Table 8.2. The overall assumed net inflows to England, Scotland and Wales have all been increased while that for Northern Ireland is unchanged.

The projections, therefore, assume *constant* levels of annual net migration beyond 2007–08. In reality, of course, migration will inevitably continue to fluctuate from year to year. But such long-term fluctuations are impossible to predict. So the assumptions in Table 8.2 should be regarded as representing *average* annual levels of net migration for the future.

Assumptions for the short-term

Special assumptions have been applied for the first three years of the projections (2004–05 to 2006–07). These were decided after the long-term assumptions, thus enabling them to take account of the most up to date data available. Indeed, the assumptions for 2004–05 incorporate some provisional migration data (notably from IPS and NHSCR) for the second half of 2004.

Table 8.4 summarises these short-term assumptions. An allowance has been made for additional net migration during the first three years of the projection period from the accession countries which joined the European Union in May 2004 (see below). The 2004–05 UK assumption also differs from the long-term assumption as it took account, as noted above, of

Table 8.4

Short-term net migration assumptions for the United Kingdom and constituent countries

	Short-term assumptions			Long-term assumptions
	2004–05	2005–06	2006–07	2007–08 onwards
International net migration				
England	238,500	181,500	160,000	138,000
Wales	3,500	6,000	5,500	5,000
Scotland	11,000	6,000	4,000	2,500
Northern Ireland	2,000	1,500	500	–500
United Kingdom	255,000	195,000	170,000	145,000
Cross-border net migration				
England	–20,500	–16,500	–12,000	–8,000
Wales	8,500	7,500	7,000	6,500
Scotland	10,000	7,500	4,500	1,500
Northern Ireland	2,000	1,500	500	0
Total net migration				
England	218,000	165,000	148,000	130,000
Wales	12,000	13,500	12,500	11,500
Scotland	21,000	13,500	8,500	4,000
Northern Ireland	4,000	3,000	1,000	–500
United Kingdom	255,000	195,000	170,000	145,000

provisional data for the second half of 2004.[7] The 2005–06 and 2006–07 UK assumptions differ from the long-term assumption solely because of the accession country allowance.

The figures for the first three years also assume a gradual transition from current cross-border migration levels (where net flows from England to Scotland are unusually high) to the assumed long-term levels.

Enlargement of the European Union

On 1 May 2004, ten countries joined the European Union (EU): Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. There is no evidence of increased immigration from either Cyprus or Malta. For the remaining eight countries (the A8), there is evidence of significantly increased immigration since May 2004. As a result, an allowance for additional short-term net migration from the A8 countries has been included in the 2004-based projections. The allowance is for 75 thousand net migrants in 2004–05, 50 thousand in 2005–06 and 25 thousand in 2006–07, that is, a total of 150 thousand in the first three years of the projection period.

Very little actual migration data is available yet since EU enlargement. The principal source for estimates of international migration to and from the United Kingdom is the International Passenger Survey (IPS). At the time of finalising the 2004-based projections, some provisional IPS data for the second half of 2004 had just become available. [It has subsequently been estimated that there was net migration of 48 thousand citizens of the ten accession countries in the whole of the calendar year 2004.[3]]

However, nationals of the A8 countries who wish to take up employment in the UK are generally required to register with the Worker Registration Scheme (WRS). At the time of finalising the projections, WRS data were available for May 2004 to June 2005.[8] Although the WRS does not provide estimates of A8 migration directly, it was used in conjunction with the provisional IPS data for the second half of 2004 to provide a very tentative 'estimate' of around 75 thousand net migrants from A8 countries during 2004–05, the first year of the projection period. No hard evidence was available on which to base an allowance for additional A8 net migration beyond 2004–05. There were reasons for believing that net flows would soon decline but any precise allowance was, inevitably, arbitrary. However, for these projections, an additional allowance was made for net migration of 50 thousand A8 citizens in 2005–06 and 25 thousand in 2006–07. WRS data were also used to distribute the additional A8 allowance between the four countries of the UK. A fuller discussion of the A8 allowance is available on the GAD website.[9]

Bulgaria and Romania

No allowance has been made in the 2004-based projections for the possible effects on future net migration of the accession of Bulgaria and Romania to the European Union. These countries are currently due to accede to the EU on 1 January 2007. No decision has yet been taken on whether citizens of Bulgaria and Romania will have similar access to the UK labour market (or the labour market of other EU countries) as have citizens of the A8 countries.

Illegal migration

No allowance has been made in the projections for illegal migrants entering the UK clandestinely who are not part of the asylum process. Similarly, no explicit or separate official estimate is made for illegal migrants in ONS estimates of total international migration.

Age and sex distribution

For England, Wales and Scotland, the assumed age and sex distribution of international migrants has been based on ONS estimates of the age/sex distributions of the various categories of migrants discussed above. In general, the assumed distributions are based on averages of the last five years' data. For estimated flows with Ireland, however, distributions were based on census data (using 2001 UK Census data for inflows and 2002 Irish Census data for outflows).

For Northern Ireland, where the long-term total migration assumption was not broken down into component categories (see above section on 'Allocation of international migration to the constituent countries of the United Kingdom'), age distributions were applied based on IPS data for the UK as a whole.

For accession country migration, age and sex distributions were based on WRS data. For cross-border migration, separate age distributions, based on NHSCR data, were calculated for each country.

Table 8.5

Assumed long-term net migration by age and sex

United Kingdom — thousands

	2007–08 onwards		
Age group	Persons	Males	Females
0–4	3.0	0.3	2.7
5–9	4.2	1.8	2.4
10–14	2.5	2.4	0.1
15–19	37.9	21.3	16.7
20–24	50.7	20.2	30.5
25–29	34.5	18.1	16.4
30–34	12.2	4.6	7.6
35–39	5.7	3.1	2.6
40–44	3.6	2.0	1.5
45–49	–2.2	–0.9	–1.3
50–54	–1.8	–1.2	–0.6
55–59	–2.9	–1.9	–1.0
60–64	–3.5	–2.5	–1.0
65–69	0.0	0.3	–0.3
70–74	–0.4	–0.4	0.0
75 & over	1.5	0.7	0.8
All ages	145.0	68.0	77.0

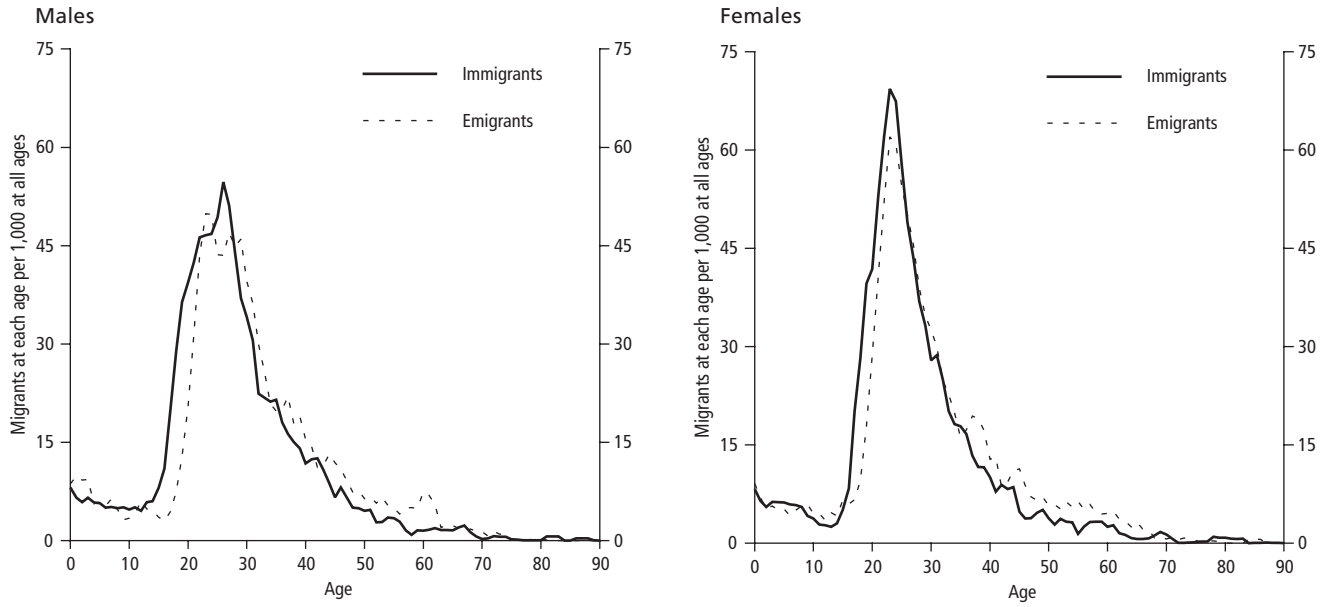
In each case the age distributions were considered separately for males and females, and for immigrants and emigrants. The long-term distribution for the UK is summarised in **Table 8.5**. The table shows that the projections assume slightly more female migrants than male migrants. Equivalent tables for the individual countries can be found on the GAD website.[10]

The assumed age distributions for international migration to and from the UK, and the NHSCR derived distributions for cross-border migration for England, are shown in **Figure 8.5**. All these distributions are highly peaked at the young working ages, which was also the case for the distributions assumed for cross-border migration for Wales, Scotland and Northern Ireland.

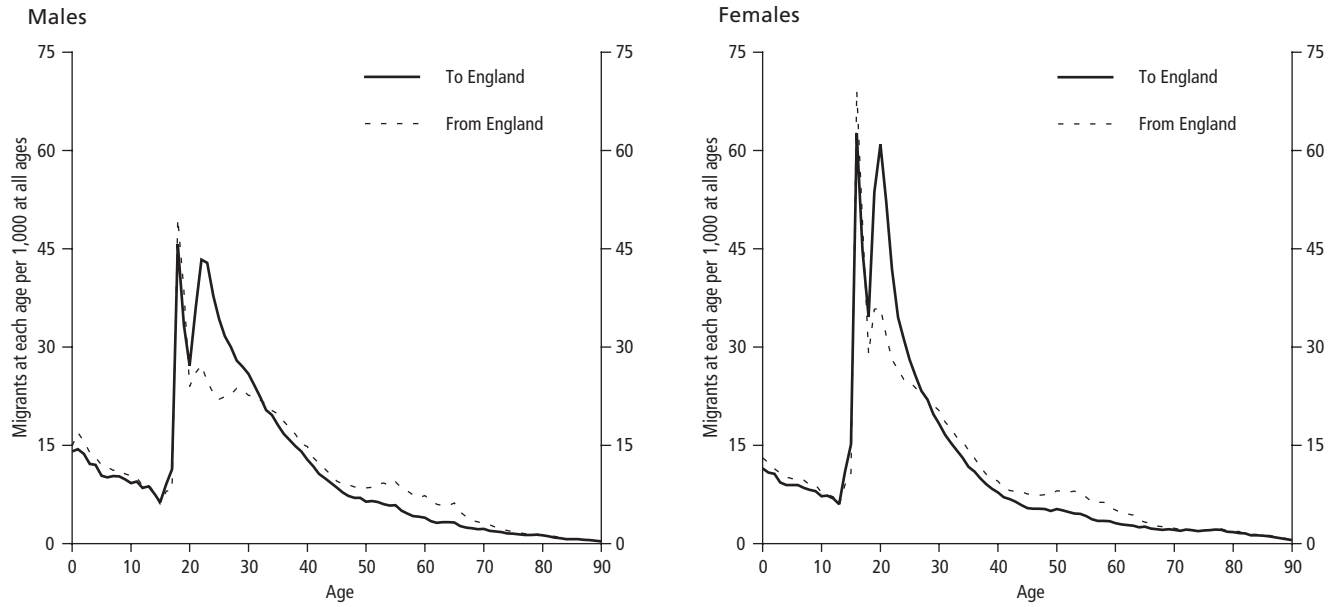
Figure 8.5

Assumed long-term age distribution per thousand migrants

(a) International migration to/from the United Kingdom



(b) Cross-border migration between England and the rest of the United Kingdom



Views on future migration levels

Consideration of how migration projections are prepared in other countries and by other agencies[11, 12] suggests that migration projections tend to be based largely on past trends in migration time-series. While many projection makers say that their assumptions are also informed by expert opinion, few use immigration assumptions "that are justified by any explicit reference to a theory of how or why immigration happens."[11] It is therefore perhaps helpful to summarise some of the current arguments put forward by experts regarding future levels of net migration in the UK.

Perhaps the most common argument (see, for example, the views of the UK Expert Group in Appendix III), why net migration levels might rise is related to the continuing ageing of the UK population. So, the low fertility levels of recent years will lead to gaps in the labour market in the future, and dependency ratios will rise as the elderly population increases as a result of improving life expectancy and the retirement of the baby boom cohorts of the post war period. Meanwhile, as a consequence of generally higher fertility levels outside the developed world, there will continue to be a plentiful potential supply of immigrants.

These 'push' and 'pull' factors, amongst others, would at least partly explain the general underlying upward trend in net migration to the UK over the last twenty years or so. Some would argue that there is no reason to believe that this upward trend will not continue. Conversely, others question whether it can be justified to assume that net migration will continue at current levels indefinitely, given that these levels had never been experienced in UK history before the last few years.[11]

It should be noted, however, that trends in underlying push and pull factors in western countries do not automatically follow through to corresponding trends in net migration. For example, increases in the numbers of people wishing to enter a country may lead governments to consider more targeted or restrictive immigration policies. The different responses of EU governments to the opening of their labour markets to people from the new accession countries is a reminder that migrant numbers are not just dependent on the demographic characteristics of the sending and receiving countries, but will also be affected by any intervening obstacles or incentives placed on their movement.

There is evidence that levels of international migration are correlated with economic factors such as unemployment rates, although the strength of the relationship may vary from country to country.[13] Nevertheless, few agencies explicitly use explanatory variables (whether economic or other) in projection making other than in the very short-term. This is often because the explanatory variables are considered to be as, or more, difficult to predict than the demographic variables! The relative strength of the UK economy seen in recent years may not, of course, continue indefinitely. If so, the UK may face increasing competition for migrants both from other EU countries and also from economically emerging nations outside the EU.

Latest Eurostat and UN projections

In their latest (2004-based) projections,[14] Eurostat assume a gradual decline in UK net migration from current levels to a long-term level of around 100,000 a year. Eurostat's assumptions were derived from a combination of approaches, but the projected slight decline results from their time-series modelling of the UK net migration series. It therefore contrasts with the upward trend projected in our modelling of the IPS time-series (see **Figure 8.2**) and by others who have looked at UK data. We are investigating the reasons for the different results produced by these models. This is a useful reminder, however, that while using a projection model may appear to be a purely 'objective' way of determining assumptions, the choice of model used is a judgement that may have a significant impact on results.

In their latest two sets of projections, including the current 2004 Revision,[15] the UN have used the same long-term migration assumption for the UK as has been applied in the official UK projections produced by GAD.

Further details

Chapter 9 presents the results of variant projections based on alternative assumptions about future migration.

Notes and references

1 Office of Population Censuses and Surveys (1993) *National population projections: a new methodology for determining migration assumptions.* Occasional Paper 42. OPCS: London.

2 Office for National Statistics (1999) *National population projections: 1996-based,* ONS Series PP2 no. 21. The Stationery Office: London. Footnote to p 34.

3 Office for National Statistics (2006) *International Migration* 2004 ONS Series MN no. 31. www.statistics.gov.uk/STATBASE/Product.asp?vlnk=507

4 For a fuller discussion see *International Migration Statistics*. National Statistics Quality Review Series no. 23. ONS (2003). Available at: www.statistics.gov.uk/methods_quality/quality_review/population.asp

5 As this analysis was based on actual data up to 2003, the EEA was taken as the 15 member states of the EU as constituted before 1 May 2004 plus Iceland, Liechtenstein and Norway. The ten countries which acceded to the EU on 1 May 2004 are therefore included in the Rest of the World category.

6 *Methodology to estimate Total International Migration since 1991.* Available at: www.statistics.gov.uk/downloads/theme_population/Methodology_for_Revised_International_Migration_Estimates.doc

7 The international migration estimates subsequently published by ONS www.statistics.gov.uk/STATBASE/Product.asp?vlnk=507 show that net inward migration increased in 2004 for Commonwealth citizens as well as EU citizens.

8 See www.ind.homeoffice.gov.uk/ind/en/home/about_us/reports/accession_monitoring.html%20

9 See www.gad.gov.uk/Population/2004/methodology/migrassa8.htm

10 Tables can be downloaded from www.gad.gov.uk/Population/2004/methodology/migrass.htm

11 Howe N and Jackson R (2005) *Projecting Immigration: A Survey of the Current State of Practice and Theory.* Centre for Strategic & International Studies: Washington DC. Available at www.csis.org/component/option,com_csis_pubs/task,view/id,2528/

12 Shaw C (2002) *Latest national migration forecasts in Europe.* Eurostat: Brussels. Annex 5 from forum.europa.eu.int/Public/irc/dsis/population/library?l=/projections_september&vm=detailed&sb=Title

13 Eurostat (2003) *Analysis and forecasting of international migration by major groups.* Eurostat Working Paper 3/2002/E/no. 17. epp.eurostat.cec.eu.int/portal/page?_pageid=1073,46587259&_dad=portal&_schema=PORTAL&p_product_code=KS-CC-03-002

14 epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136184,0_45572595&_dad=portal&_schema=PORTAL

15 esa.un.org/unpp/

9 Variant projections

Background

The results of the population projections, as described in **Chapter 3**, provide a consistent starting point for all government planning which is affected by the numbers in the population. The projections are based on assumptions judged to be the best that could be made at the time they are adopted. However, due to the inherent uncertainty of demographic behaviour, any set of projections will inevitably be proved wrong, to a greater or lesser extent, as a forecast of future demographic events or population structure. Many users will need to take into account the consequences of future experience differing from the assumptions made and, to this end, the results of variant projections based on alternative assumptions of future fertility, mortality and migration are discussed in this chapter.

Another way of indicating uncertainty is to consider the accuracy of previous sets of projections. The accuracy of national population projections made between 1971 and 1989 is discussed elsewhere.[1] That analysis was carried out following the rebasing of population estimates after the 1991 Census. An updated analysis following the 2001 Census rebasing is planned for publication during 2006. It has been delayed because of the need to take account of the revisions made to population estimates in 2003 and 2004. This analysis will be greatly facilitated by the extensive database of past national projections published earlier in 2006 on the GAD website (see **Chapter 12**).

This chapter summarises the results of official high and low variant projections for the United Kingdom. These are intended as plausible alternative scenarios and *not* to represent upper or lower limits for future demographic behaviour. In these projection variants, the different fertility, mortality and migration assumptions have been treated as separate and independent departures from the assumptions in the principal projection. However, in addition to describing these 'single component' variants, this chapter also summarises the results of selected 'combination' variants, taking two or more of these alternative scenarios together.

Variant fertility assumptions

In the long-term, changes in the level of fertility are critical in determining the size of the population. Any sustained increase (say) in the level of fertility would clearly increase the number of births. But, in a generation's time, it would have also increased the number of women of childbearing age, compounding the effect on births.

Cohorts of women who have already completed their childbearing have shown a wide range of completed family sizes. Therefore, assumptions for generations who have not yet entered the childbearing ages, or who have done so only recently, are necessarily highly speculative.

The assumptions made for the variant fertility projections for the United Kingdom are summarised in **Table 9.1** and illustrated in **Figure 9.1**. The low variant assumes that the average family size of successive cohorts will continue to fall, reaching an ultimate level of 1.54 for women born from the early 1990s onwards. Although low by historical standards in the United Kingdom, this is slightly above the latest TFR for the European Union as a whole (1.50 in 2004). In Italy, Spain and Greece, TFRs are currently around 1.3 and in some Eastern European countries, rates are even lower.[2]

Figure 9.1

Actual and assumed completed family size, women born 1940–2004

United Kingdom

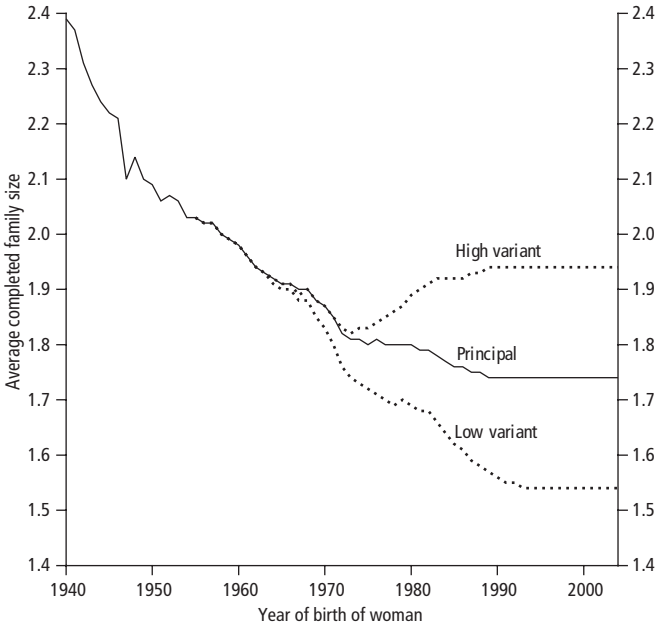


Table 9.1

Actual and assumed average number of children by age and cohort: variant fertility projections

United Kingdom

Women's year of birth	Average family size	Mean age at motherhood (years)	Average number of children born to women at ages: Under 20	20–24	25–29	30–34	35–39	40 and over
	Actual values							
1945	2.22	26.0	0.21	0.85	0.72	0.30	0.11	0.02
1950	2.09	26.4	0.23	0.70	0.63	0.36	0.13	0.03
1955	2.03	27.1	0.22	0.56	0.65	0.40	0.16	0.04
	High variant							
1960	1.98	27.8	0.16	0.53	0.63	0.44	0.19	0.04
1965	1.91	28.4	0.13	0.46	0.59	0.45	0.22	0.05
1970	1.87	28.7	0.15	0.42	0.52	0.47	0.25	0.06
1975	1.83	29.1	0.15	0.36	0.47	0.52	0.27	0.06
1980	1.89	29.1	0.15	0.35	0.53	0.53	0.26	0.06
1985	1.92	29.0	0.14	0.39	0.55	0.52	0.26	0.06
1990	1.94	28.9	0.15	0.39	0.55	0.52	0.26	0.06
1995 & later	1.94	28.9	0.15	0.39	0.55	0.52	0.26	0.06
	Principal projection							
1960	1.98	27.8	0.16	0.53	0.63	0.44	0.19	0.04
1965	1.91	28.4	0.13	0.46	0.59	0.45	0.22	0.05
1970	1.87	28.7	0.15	0.42	0.52	0.47	0.25	0.06
1975	1.80	29.1	0.15	0.36	0.47	0.50	0.26	0.06
1980	1.80	29.1	0.15	0.35	0.47	0.50	0.26	0.06
1985	1.76	29.3	0.14	0.34	0.45	0.50	0.27	0.06
1990	1.74	29.4	0.13	0.34	0.45	0.50	0.27	0.06
1995 & later	1.74	29.4	0.12	0.33	0.45	0.50	0.27	0.07
	Low variant							
1960	1.98	27.8	0.16	0.53	0.63	0.44	0.19	0.04
1965	1.90	28.3	0.13	0.46	0.59	0.45	0.22	0.05
1970	1.83	28.4	0.15	0.42	0.52	0.47	0.22	0.05
1975	1.72	28.7	0.15	0.36	0.47	0.46	0.22	0.05
1980	1.69	28.6	0.15	0.35	0.47	0.45	0.23	0.05
1985	1.62	28.9	0.14	0.33	0.43	0.45	0.23	0.05
1990	1.56	29.2	0.11	0.30	0.42	0.45	0.23	0.05
1995 & later	1.54	29.3	0.10	0.29	0.42	0.45	0.23	0.05

** Figures above the stepped lines are actual values: those below the lines are wholly or partly projected*

The high variant would imply a reversal of the recent downward trend in average family size. Under this assumption, family size would continue to decline to almost 1.80 children, for women born in the early 1970s, before recovering to reach an ultimate level of 1.94 for women born from around 1990 onwards. Therefore, even in the high variant, the long-term assumption would be below the completed family size of women born as recently as 1960 who are now reaching the end of their childbearing lives.

In the low variant projection, it is assumed that fertility rates will fall up to around age 30, with some very modest increases at older ages. The high variant assumes increases in fertility rates at all ages.

Total fertility rates and numbers of births

The projected total fertility rates and numbers of births resulting from these alternative assumptions of future fertility levels are shown in **Figure 9.2**. Experience has shown that

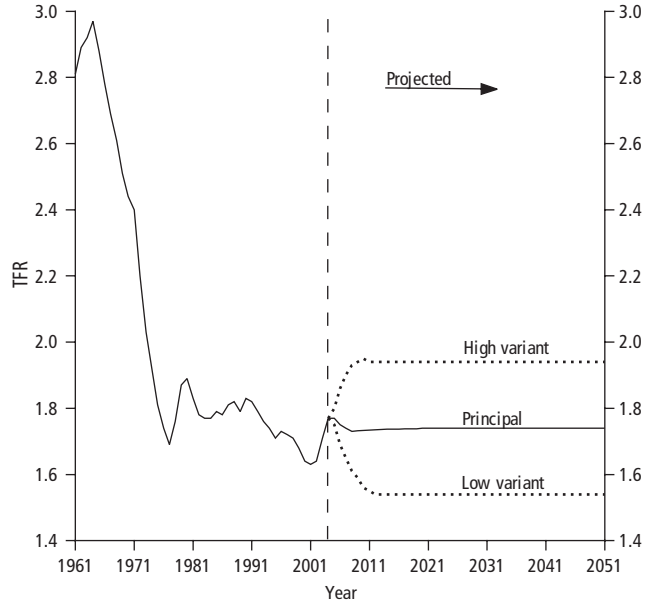
there can be quite sudden changes in fertility. It is, therefore, important to demonstrate the effect of significant short-term changes, as well as the long-term effects that would result from sustained levels of fertility significantly above or below that assumed in the principal projection. Consequently, the variants diverge quickly from the principal projection. Therefore, the TFR in the high variant rises rapidly from the 2004 level of 1.77, reaching 1.94 by 2009 while the TFR in the low variant falls to 1.54 by 2012.

Figure 9.2

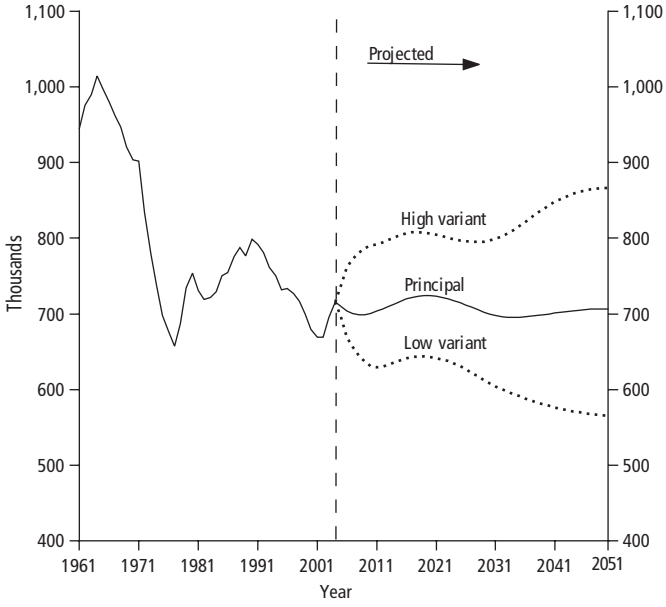
Actual and projected total fertility rates and numbers of births, 1961–2051

United Kingdom

a) Total fertility rate (TFR)



b) Number of births



Under the high variant, the number of births is projected to rise from 716 thousand in 2004, levelling off at around 800 thousand a year in ten years' time, before rising again from around 2030. However, under the low variant, the annual number of births would fall to about 630 thousand around 2010, and would then rise slightly for a few years before beginning to fall again in the longer-term.

In practice, of course, variations in the timing of childbearing are likely, as in the past, to produce considerable fluctuations in the TFR and the annual numbers of births. Therefore, even if trends in completed family size do in the long-term tend toward the assumptions underlying the principal projection or either of these variants, over short periods of time the numbers of births could differ considerably from those shown here.

Effect of fertility variants on total population size

The differences between the projected populations in the fertility variants and those in the principal projection are summarised in **Table 9.2**. Under these alternative assumptions, the population would be over one million higher or lower than the principal projection by 2021. By 2041, the differences would be around three million, partly because of the 'second generation' effect caused by the different numbers of potential mothers born in the first fifteen years or so of the projection period. These three million people would, of course, all be under the age of 40. In the high fertility variant, the projected population at 2041 would be 71.7 million, while in the lower variant it would be only 65.4 million.

Variant mortality assumptions

Chapter 7 discussed the current wide range of views about prospects for future longevity. To give some indication of these uncertainties, alternative projections have been made on assumptions of higher and lower life expectancies at birth than in the principal projection. The low life expectancy variant assumes slower improvements in mortality rates than in the principal projection; the high life expectancy variant assumes faster improvements in mortality rates (or less deterioration at ages at which mortality rates are at present increasing).

As in the principal projection, in each of these variants the special features affecting particular generations or age-groups are assumed to disappear gradually over a twenty-five year period. By 2029, in the low life expectancy variant it is assumed that mortality rates will have reached constant levels at all ages, but in the high life expectancy variant it is assumed that mortality rates will still be falling by 2 per cent a year (and that

this rate of improvement will continue thereafter). This compares with a fall of 1 per cent a year in 2029 at all ages in the principal projection (and continuing at that rate thereafter).

At the time the projections are made there is always some uncertainty about the *current* rate of mortality improvement. Further, epidemics (there have been no major ones in recent years), or hard winters, can have a considerable effect on the number of deaths, although this may be partially offset by fewer deaths than normal in the following year. In very recent years, however, excess winter mortality has been relatively low.[3]

As such uncertainties could have an immediate effect on the number of deaths recorded, the rates of improvement used for 2004 to 2005 in the principal projection were decreased by two percentage points for the low life expectancy variant and increased by two percentage points for the high life expectancy variant.

Expectations of life and numbers of deaths

The different expectations of life in the variant mortality projections are summarised in **Table 9.3** and shown graphically in **Figure 9.3**. These are *period* expectations of life, calculated on the basis of the death rates for the particular calendar year.

In the high variant, expectation of life at birth for males is projected to increase by over nine years from 76.6 in 2004 to 85.7 in 2041, while the corresponding increase for females is 7.6 years (from 80.9 to 88.5). In the low variant, life expectancy rises by just under three years for both sexes, reaching 79.2 and 83.6 respectively by 2029 and then remaining constant. (Figure 9.3 illustrates the further improvements assumed in the high life expectancy variant and the principal projection in later years – as mentioned above, mortality rates in the low life expectancy variant are held constant after 2029.)

Table 9.2

Population differences between variant fertility projections and principal projection by age, 2006–41

United Kingdom thousands

Year	All ages	0–4	5–9	10–14	15–19	20–29	30–39
	Difference between higher variant and principal projection						
2006	28	28					
2011	414	386	28				
2021	1,271	421	436	385	28		
2031	2,122	449	404	421	436	413	
2041	3,344	673	553	449	403	855	411
	Difference between lower variant and principal projection						
2006	–14	–14					
2011	–278	–264	–14				
2021	–1,055	–397	–380	–263	–14		
2031	–1,906	–440	–412	–397	–380	–277	
2041	–2,965	–571	–492	–439	–412	–775	–276

Table 9.3

Expectation of life at birth according to mortality rates assumed for selected years, variant mortality projections, 2004–2041

United Kingdom years

	Males			Females		
Year	High life expectancy	Principal projection	Low life expectancy	High life expectancy	Principal projection	Low life expectancy
2004*	76.6	76.6	76.6	80.9	80.9	80.9
2011	78.9	78.5	78.1	82.5	82.3	82.0
2021	81.3	80.2	79.1	84.6	83.9	83.2
2031	83.5	81.4	79.2	86.5	85.1	83.6
2041	85.7	82.5	79.2	88.5	86.0	83.6

* *Trend rates used for 2004 (see Chapter 7).*

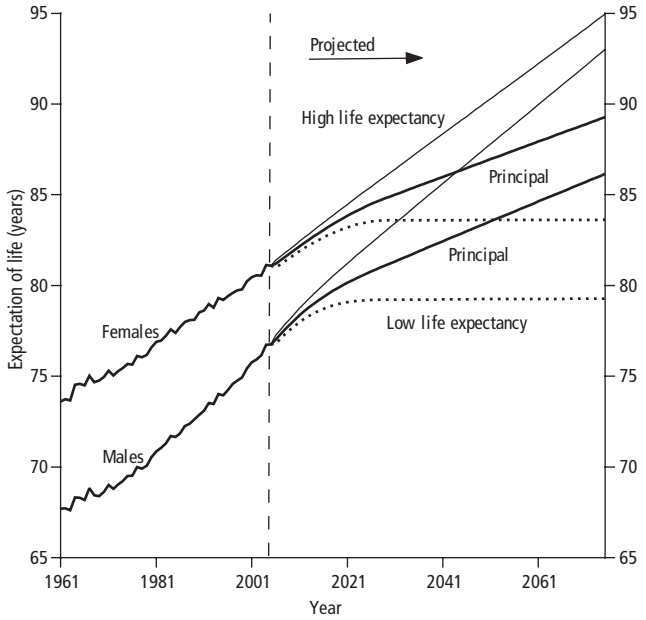
The projected number of deaths under the different mortality assumptions are also shown in Figure 9.3. The starting population is the same in each variant and the same assumptions are made about fertility rates and net migration. Therefore, as the different mortality assumptions have only a small effect on the number of women of childbearing age and hence the future number of births, the eventual cumulative number of deaths must be approximately equal in each case.

Figure 9.3

Actual and projected expectation of life and number of deaths, 1961–2074

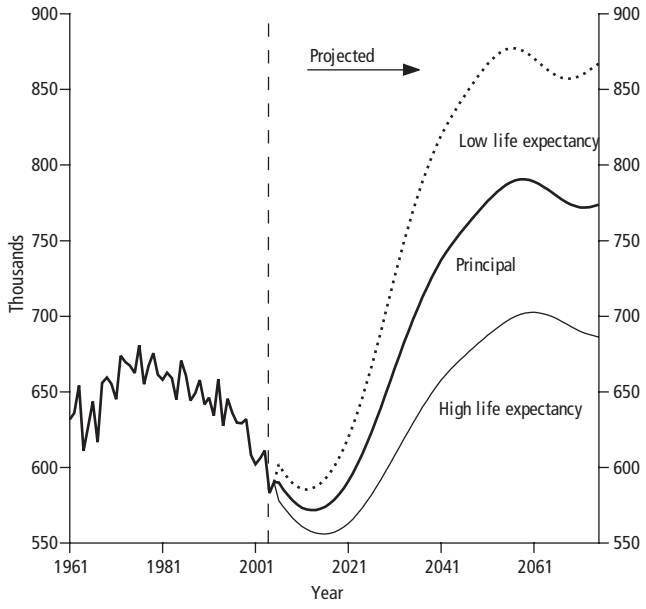
United Kingdom

a) Expectation of life at birth (years)*



** According to mortality rates experienced or assumed in given year.*

b) Number of deaths (persons)



However, in the low life expectancy variant deaths occur slightly earlier, and in the high variant slightly later.

Effect of mortality variants on total population size

The differences between the projected populations in the variant mortality projections and the principal projection are summarised in **Table 9.4**. Compared with the principal projection, the population of the United Kingdom in the year 2041 would be almost 1.5 million higher or lower in the respective variants. The majority of these differences are accounted for by persons aged 75 and over, with less than 10 per cent attributable to ages under 60. The population at 2041 would be 69.8 million in the high life expectancy variant but only 66.9 million given the low life expectancy assumptions.

Variant migration assumptions

The number of persons entering or leaving the United Kingdom has shown considerable year-to-year fluctuation in the recent past. In 1992 and 1993, there was net outward migration. Net migration then increased rapidly until 1998. Between 1998 and 2003, it was relatively stable, averaging just over 150 thousand per year, but then rose to 223 thousand in 2004.[4]

For the principal projection, it was assumed that there would be a net inflow of 255 thousand persons entering the United Kingdom in 2004–05, declining to a long-term level of 145 thousand from 2007–08 onwards. For the variant projections, except for 2004–05, annual net migration has been assumed to be 60 thousand higher or lower than in the principal projection. Therefore, from 2007–08 onwards, the high and low variants assume annual net migration to the UK of 205 thousand and 85 thousand persons respectively.

The high migration variant was calculated by assuming 30 thousand more immigrants and 30 thousand fewer emigrants each year than in the principal projection and *vice versa* for the lower variant. Because some data were available for 2004–05 at the time the projections were made, the allowance for uncertainty in the first year of the projection is only half that for later years. The assumptions are summarised in **Table 9.5**. The same age distributions as described in **Chapter 8** were then applied.

The point was made earlier in this chapter that these variants are not intended to represent limits for future demographic behaviour. Indeed, in the case of migration, whatever average level occurs in the future, it is highly likely that there will be some years when net migration exceeds the level of the high variant and others where it will be below the level of the low variant. Therefore, these migration variants should be regarded

Table 9.4

Population differences between variant mortality projections and principal projection by age, 2006–2041

United Kingdom thousands

Year	Difference between high life expectancy variant and principal projection					Difference between low life expectancy variant and principal projection				
	All ages	Under 60	60–74	75–84	85 & over	All ages	Under 60	60–74	75–84	85 & over
2006	12	2	3	4	4	–12	–1	–3	–4	–4
2011	71	9	16	21	25	–71	–9	–16	–21	–25
2021	267	33	60	73	101	–271	–35	–62	–75	–99
2031	703	68	142	191	302	–728	–76	–157	–206	–289
2041	1,417	119	227	355	716	–1,478	–143	–270	–405	–660

Table 9.5

Assumed annual net migration, variant migration projections

United Kingdom thousands

	2004–05	2005–06	2006–07	2007–08 onwards
High variant	285	255	230	205
Principal	255	195	170	145
Low variant	225	135	110	85

as giving an indication of the implications for the future, if average migration levels were to differ significantly from those assumed in the principal projection.

Effect of migration variants on total population size

The differences between the population in the variant migration projections and the principal projection are summarised in **Table 9.6**. Unlike the fertility and mortality variants, the migration variants are exactly symmetrical with respect to the principal projection, so only one set of figures is shown in the table.

Clearly, if annual net migration was to average 60 thousand more or fewer than assumed in the principal projection, this would lead to 2.2 million more or fewer migrants between 2004 and 2041. However, because migration is concentrated at young adult ages, there is also a significant second generation effect with the different number of migrants changing the number of women of childbearing age and hence the future number of births. Because migrants are predominantly young, the effect on the number of deaths over the next forty years is considerably smaller.

In fact, Table 9.6 shows that the alternative migration assumptions would lead to 2.9 million more or fewer people in the population at 2041 as compared with the principal projection. But even forty years ahead, these alternative assumptions would have little effect on the number of people aged over 70. By the year 2041, the population would be 71.3 million in the high migration variant but only 65.4 million under the low variant assumptions.

An interesting feature of these migration variants is that, although it is assumed that migration will continue to be concentrated at working ages, there is comparatively little effect on long-term dependency ratios. In the principal projection, the 'elderly dependency ratio' (defined as the

Table 9.6

Population differences between variant migration projections and principal projection by age, 2006–2041

United Kingdom thousands

Year	All ages	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70 & over
	Absolute difference between variants and principal projection								
2006	92	7	6	42	21	9	4	2	1
2011	427	56	22	146	120	48	20	11	4
2021	1,203	209	89	200	359	205	83	39	20
2031	2,042	291	242	267	413	441	236	97	54
2041	2,921	363	324	420	480	495	467	244	128

number of persons of state pensionable age per 1,000 persons of working age and allowing for the planned increase in women's state retirement age from 60 to 65 – see **Chapter 3**), would be 420 per 1,000 at the year 2041. But this ratio is not greatly different under the alternative migration assumptions; in the high and low migration variants, the ratios at 2041 are 404 per 1,000 and 438 per 1,000 respectively.

Previous work has shown that any realistic assumption of future migration could only have a very limited effect on population ageing.[5] In contrast, the raising of women's state pension age has a much greater effect. If women's state pension age remained at 60, rather than increasing to 65, the projected elderly dependency ratio at 2041 would be 490 per 1,000 rather than 420 per 1,000.

Relative uncertainties of fertility, mortality and migration

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. Therefore, the indications of uncertainty given above for fertility, mortality and migration are not directly comparable. Nevertheless, it is possible to make some general comments about the relative importance of fluctuations in fertility, mortality and migration for particular users of the projections.

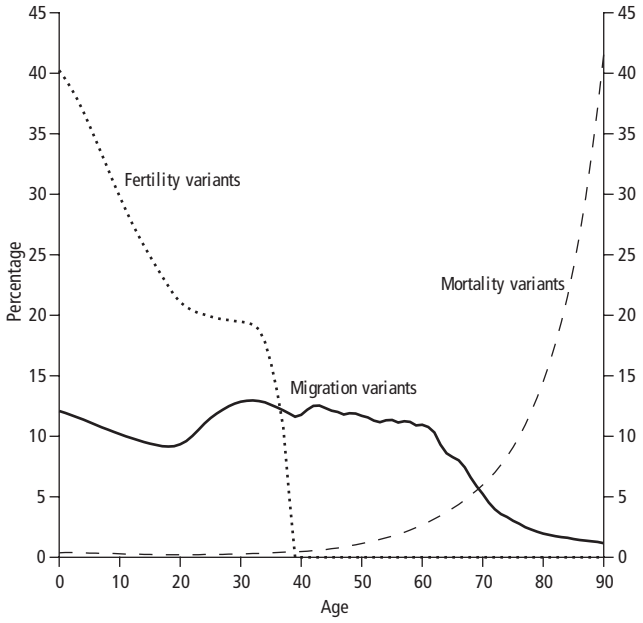
The majority of users of the projections are interested principally in the first twenty years of the projection,[6] over which period possible variations in migration numbers or fertility patterns are likely to have a greater impact on the projected size and age structure of the population than variations in mortality rates. However, for applications concerned primarily with the elderly such as planning health and social care services, interest will centre on variations in mortality. In areas such as long-term social security benefit planning, the effect of both mortality and fertility variants has to be considered, whilst for other applications, such as those concerned with the size of the workforce and the numbers of households, future migration levels are of particular importance.

Figure 9.4 gives an indication of the relative importance of the assumptions regarding fertility, mortality and migration for the population at each age in forty years' time. This graph shows the difference between the population in the high and low variant projections at each age expressed as a percentage of the population in the principal projection. Obviously, the greatest cause of uncertainty at younger ages is fertility. Migration is the most important variable in determining the size of the older working age population in forty years' time, while mortality only begins to become the dominant factor after age 70.

Figure 9.4

Population differences between high and low variants as a percentage of the population in the principal projection by age, 2044

United Kingdom



Combination variants

For particular applications, users may also be interested in projections combining two or more of these alternative scenarios, for example, high fertility *and* low migration. Some key summary statistics from selected combination variants are given in **Table 9.7**. For example, the largest total population size would result from combining the high variant assumptions for fertility, life expectancy and migration. With this combination of assumptions, the population would be about 77.5 million by 2044. However, by combining the low variant assumptions for the three components, the population at 2044 would be only 60.5 million, although this would still be a little larger than the population in 2004.

Similarly, the oldest age structure would occur with a combination of low fertility, high life expectancy and low migration. Over this forty year period, the highest dependency ratios occur given high fertility, high life expectancy and low migration. However, in the long-term, the 'old' and 'young' variants produce the highest and lowest (respectively) overall dependency ratios of all the possible combination variants. For that reason, results from the high and low medium-term

Table 9.7

Measures of population structure under the principal projection and selected variants, 2031 and 2044

United Kingdom

Projection	Total population (000s) (2004=59,835)		Percentage of population aged under 16 (2004=19.5)		Percentage of population aged 65 and over (2004=16.0)		Dependants per 1,000 persons of working age (2004=614)	
	2031	2044	2031	2044	2031	2044	2031	2044
Principal projection	67,013	68,656	17.1	16.3	22.9	24.7	667	696
Standard single component variables								
High fertility (HF)	69,135	72,445	18.6	18.2	22.2	23.4	688	712
High migration (HM)	69,055	71,851	17.3	16.4	22.3	24.0	656	680
High life expectancy (HL)	67,716	70,319	17.0	16.0	23.5	26.2	681	730
Low life expectancy (LL)	66,284	66,923	17.3	16.7	22.2	23.1	654	662
Low migration (LM)	64,971	65,460	17.0	16.2	23.5	25.5	679	715
Low fertility (LF)	65,107	65,310	15.6	14.6	23.6	26.0	644	682
Standard combination variants								
High population size (HP)	71,939	77,447	18.5	17.9	22.3	24.2	690	727
Low population size (LP)	62,395	60,526	15.6	14.8	23.5	25.1	641	664
Old age structure (old)	63,815	63,864	15.3	14.1	24.8	28.4	670	738
Young age structure (young)	70,495	73,991	18.9	18.7	21.0	21.3	664	665
High medium-term dependency ratio	67,740	70,780	18.3	17.7	23.4	25.6	714	764
Low medium-term dependency ratio	66,364	66,640	15.9	15.0	22.3	23.6	619	630
Special case scenarios								
Replacement fertility	70,924	75,557	19.6	19.5	21.6	22.5	701	723
Constant fertility	67,430	69,373	17.4	16.7	22.7	24.5	671	699
No mortality improvement	64,698	64,919	17.7	17.2	20.5	21.0	618	619
Natural change only (zero migration)	61,061	59,171	16.2	15.4	25.3	28.5	710	781
No change	65,114	65,634	18.0	17.6	20.4	20.8	622	622
Stationary	62,284	61,573	19.3	19.7	21.4	21.9	687	712

Note: Where appropriate, the labels used to identify particular variants in the charts in this chapter are given in brackets.

dependency variants are only shown for forty years ahead (that is, to 2044) on the GAD website.

Total population size

Figure 9.5 shows the implications for future population growth under each of the 'single component' 2004-based variant projections. In the principal projection, and all the high variants, the total population of the United Kingdom is projected to continue growing throughout the projection period. But, under the alternative lower assumptions of future fertility, life expectancy or net migration, the UK population would peak in size by the middle of the century.

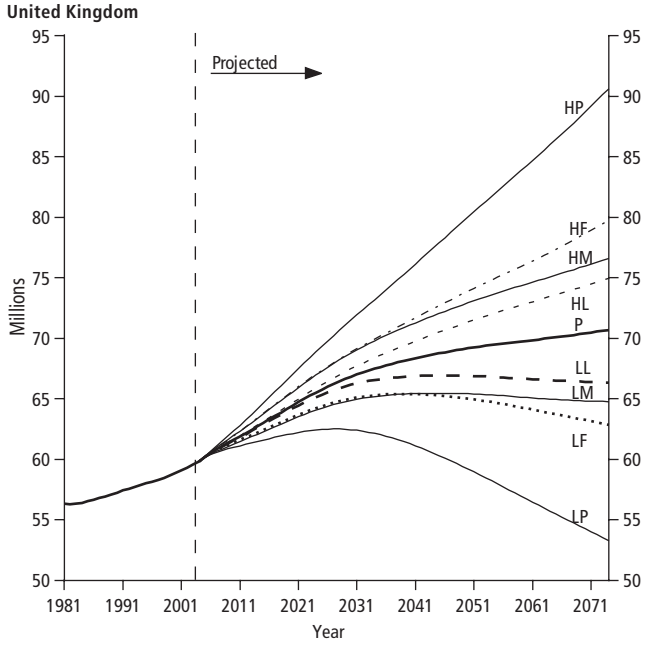
In addition to the single component variants, Figure 9.5 also shows the results of the high and low population combination variants described above which, for practical purposes, can be regarded as giving plausible upper and lower bounds for future total population size. The chart shows that there is considerable uncertainty about the future size of the population and that uncertainty widens appreciably through time.

Population aged 65 and over

Figure 9.6 shows the projected proportion of the population aged 65 and over under various alternative assumptions. In this case, as well as the single component variants, the chart also shows the results of the 'old' and 'young' combination variants. Again, these can effectively be regarded as giving upper and lower bounds for the proportion of older people in the population.

Figure 9.5

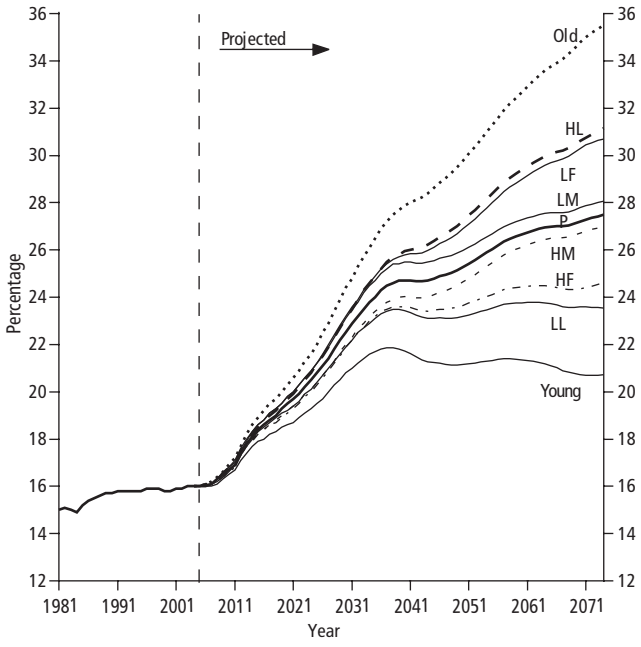
Population of the United Kingdom according to principal and variant 2004-based projections, 1981–2074



LF	Low fertility	HL	High life expectancy
LM	Low migration	HM	High migration
LL	Low life expectancy	HF	High fertility
LP	Low fertility, low migration and low life expectancy	HP	High fertility, high migration and high life expectancy
P	Principal projection		

Figure 9.6

Actual and projected percentage of the population aged 65 and over, 1981–2074



Old	Low fertility, high life expectancy and low migration	HM	High migration
		LL	Low life expectancy
LF	Low fertility	HF	High fertility
HL	High Life expectancy	Young	High fertility, low life expectancy and high migration
LM	Low migration		
P	Principal projection		

The chart shows that population ageing will occur under any plausible set of future assumptions. In 2004, some 16 per cent of the population were aged 65 and over. This is projected to rise steadily to around 31 per cent by 2074 in either the low fertility or high life expectancy variants. Higher fertility or lower life expectancy levels would significantly reduce population ageing, but there would still be increases to around 24 per cent. Even in the 'extreme' young variant projection, the proportion would increase to nearly 22 per cent by the late 2030s.

Variant projections for individual countries

2004-based variant projections are also available for the individual countries of the UK. **Figure 9.7** shows the projected total population of each country to 2044 under each of the single component variants and the high and low population combination variants, that is, equivalent to **Figure 9.5** above for the UK. Results to 2074 are available on the GAD website, as are individual country versions of **Figure 9.6**.

Special case scenarios

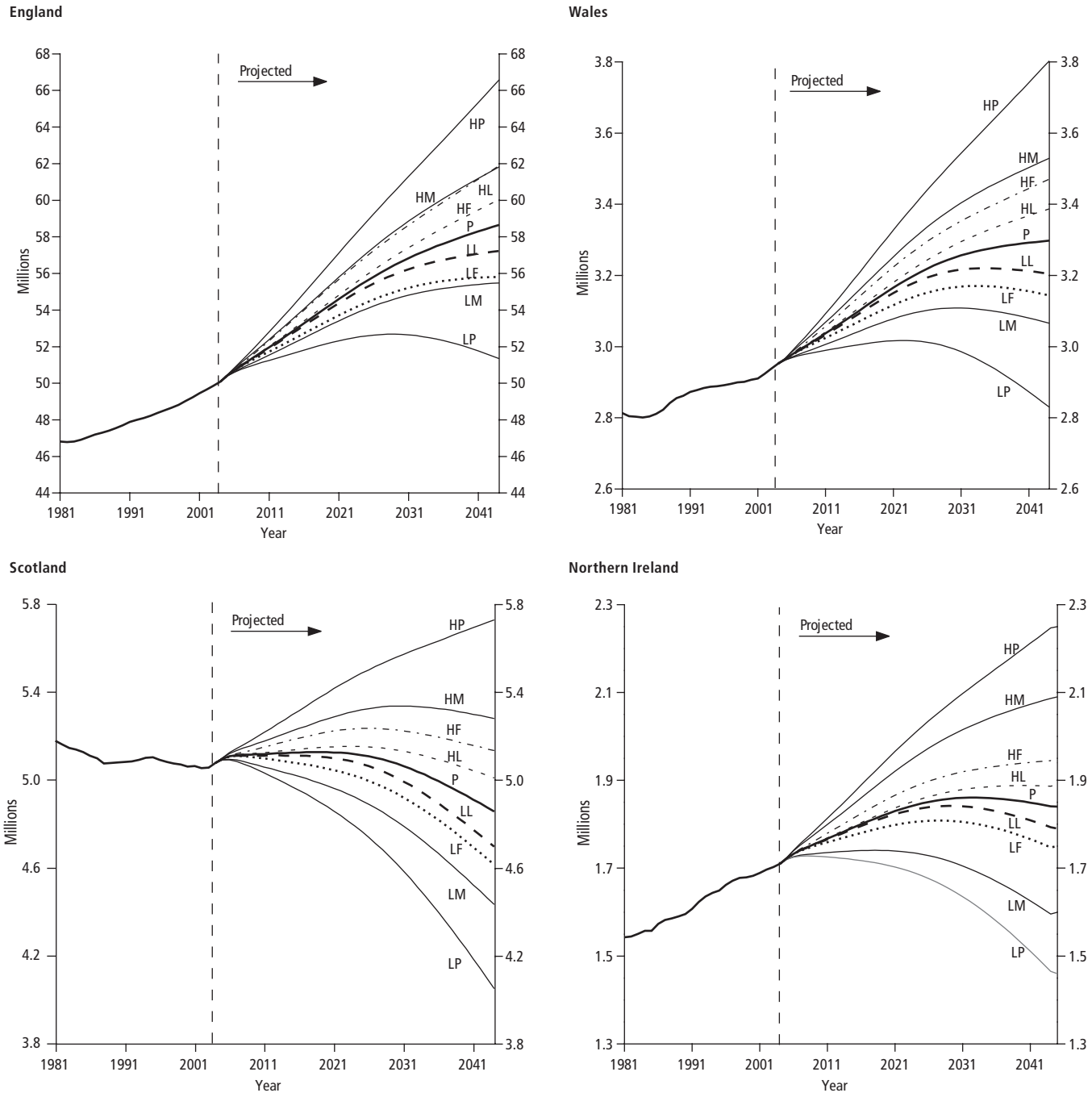
It is also sometimes useful to prepare special case scenarios, or 'what if' projections, to illustrate the consequences of a particular, but not necessarily realistic, set of assumptions. The following four sets of special case assumptions have been prepared:

- replacement fertility
- constant fertility
- no mortality improvement
- natural change only (zero migration)

A constant mortality improvement variant was carried out for the 2000-based and 2002-based variants but has not been produced for the 2004-based projections. In the 2002-based projections, this variant was identical to the standard high life expectancy variant until the 25th year of the projection, that is, 2027. Thereafter, they differed as the 2002-based high life

Figure 9.7

Population of the constituent countries of the United Kingdom according to principal and variant 2004-based projections, 1981–2044



LF	Low fertility	HL	High life expectancy
LM	Low migration	HM	High migration
LL	Low life expectancy	HF	High fertility
LP	Low fertility, low migration and low life expectancy	HP	High fertility, high migration and high life expectancy
P	Principal projection		

expectancy variant assumed a gradual reduction in mortality rate improvements beyond 2027. However, the 2004-based high life expectancy variant assumes that mortality rates will continue to improve at a constant rate beyond the 25th year of the projection (now 2029). This means that if the same approach was used for the constant mortality improvement variant now, it would be identical to the high life expectancy variant throughout the projection period.

Four corresponding projections have been prepared. Finally, a further two special case projections, based on combinations of these assumptions, have also been prepared:

- no change projection (constant fertility, no mortality improvement, principal migration)
- stationary projection (replacement fertility, no mortality improvement, zero migration)

Key indicators from these special case scenarios are included in **Table 9.7**. As with the single component and combination variants discussed above, all variants are available at UK or individual country level.

Further details

Full details of all the variants discussed in this chapter are available on the GAD website.[7] The current range of variant projections was introduced for the 2000-based projections and fully described at that time.[8]

References

1 Shaw C (1994) Accuracy and uncertainty of national population projections for the United Kingdom. *Population Trends* **77**, pp 24–32.

2 *Population in Europe 2004: First Results*. Statistics In Focus 15/2005 (2005). Available at epp.eurostat.cec.eu.int/portal/page?_pageid=1073,46587259&_dad=portal&_schema=PORTAL&p_product_code=KS-NK-05-015

3 Office for National Statistics (2005) *Excess winter deaths*. ONS News Release (October 2005). Available at www.statistics.gov.uk/statbase/Product.asp?vlnk=10805&More=n

4 Office for National Statistics (2006) *International migration 2004*. Series MN no. 31. See www.statistics.gov.uk/statbase/Product.asp?vlnk=507

5 Shaw C (2001) United Kingdom population trends in the 21st century. *Population Trends* **103**, pp 37–46.

6 Joshi H and Diamond I (1990) Demographic projections: who needs to know? From *Population projections: trends, methods and uses*. OPCS Occasional Paper 38. Papers of the Annual Conference of the British Society for Population Studies. OPCS: London.

7 See www.gad.gov.uk/Population/index.asp?v=Variant&y=2004&subYear=Continue

8 Shaw C (2002) 2000-based variant population projections. *Population Trends* **109**, pp 15–26.

10 Methodology

The cohort component method

The projections are made for successive years running from one mid-year to the next using the cohort component method.[1] 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 the 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 migrants to be added to obtain the population aged x+1 at the end of the projection year therefore consists of half of 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 q_x.

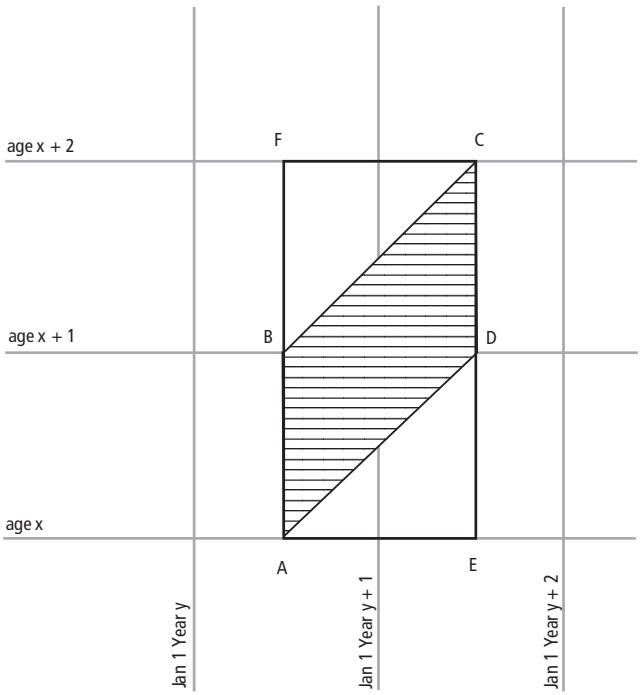
The number of births in the year are calculated by multiplying the average number of women at each single year of age during the year (taken as the mean of the populations at that age at the beginning and end of the year) by the fertility rate applicable to them during that year. The total number of 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 applying a special 'infant mortality rate' (indicated by 'birth' in the mortality rate tables found on the GAD website) to the projected number of births, and adding half the number of net migrants aged 0 last birthday. This special mortality rate is equivalent to about 85 per cent of the conventional full first year of life infant mortality rate used in official statistics.

The projections are computed for each of the component countries of the United Kingdom and the results are added together to produce projections for England & Wales, Great Britain and the United Kingdom.

Figure 10.1

Lexis diagram to illustrate the methodology of the projections



Lexis diagram

The projection process can be illustrated by means of a Lexis diagram (see **Figure 10.1**). In a Lexis diagram, age is represented on the vertical axis and time on the horizontal axis, and the life of an individual (or of a birth cohort), is represented by a diagonal line (or parallelogram) running from bottom left to top right.

So, in Figure 10.1, the line AB represents the population aged x at mid-year y. The size of this cohort one year ahead, that is, aged x+1 at mid-year y+1, is represented by the line DC. To calculate this population one year ahead (for $x \geq 0$), it is necessary to project deaths and net migration occurring to this cohort between mid-year y and mid-year y+1. The relevant interval of time for this cohort is represented by the shaded parallelogram ABCD.

Full details of the net migration assumptions are given on the GAD website. This gives the assumed number of migrants

between one mid-year and the next by age at the time of migration. The net number of migrants aged x between mid-year y and mid-year *y*+1 is represented by the square ABDE in the Lexis diagram. Similarly, the net number of migrants aged *x*+1 between mid-year y and mid-year *y*+1 is represented by the square BFCD.

As noted above, it can be assumed for computing purposes 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. Thus, of net migrants aged x between mid-year y and mid-year *y*+1, it can be assumed that half add to the population represented by the line AB in the diagram and the other half to the population represented by the line ED. Similarly, of the migrants aged x+1 in this period, half can be added to the population denoted by the line BF and half to the population represented by the line DC. Net migration in the parallelogram ABCD is therefore obtained by adding half of the net migrants aged x (that is, those adding to the population AB) and half of those aged x+1 (that is, those adding to the population DC) in this interval.

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 q_x. This produces, directly, the number of deaths in the parallelogram ABCD.

Finally, there is the special case of projecting the number of infants aged 0 at mid-year y+1. This is obtained as described above. So if *x*=0 in Figure 10.1, the required population is represented by the line ED and it is therefore necessary to project births, deaths and net migration in the triangle represented by ADE.

The relationship between m_x and q_x

The mortality rate q_x is known as the initial mortality rate, or the probability of dying. These are the mortality rates given, for each individual age, on the GAD website. In other statistical publications, and in **Chapter 8** of this volume, mortality rates are often shown as central death rates (m_x). These are obtained by dividing the number of deaths during a year at a given age by the average population at that age during the year (usually taken to be the population at the midpoint of the year). The relationship between q_x and m_x is shown by the following equation:

$$q_x = \frac{m_x}{1 + 0.5m_x}$$

Note that this equation is an approximation as it assumes deaths occur evenly between exact age *x* and exact age *x*+1. It does not hold for infant mortality, as infant deaths are concentrated in the first few months of life.

The q_x rates used in the projections are the results of two interpolations. The first interpolation takes place between the q_x rates for adjacent calendar years and produces rates on a mid-year to mid-year basis. The second interpolation is between adjacent ages and gives a set of q_x rates that, in life table terms, relate to exact age *x*+½ on a mid-year basis. These are assumed to be applicable to the mid-year population at age last birthday.

References

1 For a good introduction to projections methodology see Chapters 16 to 18 of Hinde A (1998) Demographic Methods, Arnold: London.

11 Data availability

Website

Detailed results of the 2004-based population projections for the United Kingdom and its constituent countries are available on the GAD website (at www.gad.gov.uk/Population/index.asp ?dp=Current+projections&subYear=Proceed). The results include the principal and variant projections for each country, and a summary of the assumptions on which they are based. The key datasets can be downloaded in Microsoft Excel 5.0 format along with a set of graphs depicting the results for each country.

For each projection, the following Excel datasets can be downloaded:

- components of change, summary age distributions and dependency ratios
- populations in five-year age groups
- populations by individual age (to age 90)
- fertility rates by individual age
- fertility rates in five-year age groups
- mortality rates by individual age
- net migration by individual age

The projected population numbers are shown in thousands but stored to three decimal places (that is, to unit level). This does not, of course, imply that the projections are accurate to that level of detail. *Results should always be presented in thousands*.

Further information

In addition to the standard projection output listed above, the following further details are available on request from the Office for National Statistics:

- births by age of mother
- deaths by age
- population at individual ages over 90
- life table data for future years

12 Historic projections database

Background

The Government Actuary's Department became responsible for the production of the official UK national projections in 1954. Projections were produced every year from 1955 until the 1979-based set. They were then produced every second year until the 1991-based set. There was then a 1992-based set, since when 'full' projections have again been produced every second year until the 2004-based set. In the intervening year between full projections, 'interim' sets of national projections may be produced. An interim set of 2001-based projections was produced shortly after the publication of the first results from the 2001 Census and an interim set of 2003-based projections was published in 2004 following significant revisions to the starting population on which they were based.

All national projections since the 1998-based set were made available online on the GAD website at the time of their publication. In January 2006, the database of past national projections was extended back to the 1971-based set.[1]

Content of database

The database provides detailed information on most national population projections produced since the introduction of the PP2 Series of reference volumes. This series began with the volume for the 1970-based projections which was published in 1971.

The earliest projections contained in the database are the 1971-based set. It then includes the projections made at two yearly intervals up to the 1991-based set, followed by the 1992-based and all subsequent sets. Apart from the 1971-based set (see below), the database contains projections for both the United Kingdom as a whole and for the four constituent countries. For the 1998-based set onwards, projections at Great Britain and England & Wales (combined) level are also included. For the 2000-based set onwards, variant projections are provided as well as the principal (central) projections.

For all projections up to the 1998-based set, the database gives projected populations by five year age group as well as components of change and summary indicators such as total fertility rates and (period) life expectancy. These older projections are presented in the same format as has been used for more recent projections, which were made available online at the time of their publication. In addition, the 2000-based and later sets also include more detailed results which are not available for earlier projections.

Sources of information

The historic database has been created from a variety of sources. Electronic records were available back to the 1987-based projections. For the 1979-based to 1985-based projections, the detailed results were available on microfiche. Prior to the 1979-based projections, the only sources were the PP2 Reference Volumes and some surviving paper records held by GAD.

The presentation of the national projections results has, of course, developed since 1970. As far as possible, the past projections have been recreated in the same format as they are presented today. However, especially for the earliest projections, this presented some difficulties. The main points to note are:

Populations of working age and pensionable age and associated dependency ratios

These figures are available from the 'Components of change and summary indicators' tables.

The Pensions Act 1995 announced a change in state pension age from 65 for men and 60 for women as at present, to 65 for both sexes. This change is to be phased in between 2010 and 2020. For all projections from the 1996-based set onwards, the projected working age and pensionable age populations (and the dependency ratios calculated from them) allow for this change.[2] However, for all projections up to and including the 1994-based set, the future working age and pensionable age populations were calculated using a constant state pension age of 65 for males and 60 for females.

So, from 2010 onwards, the projected working age and pensionable ages populations, and the dependency ratios derived from them, are not directly comparable for the projections made before and since the 1996-based set.

Mean and median age

These figures are available from the 'Components of change and summary indicators' tables. Mean and median age figures were not published prior to the 1996-based projections. They

have now been calculated for earlier projections. However, it was not possible to calculate mean age projections before the 1987-based set.

1973-based projections

For this set of projections only, age distributions and statistics derived from them (for example median age and dependency ratios) were only available for each year up to 1986 and then for every fifth year up to 2011, and also 2013. However, annual population totals and full components of population change data are provided.

1971-based projections

In the 1971-based projections, separate projections were not published for England and Wales individually. Therefore, for this set of projections, the database includes results for England & Wales (combined) as well as for Scotland and Northern Ireland and the United Kingdom as a whole.

Expectations of life and total fertility rates

These figures are available from the 'Components of change and summary indicators' tables.

The summary indicators of (period) expectation of life at birth and total fertility rate were not routinely published in the oldest projections. Figures for expectation of life at ages 50, 65 and 80 were first published for the 1996-based projections. It has been possible to derive all of the missing figures for earlier projections from the available information on fertility and mortality rates. However, prior to the 1987-based projections (for mortality) and the 1983-based projections (for fertility), there is no complete information on the assumed fertility or mortality rates and the summary indicators have been calculated using approximate methods. GAD is confident that any errors in recreating these indicators in the older projections will be very minor.

Accuracy of data

Source data has been used in the most accurate form available but in some instances this was in a rounded format. These rounded figures necessarily had to be used to calculate some of the missing derived statistics. In the spreadsheet tables, population numbers are displayed rounded to the nearest thousand, while some derived statistics are displayed rounded to one or two decimal places. GAD is confident that there are no significant errors in the data at the level at which they are displayed. However, for ease of production of the tables and for the convenience of users, figures are often stored in the spreadsheets to more decimal places than they are displayed. In some cases, they will not be accurate to this extra level of precision.

Pre 1970-based projections

In the course of preparing this database some limited summary information was found on the earliest official projections produced by GAD. It is hoped that additions to the database on these projections can be made later in 2006.

Further information

For any enquiries about the historical projections database, please contact natpopproj@ons.gsi.gov.uk

References

1 See www.gad.gov.uk/Population/Index.asp?dp=Past+projections&subYear=Proceed for access to data

2 See www.gad.gov.uk/Population/2004/methodology/pensionage.htm for details

Appendices

Appendix I

Age and sex structure of the projected population, 2004–2074

(a) United Kingdom

Age	Sex	2004 (base)	2006	2011	2016	2021	2026	2031	2036	2041
All ages	**Persons**	**59,835**	**60,533**	**61,892**	**63,304**	**64,727**	**66,002**	**67,013**	**67,766**	**68,353**
	Males	**29,271**	**29,668**	**30,438**	**31,205**	**31,943**	**32,579**	**33,074**	**33,448**	**33,752**
	Females	**30,564**	**30,864**	**31,454**	**32,099**	**32,784**	**33,423**	**33,939**	**34,318**	**34,602**
0 – 4	Males	1,736	1,777	1,785	1,810	1,842	1,835	1,800	1,775	1,781
	Females	1,653	1,694	1,707	1,730	1,761	1,754	1,720	1,697	1,702
5 – 9	Males	1,848	1,792	1,780	1,789	1,813	1,845	1,839	1,803	1,779
	Females	1,760	1,712	1,708	1,721	1,743	1,774	1,767	1,734	1,711
10 – 14	Males	1,985	1,928	1,802	1,790	1,799	1,824	1,856	1,849	1,814
	Females	1,885	1,829	1,716	1,712	1,725	1,748	1,779	1,772	1,738
15 – 19	Males	2,017	2,052	1,970	1,845	1,833	1,842	1,867	1,899	1,892
	Females	1,904	1,935	1,853	1,740	1,736	1,749	1,772	1,802	1,796
20 – 24	Males	1,916	2,017	2,175	2,094	1,969	1,958	1,967	1,992	2,024
	Females	1,884	1,949	2,066	1,983	1,870	1,867	1,880	1,903	1,934
25 – 29	Males	1,832	1,921	2,111	2,265	2,184	2,060	2,050	2,059	2,084
	Females	1,826	1,920	2,076	2,189	2,107	1,994	1,991	2,004	2,027
30 – 34	Males	2,122	2,003	1,962	2,149	2,303	2,223	2,100	2,090	2,099
	Females	2,157	2,018	1,974	2,128	2,240	2,158	2,046	2,043	2,056
35 – 39	Males	2,326	2,284	2,016	1,975	2,162	2,315	2,236	2,114	2,104
	Females	2,365	2,321	2,042	1,997	2,151	2,263	2,182	2,070	2,068
40 – 44	Males	2,227	2,312	2,277	2,011	1,971	2,157	2,310	2,233	2,112
	Females	2,275	2,361	2,316	2,039	1,995	2,148	2,261	2,180	2,069
45 – 49	Males	1,952	2,055	2,287	2,253	1,991	1,953	2,138	2,291	2,215
	Females	1,992	2,096	2,343	2,299	2,024	1,981	2,134	2,247	2,167
50 – 54	Males	1,828	1,823	2,014	2,242	2,210	1,955	1,919	2,103	2,254
	Females	1,868	1,868	2,069	2,314	2,271	2,000	1,959	2,112	2,224
55 – 59	Males	1,915	1,929	1,768	1,954	2,179	2,150	1,903	1,871	2,053
	Females	1,964	1,985	1,829	2,028	2,270	2,229	1,964	1,926	2,077
60 – 64	Males	1,476	1,585	1,830	1,682	1,863	2,083	2,059	1,823	1,796
	Females	1,545	1,661	1,926	1,779	1,974	2,213	2,176	1,918	1,883
65 – 69	Males	1,297	1,303	1,480	1,718	1,585	1,761	1,974	1,956	1,737
	Females	1,397	1,401	1,586	1,845	1,709	1,901	2,134	2,102	1,855
70 – 74	Males	1,077	1,094	1,173	1,347	1,573	1,459	1,628	1,832	1,821
	Females	1,262	1,254	1,312	1,494	1,743	1,621	1,808	2,035	2,008
75 – 79	Males	828	850	912	1,003	1,167	1,372	1,283	1,441	1,632
	Females	1,107	1,110	1,110	1,182	1,358	1,591	1,489	1,667	1,884
80 – 84	Males	566	566	621	698	789	934	1,106	1,048	1,190
	Females	934	895	888	918	1,002	1,166	1,373	1,296	1,462
85 – 89	Males	224	272	335	391	462	537	651	778	753
	Females	478	543	592	613	664	748	888	1,053	1,011
90 and over	Males	99	105	140	190	247	315	389	490	612
	Females	310	314	341	390	441	517	617	758	930
0 – 15	Males	5,970	5,906	5,744	5,733	5,821	5,866	5,864	5,801	5,743
	Females	5,676	5,622	5,487	5,491	5,578	5,621	5,619	5,559	5,503
16 – 29	Males	5,365	5,579	5,880	5,859	5,620	5,499	5,514	5,576	5,631
	Females	5,234	5,416	5,639	5,584	5,364	5,265	5,290	5,353	5,405
30 – 44	Males	6,675	6,598	6,255	6,136	6,436	6,695	6,646	6,436	6,315
	Females	6,796	6,700	6,332	6,163	6,386	6,570	6,489	6,294	6,193
45 – 59	Males	5,694	5,808	6,068	6,449	6,380	6,058	5,960	6,264	6,522
	Females	5,823	5,949	6,241	6,640	6,564	6,210	6,057	6,284	6,469
60 – 74	Males	3,850	3,982	4,483	4,746	5,021	5,303	5,661	5,612	5,354
	Females	4,204	4,315	4,824	5,118	5,427	5,735	6,118	6,054	5,746
75 and over	Males	1,717	1,795	2,008	2,282	2,664	3,158	3,429	3,758	4,186
	Females	2,830	2,861	2,931	3,103	3,465	4,022	4,366	4,774	5,286

thousands

2044	2046	2051	2056	2061	2066	2071	2074	Sex	Age
68,656	**68,842**	**69,252**	**69,580**	**69,858**	**70,148**	**70,481**	**70,691**	**Persons**	**All ages**
33,914	**34,015**	**34,246**	**34,446**	**34,628**	**34,812**	**35,007**	**35,124**	**Males**	
34,742	**34,827**	**35,006**	**35,134**	**35,231**	**35,336**	**35,474**	**35,567**	**Females**	
1,789	1,795	1,803	1,800	1,789	1,779	1,778	1,780	Males	0 – 4
1,710	1,715	1,723	1,720	1,710	1,700	1,699	1,701	Females	
1,780	1,784	1,798	1,806	1,804	1,793	1,783	1,781	Males	5 – 9
1,712	1,716	1,729	1,737	1,734	1,724	1,714	1,712	Females	
1,795	1,790	1,795	1,809	1,817	1,815	1,804	1,797	Males	10 – 14
1,721	1,715	1,720	1,733	1,741	1,739	1,728	1,722	Females	
1,873	1,857	1,833	1,839	1,853	1,861	1,858	1,852	Males	15 – 19
1,777	1,762	1,739	1,744	1,758	1,765	1,763	1,757	Females	
2,025	2,018	1,983	1,959	1,964	1,979	1,987	1,987	Males	20 – 24
1,934	1,927	1,894	1,871	1,876	1,889	1,897	1,897	Females	
2,107	2,117	2,110	2,075	2,052	2,057	2,072	2,078	Males	25 – 29
2,049	2,058	2,051	2,018	1,995	2,000	2,014	2,020	Females	
2,109	2,124	2,157	2,151	2,117	2,093	2,099	2,108	Males	30 – 34
2,065	2,079	2,110	2,104	2,071	2,048	2,053	2,061	Females	
2,128	2,114	2,140	2,173	2,167	2,133	2,110	2,112	Males	35 – 39
2,094	2,081	2,104	2,135	2,129	2,096	2,074	2,075	Females	
2,063	2,103	2,113	2,139	2,173	2,167	2,134	2,117	Males	40 – 44
2,026	2,067	2,080	2,104	2,135	2,129	2,096	2,079	Females	
2,150	2,096	2,088	2,099	2,125	2,159	2,155	2,137	Males	45 – 49
2,105	2,057	2,056	2,069	2,093	2,125	2,120	2,101	Females	
2,235	2,181	2,065	2,059	2,071	2,098	2,133	2,136	Males	50 – 54
2,199	2,146	2,038	2,037	2,052	2,076	2,108	2,110	Females	
2,176	2,203	2,133	2,021	2,017	2,031	2,060	2,085	Males	55 – 59
2,167	2,190	2,114	2,008	2,009	2,024	2,050	2,073	Females	
1,906	1,975	2,124	2,059	1,953	1,952	1,968	1,980	Males	60 – 64
1,996	2,034	2,146	2,073	1,972	1,974	1,991	2,001	Females	
1,651	1,715	1,891	2,038	1,979	1,880	1,883	1,910	Males	65 – 69
1,748	1,825	1,974	2,085	2,017	1,920	1,925	1,953	Females	
1,719	1,622	1,609	1,779	1,922	1,872	1,783	1,752	Males	70 – 74
1,897	1,776	1,752	1,899	2,010	1,947	1,857	1,825	Females	
1,654	1,631	1,459	1,457	1,619	1,757	1,717	1,679	Males	75 – 79
1,895	1,866	1,655	1,641	1,783	1,893	1,839	1,795	Females	
1,299	1,359	1,369	1,235	1,246	1,395	1,523	1,526	Males	80 – 84
1,594	1,662	1,655	1,477	1,475	1,610	1,717	1,710	Females	
814	870	1,008	1,029	940	965	1,093	1,177	Males	85 – 89
1,086	1,155	1,327	1,334	1,201	1,217	1,339	1,414	Females	
640	662	768	919	1,020	1,026	1,067	1,132	Males	90 and over
968	996	1,138	1,344	1,471	1,458	1,489	1,560	Females	
5,729	5,730	5,756	5,777	5,775	5,752	5,728	5,721	Males	0 – 15
5,490	5,491	5,515	5,535	5,533	5,511	5,489	5,481	Females	
5,640	5,630	5,566	5,511	5,504	5,531	5,553	5,554	Males	16 – 29
5,413	5,402	5,341	5,288	5,281	5,307	5,327	5,328	Females	
6,300	6,341	6,410	6,463	6,456	6,394	6,343	6,336	Males	30 – 44
6,185	6,227	6,295	6,343	6,335	6,273	6,223	6,216	Females	
6,561	6,480	6,286	6,179	6,214	6,289	6,348	6,357	Males	45 – 59
6,472	6,393	6,208	6,115	6,154	6,225	6,277	6,284	Females	
5,276	5,313	5,624	5,876	5,854	5,704	5,634	5,642	Males	60 – 74
5,641	5,635	5,872	6,058	5,999	5,842	5,773	5,779	Females	
4,408	4,521	4,604	4,640	4,825	5,142	5,401	5,514	Males	75 and over
5,543	5,679	5,775	5,796	5,930	6,178	6,385	6,479	Females	

Appendix I

Age and sex structure of the projected population, 2004–2074

(b) Great Britain

Age	Sex	2004 (base)	2006	2011	2016	2021	2026	2031	2036	2041
All ages	**Persons**	**58,125**	**58,800**	**60,124**	**61,504**	**62,897**	**64,151**	**65,153**	**65,908**	**66,504**
	Males	**28,434**	**28,820**	**29,571**	**30,320**	**31,042**	**31,668**	**32,160**	**32,535**	**32,843**
	Females	**29,690**	**29,980**	**30,554**	**31,184**	**31,855**	**32,483**	**32,993**	**33,373**	**33,660**
0 – 4	Males	1,680	1,721	1,731	1,755	1,787	1,782	1,749	1,727	1,734
	Females	1,600	1,641	1,655	1,677	1,708	1,703	1,672	1,651	1,657
5 – 9	Males	1,786	1,732	1,724	1,734	1,758	1,790	1,785	1,753	1,731
	Females	1,702	1,655	1,654	1,668	1,690	1,721	1,716	1,685	1,664
10 – 14	Males	1,920	1,864	1,742	1,734	1,744	1,768	1,800	1,796	1,763
	Females	1,822	1,769	1,659	1,658	1,672	1,695	1,725	1,720	1,689
15 – 19	Males	1,949	1,984	1,907	1,785	1,777	1,787	1,812	1,844	1,839
	Females	1,839	1,871	1,793	1,684	1,683	1,697	1,719	1,750	1,745
20 – 24	Males	1,857	1,953	2,108	2,031	1,910	1,903	1,913	1,937	1,970
	Females	1,826	1,887	2,004	1,927	1,818	1,817	1,831	1,853	1,884
25 – 29	Males	1,779	1,866	2,048	2,199	2,123	2,002	1,995	2,006	2,030
	Females	1,772	1,865	2,014	2,127	2,049	1,941	1,940	1,954	1,977
30 – 34	Males	2,063	1,946	1,908	2,087	2,238	2,162	2,043	2,036	2,047
	Females	2,095	1,959	1,918	2,064	2,177	2,100	1,992	1,991	2,005
35 – 39	Males	2,262	2,221	1,959	1,921	2,099	2,250	2,175	2,057	2,051
	Females	2,298	2,255	1,982	1,941	2,087	2,200	2,123	2,015	2,015
40 – 44	Males	2,165	2,249	2,215	1,956	1,918	2,096	2,246	2,173	2,055
	Females	2,211	2,295	2,251	1,979	1,939	2,085	2,198	2,122	2,015
45 – 49	Males	1,897	1,998	2,225	2,192	1,937	1,901	2,078	2,228	2,156
	Females	1,936	2,036	2,278	2,234	1,965	1,926	2,072	2,184	2,109
50 – 54	Males	1,778	1,772	1,958	2,181	2,150	1,901	1,868	2,043	2,192
	Females	1,818	1,817	2,010	2,249	2,207	1,942	1,904	2,049	2,162
55 – 59	Males	1,868	1,882	1,718	1,900	2,120	2,092	1,851	1,821	1,994
	Females	1,915	1,936	1,779	1,970	2,206	2,166	1,906	1,871	2,016
60 – 64	Males	1,437	1,543	1,785	1,634	1,811	2,026	2,003	1,773	1,748
	Females	1,503	1,616	1,878	1,730	1,918	2,151	2,114	1,862	1,830
65 – 69	Males	1,265	1,270	1,440	1,676	1,540	1,712	1,920	1,903	1,688
	Females	1,361	1,364	1,543	1,799	1,662	1,846	2,074	2,042	1,801
70 – 74	Males	1,051	1,067	1,143	1,311	1,534	1,418	1,582	1,782	1,772
	Females	1,229	1,221	1,277	1,454	1,700	1,577	1,756	1,977	1,951
75 – 79	Males	808	830	889	977	1,136	1,338	1,247	1,401	1,587
	Females	1,078	1,081	1,081	1,151	1,321	1,552	1,448	1,619	1,831
80 – 84	Males	554	554	607	681	769	909	1,079	1,019	1,157
	Females	913	873	866	895	975	1,135	1,339	1,261	1,420
85 – 89	Males	219	266	327	382	450	524	634	759	732
	Females	467	531	577	597	647	728	864	1,027	983
90 and over	Males	97	103	137	186	241	308	380	478	597
	Females	304	308	334	381	431	505	601	738	907
0 – 15	Males	5,773	5,713	5,560	5,555	5,644	5,691	5,694	5,638	5,586
	Females	5,490	5,439	5,312	5,321	5,408	5,453	5,455	5,402	5,352
16 – 29	Males	5,198	5,405	5,698	5,682	5,455	5,341	5,361	5,424	5,480
	Females	5,071	5,248	5,468	5,420	5,211	5,120	5,148	5,211	5,264
30 – 44	Males	6,490	6,415	6,083	5,963	6,255	6,508	6,464	6,266	6,153
	Females	6,604	6,510	6,151	5,984	6,203	6,385	6,313	6,128	6,035
45 – 59	Males	5,544	5,652	5,901	6,273	6,207	5,894	5,796	6,091	6,343
	Females	5,669	5,789	6,067	6,453	6,378	6,033	5,882	6,105	6,287
60 – 74	Males	3,752	3,880	4,368	4,620	4,885	5,156	5,505	5,458	5,208
	Females	4,093	4,201	4,699	4,983	5,279	5,573	5,944	5,881	5,582
75 and over	Males	1,678	1,754	1,960	2,226	2,597	3,079	3,339	3,657	4,073
	Females	2,763	2,792	2,857	3,023	3,374	3,919	4,252	4,645	5,141

thousands

2044	2046	2051	2056	2061	2066	2071	2074	Sex	Age
66,815	**67,007**	**67,437**	**67,791**	**68,099**	**68,420**	**68,786**	**69,015**	**Persons**	**All ages**
33,010	**33,115**	**33,356**	**33,567**	**33,762**	**33,961**	**34,171**	**34,297**	**Males**	
33,805	**33,893**	**34,082**	**34,224**	**34,337**	**34,459**	**34,614**	**34,718**	**Females**	
1,742	1,748	1,757	1,755	1,746	1,738	1,738	1,740	Males	0 – 4
1,665	1,670	1,679	1,677	1,669	1,661	1,660	1,663	Females	
1,732	1,737	1,752	1,760	1,759	1,750	1,742	1,740	Males	5 – 9
1,666	1,670	1,684	1,692	1,691	1,682	1,674	1,673	Females	
1,746	1,741	1,748	1,762	1,771	1,770	1,760	1,755	Males	10 – 14
1,673	1,668	1,675	1,688	1,697	1,695	1,687	1,681	Females	
1,821	1,807	1,785	1,791	1,806	1,815	1,813	1,808	Males	15 – 19
1,728	1,714	1,693	1,700	1,713	1,722	1,720	1,716	Females	
1,972	1,965	1,933	1,911	1,918	1,933	1,942	1,942	Males	20 – 24
1,886	1,879	1,849	1,828	1,834	1,848	1,856	1,857	Females	
2,053	2,063	2,058	2,027	2,005	2,012	2,027	2,033	Males	25 – 29
1,998	2,007	2,003	1,972	1,951	1,958	1,971	1,978	Females	
2,056	2,072	2,104	2,100	2,069	2,047	2,054	2,063	Males	30 – 34
2,014	2,028	2,059	2,055	2,024	2,003	2,010	2,018	Females	
2,075	2,062	2,087	2,120	2,116	2,085	2,064	2,067	Males	35 – 39
2,042	2,029	2,052	2,083	2,079	2,049	2,028	2,030	Females	
2,010	2,050	2,062	2,087	2,121	2,117	2,087	2,071	Males	40 – 44
1,974	2,015	2,029	2,052	2,083	2,079	2,049	2,034	Females	
2,093	2,040	2,036	2,048	2,074	2,108	2,106	2,089	Males	45 – 49
2,049	2,003	2,004	2,019	2,042	2,074	2,070	2,054	Females	
2,175	2,123	2,010	2,007	2,021	2,048	2,082	2,086	Males	50 – 54
2,140	2,088	1,984	1,986	2,001	2,025	2,057	2,060	Females	
2,115	2,143	2,077	1,968	1,967	1,982	2,010	2,035	Males	55 – 59
2,104	2,128	2,057	1,955	1,958	1,974	1,999	2,022	Females	
1,853	1,919	2,065	2,004	1,901	1,903	1,920	1,933	Males	60 – 64
1,938	1,974	2,086	2,017	1,919	1,924	1,941	1,952	Females	
1,606	1,669	1,837	1,981	1,926	1,830	1,836	1,863	Males	65 – 69
1,697	1,773	1,915	2,027	1,963	1,869	1,876	1,904	Females	
1,672	1,577	1,565	1,728	1,869	1,822	1,736	1,707	Males	70 – 74
1,842	1,724	1,702	1,842	1,953	1,895	1,808	1,777	Females	
1,610	1,586	1,419	1,418	1,573	1,708	1,672	1,634	Males	75 – 79
1,842	1,813	1,607	1,594	1,730	1,840	1,789	1,747	Females	
1,263	1,322	1,332	1,201	1,213	1,355	1,481	1,485	Males	80 – 84
1,548	1,615	1,608	1,433	1,433	1,562	1,669	1,663	Females	
791	846	981	1,001	914	939	1,062	1,144	Males	85 – 89
1,055	1,122	1,290	1,297	1,166	1,182	1,300	1,373	Females	
624	645	748	895	994	999	1,040	1,102	Males	90 and over
943	971	1,107	1,308	1,431	1,417	1,448	1,516	Females	
5,575	5,578	5,606	5,630	5,631	5,614	5,595	5,590	Males	0 – 15
5,342	5,344	5,371	5,394	5,395	5,378	5,360	5,355	Females	
5,491	5,483	5,426	5,377	5,373	5,403	5,426	5,429	Males	16 – 29
5,274	5,266	5,211	5,163	5,160	5,187	5,209	5,212	Females	
6,141	6,184	6,253	6,307	6,305	6,250	6,205	6,201	Males	30 – 44
6,030	6,072	6,141	6,190	6,187	6,132	6,088	6,082	Females	
6,383	6,306	6,123	6,024	6,063	6,138	6,198	6,210	Males	45 – 59
6,293	6,220	6,045	5,959	6,001	6,073	6,126	6,135	Females	
5,130	5,165	5,468	5,713	5,696	5,555	5,491	5,502	Males	60 – 74
5,477	5,470	5,703	5,886	5,835	5,687	5,625	5,634	Females	
4,289	4,399	4,479	4,515	4,693	5,002	5,255	5,366	Males	75 and over
5,389	5,520	5,612	5,631	5,759	6,002	6,206	6,299	Females	

Appendix I

Age and sex structure of the projected population, 2004–2074

(c) England and Wales

Age	Sex (base)	2004	2006	2011	2016	2021	2026	2031	2036	2041
All ages	**Persons**	**53,046**	**53,691**	**55,005**	**56,378**	**57,770**	**59,042**	**60,088**	**60,911**	**61,591**
	Males	**25,988**	**26,357**	**27,100**	**27,846**	**28,572**	**29,212**	**29,730**	**30,144**	**30,497**
	Females	**27,058**	**27,334**	**27,904**	**28,531**	**29,198**	**29,831**	**30,358**	**30,767**	**31,094**
0 – 4	Males	1,546	1,585	1,598	1,624	1,656	1,655	1,629	1,612	1,621
	Females	1,471	1,511	1,528	1,552	1,583	1,582	1,557	1,540	1,549
5 – 9	Males	1,637	1,589	1,588	1,601	1,627	1,660	1,659	1,632	1,616
	Females	1,560	1,519	1,523	1,540	1,564	1,595	1,594	1,569	1,553
10 – 14	Males	1,757	1,707	1,599	1,598	1,612	1,637	1,670	1,669	1,643
	Females	1,666	1,618	1,522	1,527	1,543	1,567	1,599	1,598	1,572
15 – 19	Males	1,781	1,815	1,747	1,639	1,639	1,652	1,678	1,711	1,710
	Females	1,679	1,710	1,640	1,545	1,549	1,566	1,590	1,622	1,621
20 – 24	Males	1,692	1,784	1,932	1,864	1,757	1,757	1,771	1,797	1,830
	Females	1,665	1,721	1,835	1,765	1,670	1,675	1,692	1,716	1,747
25 – 29	Males	1,635	1,711	1,884	2,028	1,961	1,855	1,855	1,869	1,895
	Females	1,625	1,711	1,850	1,961	1,891	1,796	1,801	1,818	1,842
30 – 34	Males	1,897	1,793	1,758	1,928	2,072	2,006	1,900	1,900	1,914
	Females	1,916	1,795	1,764	1,901	2,011	1,942	1,847	1,852	1,869
35 – 39	Males	2,070	2,035	1,809	1,773	1,942	2,086	2,021	1,916	1,916
	Females	2,093	2,056	1,817	1,786	1,922	2,032	1,963	1,869	1,874
40 – 44	Males	1,972	2,054	2,032	1,807	1,772	1,941	2,084	2,020	1,916
	Females	2,005	2,085	2,052	1,815	1,784	1,920	2,031	1,962	1,869
45 – 49	Males	1,721	1,815	2,034	2,012	1,790	1,757	1,925	2,068	2,005
	Females	1,750	1,842	2,069	2,036	1,801	1,772	1,908	2,018	1,950
50 – 54	Males	1,616	1,607	1,779	1,994	1,975	1,758	1,726	1,893	2,036
	Females	1,651	1,647	1,818	2,043	2,011	1,779	1,751	1,887	1,997
55 – 59	Males	1,704	1,713	1,559	1,727	1,938	1,921	1,711	1,683	1,848
	Females	1,746	1,760	1,611	1,781	2,003	1,974	1,746	1,720	1,855
60 – 64	Males	1,307	1,409	1,625	1,483	1,647	1,854	1,840	1,640	1,616
	Females	1,362	1,471	1,708	1,567	1,734	1,953	1,926	1,706	1,682
65 – 69	Males	1,151	1,155	1,317	1,528	1,400	1,558	1,759	1,750	1,563
	Females	1,230	1,234	1,406	1,637	1,506	1,670	1,885	1,861	1,650
70 – 74	Males	958	973	1,042	1,200	1,401	1,291	1,443	1,634	1,631
	Females	1,111	1,104	1,157	1,326	1,549	1,430	1,590	1,798	1,780
75 – 79	Males	740	760	812	893	1,042	1,224	1,137	1,280	1,458
	Females	980	982	978	1,044	1,207	1,415	1,315	1,468	1,667
80 – 84	Males	510	510	557	624	704	836	989	931	1,059
	Females	836	797	788	812	887	1,038	1,223	1,147	1,290
85 – 89	Males	203	247	302	352	414	481	584	698	670
	Females	429	488	529	545	588	664	792	940	896
90 and over	Males	90	96	127	172	223	283	349	441	549
	Females	280	283	308	351	395	461	549	678	832
0 – 15	Males	5,294	5,244	5,119	5,129	5,222	5,277	5,290	5,250	5,214
	Females	5,033	4,990	4,888	4,909	5,002	5,053	5,066	5,027	4,992
16 – 29	Males	4,754	4,947	5,229	5,226	5,030	4,940	4,971	5,040	5,101
	Females	4,634	4,801	5,011	4,980	4,798	4,728	4,766	4,834	4,891
30 – 44	Males	5,940	5,883	5,598	5,507	5,785	6,032	6,005	5,836	5,747
	Females	6,014	5,936	5,633	5,501	5,717	5,894	5,841	5,683	5,611
45 – 59	Males	5,040	5,135	5,371	5,733	5,703	5,436	5,363	5,644	5,889
	Females	5,148	5,249	5,498	5,860	5,816	5,525	5,405	5,625	5,802
60 – 74	Males	3,416	3,536	3,984	4,211	4,447	4,703	5,042	5,024	4,810
	Females	3,704	3,809	4,271	4,530	4,788	5,053	5,400	5,365	5,112
75 and over	Males	1,544	1,613	1,799	2,040	2,383	2,824	3,059	3,349	3,737
	Females	2,525	2,550	2,603	2,752	3,077	3,578	3,880	4,232	4,685

thousands

2044	2046	2051	2056	2061	2066	2071	2074	Sex	Age
61,957	**62,189**	**62,719**	**63,176**	**63,586**	**64,004**	**64,457**	**64,736**	**Persons**	**All ages**
30,692	**30,816**	**31,105**	**31,365**	**31,608**	**31,851**	**32,103**	**32,253**	**Males**	
31,266	**31,373**	**31,613**	**31,811**	**31,979**	**32,152**	**32,354**	**32,483**	**Females**	
1,631	1,638	1,648	1,650	1,644	1,639	1,641	1,645	Males	0 – 4
1,559	1,565	1,575	1,576	1,571	1,566	1,568	1,572	Females	
1,619	1,625	1,641	1,652	1,653	1,648	1,643	1,643	Males	5 – 9
1,556	1,561	1,577	1,587	1,588	1,583	1,578	1,579	Females	
1,629	1,626	1,635	1,651	1,662	1,664	1,658	1,654	Males	10 – 14
1,560	1,557	1,565	1,581	1,591	1,592	1,587	1,584	Females	
1,695	1,684	1,667	1,676	1,693	1,704	1,705	1,702	Males	15 – 19
1,607	1,595	1,580	1,588	1,604	1,614	1,615	1,613	Females	
1,833	1,829	1,803	1,786	1,796	1,812	1,823	1,825	Males	20 – 24
1,750	1,746	1,721	1,705	1,714	1,730	1,740	1,742	Females	
1,918	1,928	1,927	1,902	1,885	1,895	1,911	1,919	Males	25 – 29
1,864	1,873	1,872	1,847	1,832	1,840	1,856	1,863	Females	
1,925	1,940	1,974	1,973	1,948	1,932	1,941	1,951	Males	30 – 34
1,878	1,893	1,924	1,924	1,899	1,883	1,892	1,902	Females	
1,941	1,931	1,957	1,991	1,991	1,966	1,950	1,954	Males	35 – 39
1,902	1,891	1,916	1,947	1,947	1,922	1,907	1,910	Females	
1,879	1,917	1,932	1,959	1,993	1,993	1,968	1,956	Males	40 – 44
1,834	1,874	1,891	1,916	1,947	1,947	1,923	1,910	Females	
1,950	1,903	1,905	1,920	1,948	1,982	1,983	1,970	Males	45 – 49
1,899	1,858	1,863	1,881	1,906	1,938	1,938	1,925	Females	
2,022	1,975	1,875	1,879	1,895	1,923	1,958	1,963	Males	50 – 54
1,977	1,931	1,840	1,846	1,864	1,890	1,922	1,926	Females	
1,961	1,990	1,932	1,836	1,841	1,858	1,887	1,912	Males	55 – 59
1,940	1,965	1,901	1,812	1,819	1,838	1,865	1,887	Females	
1,714	1,779	1,918	1,864	1,773	1,781	1,800	1,813	Males	60 – 64
1,782	1,816	1,925	1,864	1,778	1,787	1,807	1,819	Females	
1,488	1,544	1,704	1,841	1,792	1,708	1,718	1,745	Males	65 – 69
1,558	1,630	1,763	1,871	1,814	1,732	1,743	1,772	Females	
1,546	1,461	1,449	1,604	1,738	1,697	1,621	1,597	Males	70 – 74
1,686	1,581	1,566	1,696	1,804	1,752	1,676	1,650	Females	
1,482	1,463	1,316	1,314	1,462	1,590	1,558	1,526	Males	75 – 79
1,680	1,655	1,475	1,468	1,594	1,701	1,655	1,619	Females	
1,160	1,217	1,230	1,116	1,126	1,261	1,381	1,385	Males	80 – 84
1,409	1,473	1,471	1,317	1,321	1,441	1,545	1,539	Females	
725	776	904	926	850	873	990	1,067	Males	85 – 89
960	1,021	1,178	1,188	1,073	1,091	1,201	1,270	Females	
574	592	686	825	919	928	966	1,026	Males	90 and over
865	888	1,011	1,196	1,311	1,304	1,336	1,401	Females	
5,210	5,217	5,252	5,283	5,293	5,285	5,276	5,276	Males	0 – 15
4,989	4,995	5,028	5,058	5,067	5,060	5,051	5,051	Females	
5,116	5,113	5,070	5,034	5,040	5,076	5,105	5,113	Males	16 – 29
4,906	4,902	4,861	4,827	4,832	4,866	4,893	4,900	Females	
5,745	5,789	5,863	5,923	5,931	5,890	5,859	5,861	Males	30 – 44
5,615	5,658	5,732	5,787	5,793	5,753	5,722	5,723	Females	
5,933	5,867	5,712	5,635	5,683	5,763	5,828	5,844	Males	45 – 59
5,815	5,753	5,604	5,539	5,590	5,666	5,725	5,739	Females	
4,747	4,784	5,071	5,310	5,304	5,185	5,139	5,156	Males	60 – 74
5,027	5,027	5,254	5,432	5,396	5,271	5,226	5,241	Females	
3,940	4,047	4,137	4,181	4,356	4,652	4,896	5,003	Males	75 and over
4,914	5,037	5,134	5,168	5,300	5,537	5,737	5,829	Females	

Appendix I

Age and sex structure of the projected population, 2004–2074

(d) England

Age	Sex	2004 (base)	2006	2011	2016	2021	2026	2031	2036	2041
All ages	**Persons**	**50,094**	**50,714**	**51,967**	**53,276**	**54,605**	**55,823**	**56,832**	**57,632**	**58,299**
	Males	**24,554**	**24,907**	**25,615**	**26,325**	**27,017**	**27,630**	**28,130**	**28,532**	**28,877**
	Females	**25,540**	**25,807**	**26,352**	**26,951**	**27,588**	**28,194**	**28,702**	**29,100**	**29,422**
0 – 4	Males	1,464	1,503	1,515	1,539	1,570	1,571	1,547	1,532	1,542
	Females	1,394	1,433	1,449	1,471	1,501	1,501	1,479	1,464	1,473
5 – 9	Males	1,546	1,500	1,504	1,516	1,540	1,572	1,572	1,549	1,534
	Females	1,473	1,434	1,443	1,458	1,480	1,510	1,511	1,488	1,474
10 – 14	Males	1,657	1,610	1,508	1,512	1,524	1,548	1,580	1,580	1,557
	Females	1,571	1,525	1,436	1,445	1,460	1,483	1,513	1,513	1,491
15 – 19	Males	1,679	1,710	1,647	1,546	1,550	1,563	1,586	1,618	1,619
	Females	1,582	1,612	1,546	1,457	1,466	1,481	1,503	1,533	1,534
20 – 24	Males	1,599	1,686	1,824	1,762	1,661	1,665	1,678	1,702	1,734
	Females	1,573	1,627	1,736	1,669	1,581	1,589	1,605	1,627	1,657
25 – 29	Males	1,557	1,628	1,790	1,924	1,862	1,762	1,766	1,779	1,803
	Females	1,547	1,628	1,758	1,863	1,797	1,709	1,718	1,733	1,755
30 – 34	Males	1,807	1,710	1,674	1,832	1,967	1,905	1,806	1,810	1,823
	Females	1,820	1,707	1,678	1,805	1,910	1,845	1,757	1,766	1,781
35 – 39	Males	1,968	1,936	1,723	1,686	1,844	1,979	1,918	1,819	1,824
	Females	1,984	1,949	1,726	1,696	1,823	1,929	1,863	1,775	1,785
40 – 44	Males	1,869	1,947	1,931	1,719	1,683	1,841	1,975	1,915	1,818
	Females	1,897	1,974	1,943	1,721	1,692	1,819	1,925	1,859	1,772
45 – 49	Males	1,627	1,718	1,926	1,910	1,702	1,667	1,824	1,958	1,899
	Females	1,653	1,740	1,957	1,926	1,706	1,678	1,805	1,910	1,846
50 – 54	Males	1,522	1,515	1,681	1,887	1,872	1,669	1,636	1,792	1,925
	Females	1,554	1,551	1,714	1,929	1,900	1,683	1,656	1,783	1,888
55 – 59	Males	1,603	1,610	1,466	1,629	1,831	1,819	1,621	1,592	1,746
	Females	1,642	1,654	1,515	1,676	1,889	1,861	1,648	1,624	1,750
60 – 64	Males	1,225	1,321	1,525	1,392	1,550	1,748	1,739	1,551	1,525
	Females	1,278	1,381	1,603	1,470	1,629	1,839	1,814	1,607	1,585
65 – 69	Males	1,081	1,083	1,233	1,431	1,312	1,465	1,657	1,652	1,476
	Females	1,156	1,158	1,318	1,535	1,412	1,568	1,773	1,751	1,553
70 – 74	Males	900	913	976	1,123	1,312	1,209	1,356	1,539	1,539
	Females	1,044	1,037	1,085	1,243	1,452	1,341	1,493	1,692	1,675
75 – 79	Males	695	715	763	837	976	1,147	1,066	1,203	1,373
	Females	920	923	919	980	1,132	1,327	1,233	1,379	1,569
80 – 84	Males	479	478	524	586	661	783	927	873	996
	Females	784	748	742	763	833	974	1,147	1,076	1,212
85 – 89	Males	191	232	284	331	389	451	547	654	629
	Females	403	458	497	513	553	623	744	882	841
90 and over	Males	85	90	120	162	210	266	328	414	515
	Females	264	267	289	329	372	434	517	637	782
0 – 15	Males	5,000	4,955	4,842	4,855	4,945	4,997	5,014	4,980	4,948
	Females	4,755	4,716	4,625	4,648	4,737	4,786	4,802	4,769	4,739
16 – 29	Males	4,501	4,683	4,946	4,944	4,763	4,683	4,717	4,781	4,840
	Females	4,386	4,544	4,742	4,714	4,548	4,487	4,526	4,590	4,645
30 – 44	Males	5,644	5,594	5,328	5,238	5,494	5,725	5,698	5,545	5,465
	Females	5,702	5,631	5,347	5,222	5,426	5,592	5,544	5,400	5,338
45 – 59	Males	4,752	4,843	5,074	5,426	5,405	5,155	5,082	5,342	5,570
	Females	4,849	4,945	5,186	5,532	5,495	5,222	5,110	5,317	5,484
60 – 74	Males	3,206	3,318	3,734	3,947	4,174	4,422	4,751	4,741	4,540
	Females	3,477	3,575	4,006	4,248	4,493	4,747	5,079	5,050	4,813
75 and over	Males	1,450	1,515	1,691	1,916	2,235	2,647	2,868	3,143	3,513
	Females	2,371	2,395	2,447	2,586	2,890	3,359	3,641	3,974	4,403

thousands

2044	2046	2051	2056	2061	2066	2071	2074	Sex	Age
58,660	**58,887**	**59,411**	**59,866**	**60,275**	**60,691**	**61,142**	**61,420**	**Persons**	**All ages**
29,068	**29,189**	**29,473**	**29,728**	**29,966**	**30,206**	**30,454**	**30,603**	**Males**	
29,592	**29,698**	**29,938**	**30,137**	**30,308**	**30,485**	**30,688**	**30,817**	**Females**	
1,551	1,557	1,568	1,570	1,566	1,562	1,564	1,569	Males	0 – 4
1,482	1,488	1,498	1,501	1,496	1,493	1,495	1,499	Females	
1,537	1,543	1,559	1,570	1,572	1,567	1,564	1,564	Males	5 – 9
1,478	1,483	1,498	1,508	1,510	1,506	1,502	1,503	Females	
1,545	1,542	1,551	1,567	1,578	1,580	1,576	1,573	Males	10 – 14
1,479	1,476	1,485	1,500	1,511	1,513	1,509	1,506	Females	
1,606	1,595	1,580	1,590	1,606	1,617	1,619	1,617	Males	15 – 19
1,521	1,511	1,497	1,506	1,521	1,531	1,534	1,531	Females	
1,738	1,735	1,711	1,697	1,706	1,722	1,733	1,736	Males	20 – 24
1,661	1,658	1,635	1,621	1,630	1,645	1,656	1,658	Females	
1,825	1,835	1,836	1,813	1,798	1,808	1,824	1,832	Males	25 – 29
1,776	1,786	1,786	1,764	1,750	1,759	1,774	1,781	Females	
1,833	1,848	1,880	1,881	1,858	1,844	1,853	1,863	Males	30 – 34
1,790	1,804	1,834	1,835	1,812	1,799	1,808	1,817	Females	
1,848	1,838	1,862	1,894	1,896	1,873	1,859	1,864	Males	35 – 39
1,811	1,800	1,823	1,853	1,854	1,832	1,818	1,822	Females	
1,784	1,823	1,837	1,861	1,894	1,896	1,874	1,862	Males	40 – 44
1,743	1,782	1,798	1,820	1,851	1,852	1,830	1,819	Females	
1,847	1,803	1,810	1,824	1,849	1,882	1,884	1,873	Males	45 – 49
1,798	1,760	1,770	1,786	1,809	1,840	1,841	1,830	Females	
1,912	1,868	1,775	1,782	1,797	1,823	1,857	1,863	Males	50 – 54
1,869	1,825	1,740	1,751	1,767	1,791	1,822	1,827	Females	
1,852	1,878	1,824	1,734	1,743	1,759	1,786	1,810	Males	55 – 59
1,830	1,854	1,793	1,711	1,722	1,739	1,764	1,786	Females	
1,616	1,677	1,808	1,758	1,672	1,683	1,701	1,713	Males	60 – 64
1,678	1,710	1,815	1,756	1,676	1,689	1,707	1,718	Females	
1,404	1,455	1,605	1,733	1,688	1,608	1,622	1,648	Males	65 – 69
1,468	1,535	1,658	1,762	1,707	1,631	1,646	1,673	Females	
1,459	1,379	1,366	1,510	1,636	1,597	1,526	1,505	Males	70 – 74
1,587	1,488	1,474	1,596	1,699	1,649	1,578	1,556	Females	
1,398	1,380	1,243	1,239	1,376	1,497	1,467	1,436	Males	75 – 79
1,582	1,558	1,389	1,382	1,500	1,602	1,558	1,524	Females	
1,092	1,146	1,161	1,054	1,061	1,188	1,300	1,304	Males	80 – 84
1,326	1,386	1,385	1,241	1,244	1,357	1,455	1,450	Females	
681	730	852	875	803	823	932	1,005	Males	85 – 89
901	959	1,109	1,119	1,011	1,028	1,131	1,197	Females	
538	555	645	777	867	876	912	967	Males	90 and over
812	834	950	1,126	1,236	1,229	1,260	1,320	Females	
4,946	4,953	4,988	5,020	5,032	5,027	5,021	5,023	Males	0 – 15
4,737	4,743	4,777	4,807	4,818	4,814	4,808	4,809	Females	
4,856	4,854	4,818	4,786	4,794	4,829	4,858	4,867	Males	16 – 29
4,661	4,659	4,623	4,593	4,600	4,633	4,661	4,669	Females	
5,465	5,508	5,579	5,637	5,648	5,613	5,587	5,589	Males	30 – 44
5,343	5,386	5,455	5,509	5,518	5,483	5,456	5,458	Females	
5,612	5,550	5,409	5,340	5,389	5,465	5,528	5,545	Males	45 – 59
5,497	5,439	5,303	5,247	5,299	5,371	5,428	5,442	Females	
4,479	4,512	4,778	5,001	4,996	4,889	4,849	4,866	Males	60 – 74
4,733	4,733	4,947	5,114	5,082	4,969	4,931	4,947	Females	
3,709	3,812	3,902	3,944	4,107	4,384	4,611	4,713	Males	75 and over
4,621	4,738	4,833	4,867	4,991	5,216	5,404	5,491	Females	

Appendix I

Age and sex structure of the projected population, 2004–2044

(e) Wales thousands

Age	Sex	2004 (base)	2006	2011	2016	2021	2026	2031	2036	2041	2044
All ages	**Persons**	**2,952**	**2,977**	**3,037**	**3,102**	**3,165**	**3,219**	**3,256**	**3,278**	**3,292**	**3,298**
	Males	**1,434**	**1,449**	**1,485**	**1,521**	**1,555**	**1,582**	**1,600**	**1,612**	**1,620**	**1,624**
	Females	**1,518**	**1,528**	**1,552**	**1,580**	**1,611**	**1,637**	**1,656**	**1,667**	**1,672**	**1,674**
0 – 4	Males	82	82	83	85	86	84	82	80	80	80
	Females	77	77	79	81	82	80	78	76	76	76
5 – 9	Males	91	88	84	85	87	88	87	84	82	82
	Females	87	84	80	81	83	84	83	80	78	78
10 – 14	Males	100	97	90	86	87	89	90	89	86	85
	Females	95	93	86	81	83	85	86	85	82	81
15 – 19	Males	102	104	100	93	89	90	92	93	91	90
	Females	97	98	95	88	84	85	87	88	87	85
20 – 24	Males	93	98	107	103	96	92	93	95	96	95
	Females	93	94	100	96	90	85	87	89	90	89
25 – 29	Males	77	83	95	104	100	93	89	90	92	93
	Females	78	83	92	97	94	87	83	85	86	87
30 – 34	Males	90	83	84	96	105	101	94	90	91	92
	Females	96	88	86	95	100	97	90	86	88	89
35 – 39	Males	102	99	86	86	98	107	103	96	92	93
	Females	108	106	91	90	99	104	100	94	90	91
40 – 44	Males	103	107	101	88	88	100	109	105	98	94
	Females	108	111	109	94	92	101	106	103	96	92
45 – 49	Males	94	97	107	102	89	89	101	110	106	102
	Females	97	102	113	110	95	93	102	108	104	101
50 – 54	Males	94	92	98	107	102	89	90	101	111	109
	Females	97	96	103	114	111	97	95	104	109	108
55 – 59	Males	101	103	92	98	108	103	90	91	102	110
	Females	104	106	97	104	115	112	98	97	106	109
60 – 64	Males	82	87	101	91	96	106	101	89	90	98
	Females	85	91	106	97	104	114	112	98	97	104
65 – 69	Males	70	72	84	97	88	93	102	98	87	83
	Females	75	76	88	102	94	102	112	110	97	91
70 – 74	Males	58	59	65	77	89	81	87	96	92	87
	Females	67	67	71	83	97	90	97	107	105	99
75 – 79	Males	45	46	49	56	66	78	71	77	85	84
	Females	60	59	59	64	75	88	82	89	98	98
80 – 84	Males	31	31	33	38	44	53	62	58	63	68
	Females	51	50	47	48	54	64	76	71	78	84
85 – 89	Males	12	15	18	21	25	30	37	44	41	44
	Females	26	30	33	32	35	40	49	58	55	58
90 and over	Males	5	5	7	10	13	17	21	27	34	36
	Females	16	16	18	21	23	27	33	41	51	53
0 – 15	Males	294	288	277	274	278	279	277	270	265	264
	Females	278	274	263	260	265	266	264	258	253	252
16 – 29	Males	252	264	282	282	267	257	255	259	261	260
	Females	248	256	269	265	251	241	240	244	246	245
30 – 44	Males	295	289	270	269	291	308	306	291	281	279
	Females	312	306	286	278	291	302	297	283	273	271
45 – 59	Males	289	292	297	307	298	281	281	302	319	321
	Females	299	304	313	328	321	302	295	308	319	318
60 – 74	Males	210	219	250	264	273	280	290	283	269	268
	Females	226	234	265	282	296	306	321	315	299	294
75 and over	Males	93	97	108	125	148	177	192	206	224	231
	Females	154	155	157	166	187	219	239	259	282	293

Appendix I

Age and sex structure of the projected population, 2004–2044

(f) Scotland thousands

Age	Sex (base)	2004	2006	2011	2016	2021	2026	2031	2036	2041	2044
All ages	**Persons**	**5,078**	**5,108**	**5,120**	**5,126**	**5,127**	**5,109**	**5,065**	**4,997**	**4,913**	**4,857**
	Males	**2,446**	**2,463**	**2,470**	**2,473**	**2,471**	**2,457**	**2,429**	**2,391**	**2,347**	**2,318**
	Females	**2,632**	**2,646**	**2,649**	**2,653**	**2,656**	**2,652**	**2,635**	**2,605**	**2,566**	**2,539**
0 – 4	Males	135	136	132	131	130	126	120	115	112	111
	Females	129	130	127	126	125	121	115	110	108	107
5 – 9	Males	149	143	136	132	131	130	126	120	115	113
	Females	141	137	131	128	127	126	122	116	112	110
10 – 14	Males	163	157	143	136	133	131	131	127	120	117
	Females	156	151	137	132	129	127	127	123	117	114
15 – 19	Males	168	169	160	145	138	135	134	133	129	125
	Females	160	160	153	139	134	130	129	128	125	121
20 – 24	Males	164	169	176	167	153	145	142	141	140	138
	Females	161	166	169	161	147	142	139	138	137	135
25 – 29	Males	144	155	163	170	161	147	140	137	136	135
	Females	147	153	164	166	158	145	139	136	135	135
30 – 34	Males	166	153	151	159	166	157	143	136	133	132
	Females	178	164	154	164	167	159	145	140	137	135
35 – 39	Males	191	185	151	149	157	164	155	141	134	133
	Females	206	200	165	155	165	168	160	146	141	140
40 – 44	Males	193	195	183	149	147	155	162	153	139	132
	Females	206	210	199	165	155	165	167	159	146	140
45 – 49	Males	177	183	192	180	146	144	152	160	151	143
	Females	185	194	208	198	164	154	164	166	159	150
50 – 54	Males	163	165	179	187	176	143	141	150	157	154
	Females	167	171	192	206	196	162	153	162	165	163
55 – 59	Males	164	169	159	173	181	171	139	138	146	153
	Females	169	175	168	189	203	193	160	151	161	165
60 – 64	Males	129	135	159	151	164	172	163	133	132	139
	Females	141	145	170	163	184	197	188	156	148	156
65 – 69	Males	114	114	124	148	141	153	162	153	125	118
	Females	131	130	137	162	156	176	190	181	151	138
70 – 74	Males	93	95	101	111	133	127	140	148	140	126
	Females	118	118	120	128	151	146	166	179	171	156
75 – 79	Males	68	70	77	84	94	113	110	121	129	127
	Females	98	99	102	107	114	136	133	151	164	162
80 – 84	Males	43	44	49	57	65	73	89	88	98	104
	Females	77	75	77	83	89	96	115	114	130	139
85 – 89	Males	16	20	25	30	37	43	50	62	62	67
	Females	38	43	48	52	58	65	72	87	87	96
90 and over	Males	7	8	10	14	19	25	31	38	48	51
	Females	24	25	26	31	36	44	52	61	75	79
0 – 15	Males	479	470	441	426	421	414	403	388	373	365
	Females	457	449	424	412	407	400	390	375	360	353
16 – 29	Males	444	459	469	456	425	401	390	385	380	375
	Females	437	448	457	440	413	392	382	377	372	368
30 – 44	Males	550	533	484	456	469	476	460	430	406	397
	Females	590	574	518	484	486	491	472	445	423	415
45 – 59	Males	503	517	530	540	503	458	433	447	454	450
	Females	521	540	568	593	562	509	476	480	484	478
60 – 74	Males	336	344	384	409	438	453	464	433	398	383
	Females	389	393	427	453	491	520	543	516	470	450
75 and over	Males	134	141	161	186	214	254	280	308	336	348
	Females	237	242	254	272	297	341	372	412	456	475

Appendix I

Age and sex structure of the projected population, 2004–2044

(g) Northern Ireland thousands

Age	Sex	2004 (base)	2006	2011	2016	2021	2026	2031	2036	2041	2044
All ages	**Persons**	**1,710**	**1,733**	**1,767**	**1,800**	**1,830**	**1,851**	**1,860**	**1,859**	**1,849**	**1,841**
	Males	**836**	**848**	**868**	**885**	**900**	**911**	**914**	**913**	**908**	**904**
	Females	**874**	**884**	**900**	**915**	**930**	**940**	**946**	**946**	**941**	**937**
0 – 4	Males	56	56	55	55	55	53	50	48	47	47
	Females	53	54	52	53	53	51	48	46	45	45
5 – 9	Males	62	60	56	55	55	55	53	51	48	48
	Females	58	57	54	53	53	53	51	49	47	46
10 – 14	Males	65	64	60	56	55	55	56	53	51	49
	Females	62	60	57	54	53	53	53	51	49	47
15 – 19	Males	68	68	63	60	56	55	55	55	53	52
	Females	65	64	59	56	53	52	52	52	51	49
20 – 24	Males	59	64	67	62	59	55	54	54	55	53
	Females	57	61	61	57	53	50	49	50	50	49
25 – 29	Males	53	55	64	66	62	58	54	53	54	54
	Females	54	55	63	62	58	54	51	50	51	51
30 – 34	Males	60	57	54	63	65	61	57	54	52	52
	Females	62	59	56	63	63	58	54	52	51	51
35 – 39	Males	64	63	57	54	63	65	61	57	54	53
	Females	66	65	59	56	64	63	59	55	52	52
40 – 44	Males	61	63	62	56	53	62	64	60	56	53
	Females	64	66	65	59	56	63	63	58	55	52
45 – 49	Males	55	57	62	61	55	52	61	63	59	57
	Females	56	60	65	65	59	56	63	62	58	56
50 – 54	Males	49	51	56	61	60	54	51	60	62	59
	Females	49	51	59	65	64	58	55	62	62	60
55 – 59	Males	47	48	50	54	59	58	53	50	58	62
	Females	49	49	50	58	64	63	57	55	62	62
60 – 64	Males	39	42	45	48	52	57	56	51	48	53
	Females	42	45	48	49	57	62	62	56	54	58
65 – 69	Males	32	33	39	43	45	49	54	53	48	45
	Females	36	37	43	46	47	55	60	60	54	51
70 – 74	Males	26	27	30	36	39	41	46	50	50	48
	Females	33	33	34	40	44	44	52	57	57	55
75 – 79	Males	20	20	22	26	31	34	36	40	44	45
	Females	28	29	29	31	37	40	41	48	53	54
80 – 84	Males	12	13	15	17	20	25	27	30	33	36
	Females	22	22	23	24	26	31	34	36	42	45
85 – 89	Males	5	6	8	9	11	14	17	19	21	23
	Females	11	12	14	16	17	20	24	26	28	31
90 and over	Males	2	2	3	4	5	7	9	12	15	16
	Females	6	6	7	9	11	13	15	19	23	24
0 – 15	Males	197	193	184	178	177	175	170	163	157	154
	Females	187	183	175	170	170	168	164	157	150	148
16 – 29	Males	167	174	182	177	165	157	153	152	151	149
	Females	163	168	171	164	153	146	142	142	141	139
30 – 44	Males	185	183	173	173	181	187	182	170	162	158
	Females	192	190	181	179	183	185	176	165	158	155
45 – 59	Males	151	156	168	176	174	164	164	173	179	178
	Females	154	160	174	188	186	177	176	179	182	178
60 – 74	Males	98	102	115	126	136	148	156	154	146	146
	Females	111	114	125	135	147	162	174	173	165	164
75 and over	Males	39	41	47	56	67	79	90	101	113	119
	Females	67	69	73	79	91	103	114	129	146	154

Appendix II

Projected components of population change, 2004–2044 (annual averages)

Thousands

	2004 –2006	2006 –2011	2011 –2016	2016 –2021	2021 –2026	2026 –2031	2031 –2036	2036 –2041	2041 –2044
United Kingdom									
Population at start	59,835	60,533	61,892	63,304	64,727	66,002	67,013	67,766	68,353
Births	714	701	710	722	720	705	696	698	702
Deaths	590	579	573	583	609	648	690	725	746
Natural change	124	122	137	140	110	57	6	–28	–44
Net migration	225	150	145	145	145	145	145	145	145
Total change	349	272	282	285	255	202	151	117	101
Population at end	60,533	61,892	63,304	64,727	66,002	67,013	67,766	68,353	68,656
Great Britain									
Population at start	58,125	58,800	60,124	61,504	62,897	64,151	65,153	65,908	66,504
Births	692	679	688	701	699	686	677	679	684
Deaths	576	565	558	568	593	631	672	706	726
Natural change	116	115	130	133	105	55	5	–26	–42
Net migration	222	150	146	146	146	146	146	146	146
Total change	338	265	276	279	251	200	151	119	104
Population at end	58,800	60,124	61,504	62,897	64,151	65,153	65,908	66,504	66,815
England & Wales									
Population at start	53,046	53,691	55,005	56,378	57,770	59,042	60,088	60,911	61,591
Births	638	627	637	650	649	639	632	635	640
Deaths	520	510	504	513	536	571	609	641	660
Natural change	118	117	133	137	113	68	23	–5	–19
Net migration	204	145	142	142	142	142	142	142	142
Total change	322	263	275	279	254	209	165	136	122
Population at end	53,691	55,005	56,378	57,770	59,042	60,088	60,911	61,591	61,957
England									
Population at start	50,094	50,714	51,967	53,276	54,605	55,823	56,832	57,632	58,299
Births	606	595	604	616	616	607	601	605	610
Deaths	487	478	472	481	503	535	571	601	619
Natural change	119	117	132	136	114	72	30	3	–10
Net migration	192	134	130	130	130	130	130	130	130
Total change	310	251	262	266	244	202	160	133	120
Population at end	50,714	51,967	53,276	54,605	55,823	56,832	57,632	58,299	58,660
Wales									
Population at start	2,952	2,977	3,037	3,102	3,165	3,219	3,256	3,278	3,292
Births	32	32	33	33	33	32	31	31	31
Deaths	33	32	31	32	33	36	38	40	40
Natural change	0	0	1	1	–1	–4	–7	–9	–10
Net migration	13	12	12	12	12	12	12	12	12
Total change	12	12	13	13	11	7	4	3	2
Population at end	2,977	3,037	3,102	3,165	3,219	3,256	3,278	3,292	3,298
Scotland									
Population at start	5,078	5,108	5,120	5,126	5,127	5,109	5,065	4,997	4,913
Births	54	52	51	51	50	47	45	44	43
Deaths	56	55	54	55	57	60	63	65	66
Natural change	–2	–3	–3	–4	–8	–13	–18	–21	–22
Net migration	17	5	4	4	4	4	4	4	4
Total change	15	2	1	0	–4	–9	–14	–17	–18
Population at end	5,108	5,120	5,126	5,127	5,109	5,065	4,997	4,913	4,857
Northern Ireland									
Population at start	1,710	1,733	1,767	1,800	1,830	1,851	1,860	1,859	1,849
Births	22	21	22	22	21	20	19	18	18
Deaths	14	14	15	15	16	17	19	20	21
Natural change	8	7	7	6	5	2	0	–1	–2
Net migration	4	0	–1	–1	–1	–1	–1	–1	–1
Total change	11	7	7	6	4	2	0	–2	–3
Population at end	1,733	1,767	1,800	1,830	1,851	1,860	1,859	1,849	1,841

Appendix III

National Population Projections expert advisory panel

Notes of meeting held on 5 May 2005

Government Actuary's Department (GAD)/Office for National Statistics (ONS) attendees:

George Russell	GAD
Chris Shaw	GAD
Adrian Gallop	GAD
Helen Bray	GAD (secretary)
Judith Jones	ONS
Steve Smallwood	ONS

Expert panel:

Professor David Coleman, University of Oxford

John Hollis, Greater London Assembly

Professor Mike Murphy, London School of Economics

Professor Phil Rees, University of Leeds

Professor John Salt, University College London

Professor Robert Wright, University of Stirling (now University of Strathclyde)

Apologies:

Dr Máire Ní Bhrolcháin, University of Southampton

Introduction by GAD/ONS

George Russell opened up the meeting and thanked everyone for coming. He ran through the agenda and passed over to Judith Jones, joint head of Population and Demography at ONS, to provide the introduction.

The aim of this meeting was to have an informed discussion about the assumptions used for the national population projections. The meeting would concentrate on UK-level assumptions. Separate consultation procedures existed for the four constituent countries of the UK. The role of this expert group is strictly advisory – any views are welcomed. GAD/ONS will consider all comments made but responsibility for final decisions on assumptions remains with GAD and the Registrars General.

GAD/ONS were not seeking consensus views. If they did exist that was of interest. Where they did not, they wanted to hear the full range of views that exist.

GAD/ONS would give short introductory presentations on each of the three assumptions sets, before opening the floor to general discussion. These would predominantly be based on the last set of assumptions (2002-based and interim 2003-based projections). Some reference to provisional thinking on the new set of assumptions may be made but this would be strictly in confidence until the assumptions are published further through the projection process.

In advance of the meeting it was impossible to say exactly how GAD/ONS will respond to comments made. GAD would consider whether any of the conclusions of the meeting could immediately feed into the forthcoming individual country consultation processes being undertaken by the Registrars General. However, it was likely that most comments would need to be considered over a longer timescale. A record of the meeting will be made, but will not assign views to individuals.

The next projections are scheduled for publication on 20 October 2005. The headline assumptions will be pre-announced in *Population Trends*[1] in September 2005.

A questionnaire was provided to all of the experts and anonymised summaries of the responses are given in the annex to this note. GAD would be happy to receive further comments after the meeting.

Chris added that Eurostat and UN had both recently published 2004-based population projections. In general, their assumptions for the UK were broadly comparable to our own.

Fertility assumptions

Introduction

Steve Smallwood set the scene, noting an upwards movement in births in the last two years and also an increase in the number of births to mothers from abroad. He illustrated how the Completed Family Size has less variation than period fertility, and that it showed a general downward trend. He also showed evidence of the adjustment to later childbearing and how some of a severe drop in the 20s is 'recovered' at later ages.

UK figures were considered, but they are calculated by adding the assumptions for the component countries. As well as trends, other elements are also used to decide on the assumptions – parity progression modelling (for England & Wales), intention data (General Household Survey) and others (for example, analysis of

childbearing patterns for different educational groups). The current level of variant range of +/– 0.2 was also mentioned. While plausible reasons could be given for the variants, for example, relating them to intentions data, their setting was still fairly subjective at the moment and would benefit from greater debate.

Discussion

It was noted that almost all of the standard explanations for low fertility in western countries might be expected to continue to influence rates down rather than up. Most potential upward influences are much more radical and therefore less likely to happen.

However, many panel members felt that one significant factor which could cause an increase in fertility rates in the UK is the expected increase in ethnic minority population. Most – although not all – non-white ethnic groups have higher fertility rates than the white population. There are many uncertainties – how high the ethnic population might reach, how much higher their fertility may be, whether and how quickly entrants into the UK would tend towards 'national' fertility rates, etc. It was noted that historically London had lower fertility rates than the rest of the country but in recent years this has increased to the national average, and the concentration of ethnic groups in London is considered to be a factor in this.

How much influence Government policies have on fertility rates was also discussed. At the moment there is both the drive to reduce teenage pregnancy rates and also a number of more 'family friendly' policies designed for the population as a whole. One panel member thought that a gradual realisation that migration would not solve demographic problems would, in the long-term, lead to more attention being given to pro-natalist policies. Studies in France have indicated that such policies have resulted in an increase of about 0.1 children per woman. However, in general many policy initiatives tend to have just a short-term period effect, as they predominantly influence birth timing rather than the total number of children women have.

It was considered probable that the factors just mentioned would be most likely to prevent a continued reduction in the TFR rather than to cause an increase. However, while the trend to delayed childbearing continues, the age at which women choose to have their children would continue to be a significant driver of the TFR.

One panel member commented that it might be better to have asymmetrical variants, with a greater margin for low fertility than for high. There seemed little likelihood of substantially higher levels.

GAD replied that although the comments about non-symmetrical variants were sensible there was a concern about whether doing this would lead people to make erroneous judgements of the likelihood of the principal projection occurring. Would people perceive the principal assumption as being too high or too low if it was not the mid-point between the two variants? The academics felt that if the explanations accompanying non-symmetrical variants were strong enough users would not be misled.

Mortality assumptions

Introduction

GAD started this section with a description of how the mortality assumptions are calculated, and detailing what the assumptions for the 2002 and 2003 based projections were. A comparison with the UN and EU projections was provided (in terms of life expectancy).

GAD were looking for opinions on two specific questions – what should the target rate of improvement after 25 years be, and should we continue with the tailing off of improvement after 25 years?

Discussion

Generally the target rate of improvement of 1 per cent was considered to be too low. Figures up to and including 2 per cent were suggested. It was thought that there was little reason to believe that improving mortality would not continue. GAD responded that the 'golden cohort' generations are currently dominating the old ages and raising the average rate of improvement. As these cohorts age, their influence on overall mortality measures will diminish.

Other events are also occurring which increase the chances of longevity going up (circumstances of housing, reduced overall levels of deprivation etc) and the improvement is a sum of these changes. All governments support increasing/improving wealth, health and incomes. However, there was also talk of 'new' medical shifts which could work in the opposite direction and the need to monitor these. This included 'international' diseases (for example, avian flu), obesity, HIV, hepatitis etc. Also other causes of increasing longevity are lifestyle-related which some sectors of the population may choose not to adopt.

The tailing off of improvements in mortality after 25 years was thought to be arbitrary – there is no evidence to cause us to expect this. A suggestion for further investigation was to look at countries which have already passed our current life expectancies to see what happened after that.

The assumed convergence of male and female life expectancy was noted.

The variants were also discussed – again there was considered to be a case, but maybe even stronger than for fertility, for the variants to be asymmetrical, with greater scope for higher longevity than lower.

The importance of these assumptions was stressed. Even a minor change in the numbers living to old ages could affect estimates of future expenditure by £ billions. It was generally agreed that the risk of exaggerating the number reaching old ages was preferable to the risk of underestimating numbers.

The need for careful presentation of any future changes in the assumed rate of improvement and subsequent increases in the number at old ages was also discussed. It was also vital to stress uncertainty in a time of increasing demand for certainty!

This topic was completed with a discussion on the poor knowledge base available at the moment and on international comparisons. One country which has done a more in-depth analysis based on causes of death (Holland) has lower life expectancy predictions, but those for France are significantly higher than for the UK.

It was acknowledged that there are elements influencing mortality improvement in both directions and that these need to be considered together to determine if the overall effect will be positive or negative. However, it was agreed that medical advances could be dramatic with long-term or permanent effects, while negative influences are more likely to be short-term.

Migration assumptions

Introduction

GAD started by running through the current data series and giving more detail of the effect on the International Passenger Survey (IPS) projection model of two more years worth of data. Chris also explained how the exponential smoothing model used for IPS worked. Finally, he ran through the other elements of the migration assumption and advised that these are unlikely to change significantly in the 2004 projection round.

The fact that GAD assumptions currently make no allowance for failed asylum seekers who remain in the country was mentioned. Chris informed the group that the forthcoming 2004-based projections would allow for such people.

Discussion

The first comment made was how hard future migration patterns are to predict. Young people tend to drive changes with their greater mobility. The lack of reliable emigration data was noted.

It was noted that although all of the 'old' European countries had increasing net in-migration, the UK's accelerated trend was out of step with other countries. The lack of data on the migrant inflow from the new EU countries was noted, and also that the effect of this was likely to be short term (although the likely inclusion of Bulgaria and Romania will then have a similar effect in due course). It was also mentioned that the opportunities for reducing immigration was limited by the freedom of movement of EU citizens.

There was a divergence of views about the possible level of migration in the long-term (but agreement that any forecast figure will inevitably be wrong). One point of view was that the current large scale movement will have burnt itself out in the long-term (assuming no unforeseeable war or similar). Others disagreed, with different reasons behind their thinking. One of these is the demographic pattern of the country; in 20–30 years time the baby boom generation will be retiring and large gaps in the labour market will only be able to be filled by migrants.

Another factor could be the introduction of a points system for work-related migration. Although this may initially limit and reduce immigration, labour shortages will inevitably be targeted via this route and the number admitted could increase significantly in the longer-term.

The effect of government policy on migration was also discussed. Family reunion may be made much harder and there are of course policies relating to asylum seekers, as well as work-related migration. It was pointed out that nearly 50 per cent of entrants on work permits are coming to work for government bodies. Student intake is also significant.

The use of a flat line for the long-term net migration projections was queried. One expert suggested fitting a variable trend, as historically migration figures have had this look. Chris responded that one of the reasons a constant assumption is used is because GAD doesn't want to convey a false impression that they can accurately predict annual small changes to the future migration level. The 'flat line' is effectively an average figure. This was understood but it was thought that this needs to be made much clearer whenever and wherever these figures are published.

Finally, it was stressed that more needs to be done to improve migration statistics generally and to disaggregate the flows into its various elements, for example, work migration and spouse/family reunion.

Conclusion

Both GAD/ONS and expert panel members commented that they found the meeting useful and stimulating. It was agreed that both sides would consider at a later date whether a formal group should be set up with meetings such as this becoming a regular part of the assumptions setting process.

Reference

1. 2004-based national population projections: underlying long-term assumptions. In brief, *Population Trends* **121**, pp 2–4.

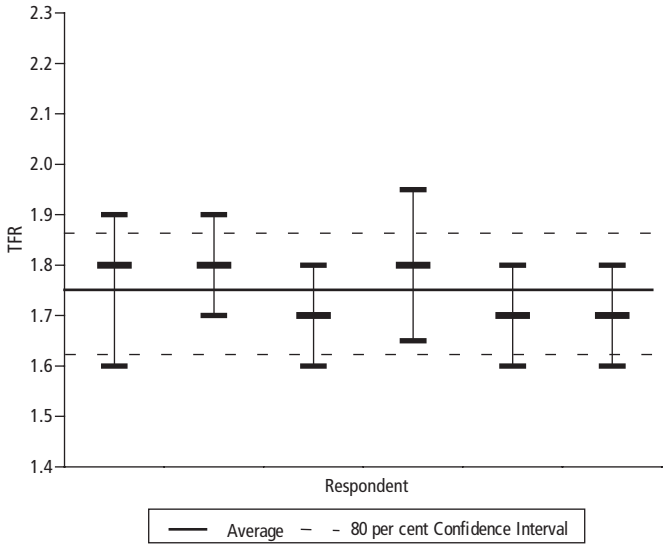
Annex A

Summary of responses to questionnaire

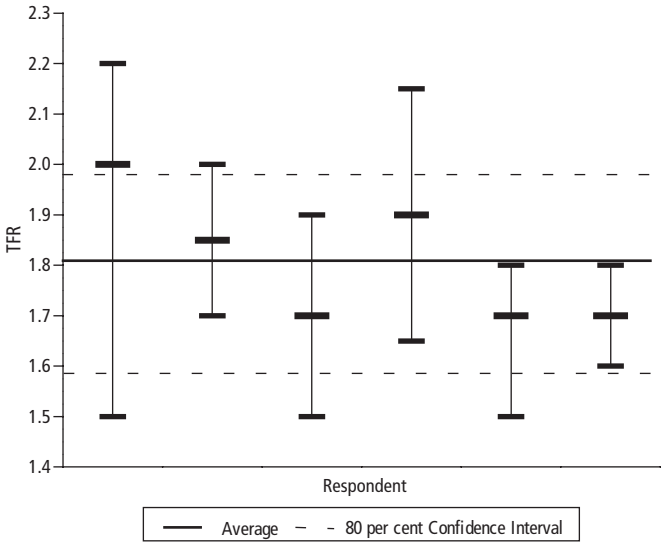
Responses on fertility assumptions

TFR estimates

Respondents' estimates of the TFR in 2010



Respondents' estimates of the TFR in 2030



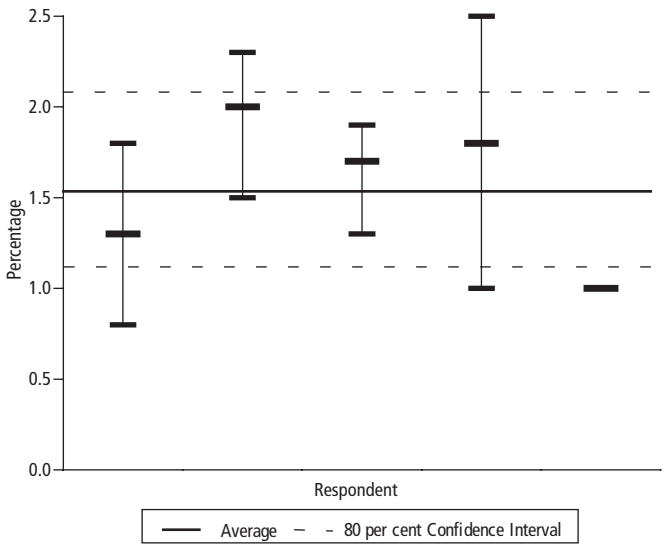
Does the respondent think TFR will increase between 2010 and 2030?

Increase	3
No change	3
Decrease	0

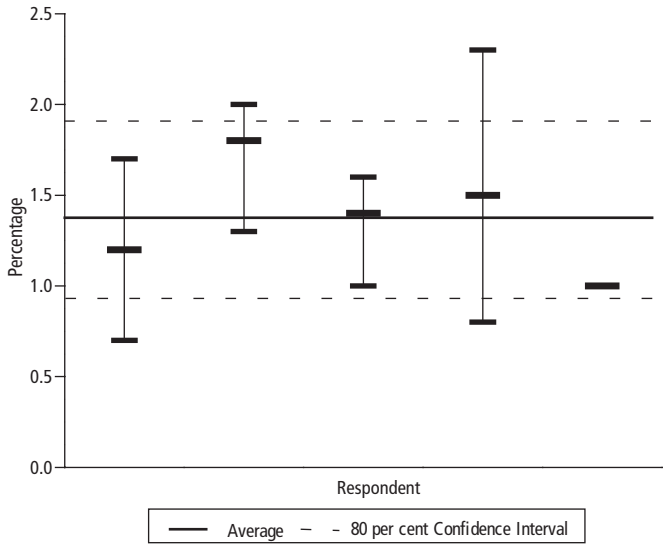
Responses on mortality assumptions

Average annual mortality improvement

Respondents' estimates of average mortality improvement in the year 2030, males



Respondents' estimates of average mortality improvement in the year 2030, females



Does the respondent think long-term mortality improvement will be similar for males/females?

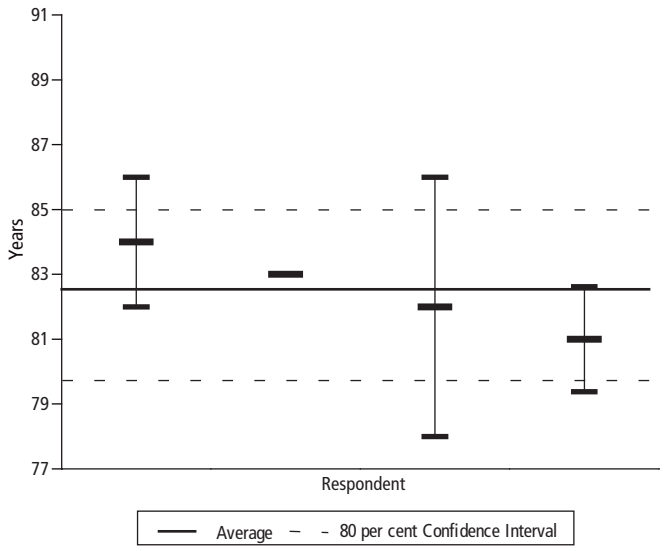
Male higher	4
Same	1
Female higher	0

What does the respondent think GAD should assume for long-term mortality improvement?

Constant rate of improvement	5
Long-term decline in improvement	0

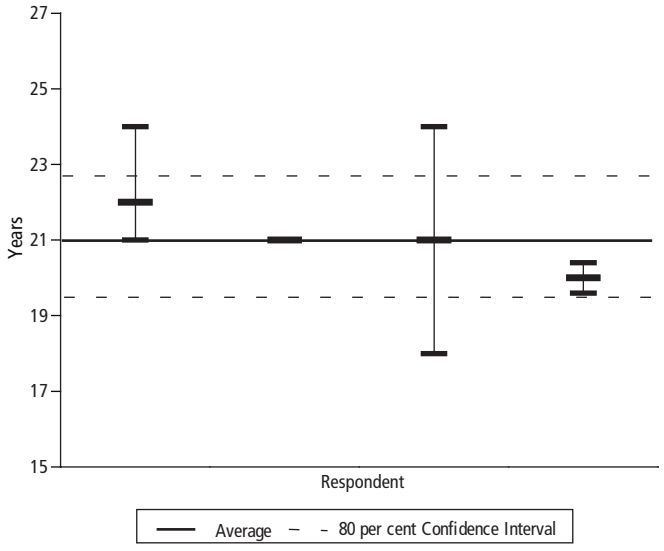
Life expectancy at birth

Respondents' estimates of EOL(0) in 2030, males

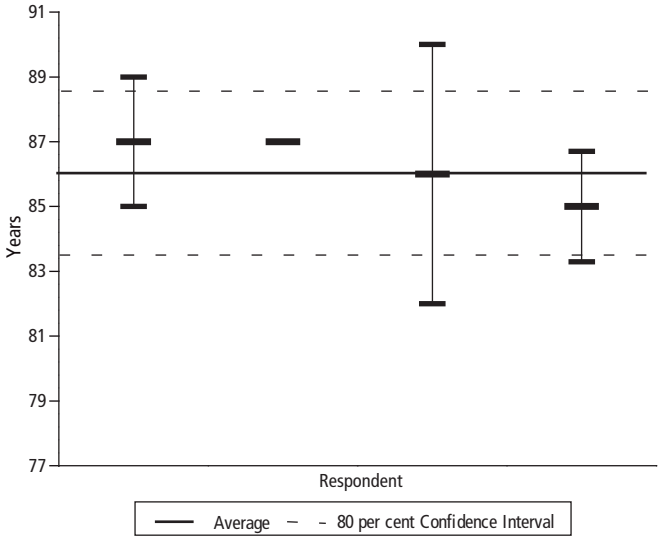


Life expectancy at age 65

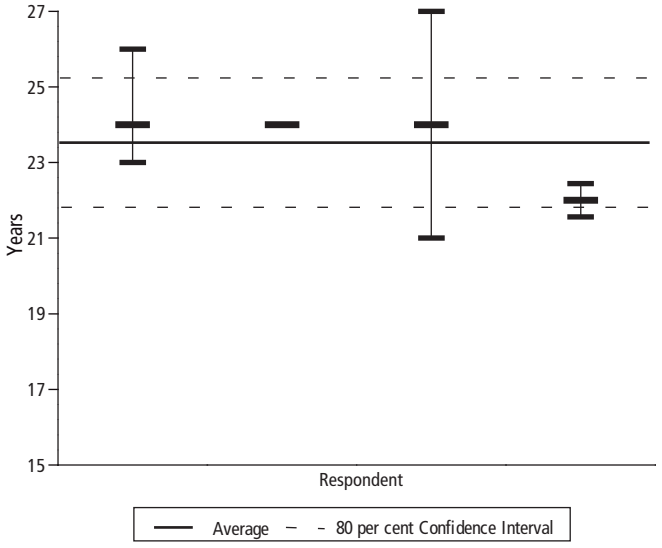
Respondents' estimates of EOL(65) in 2030, males



Respondents' estimates of EOL(0) in 2030, females



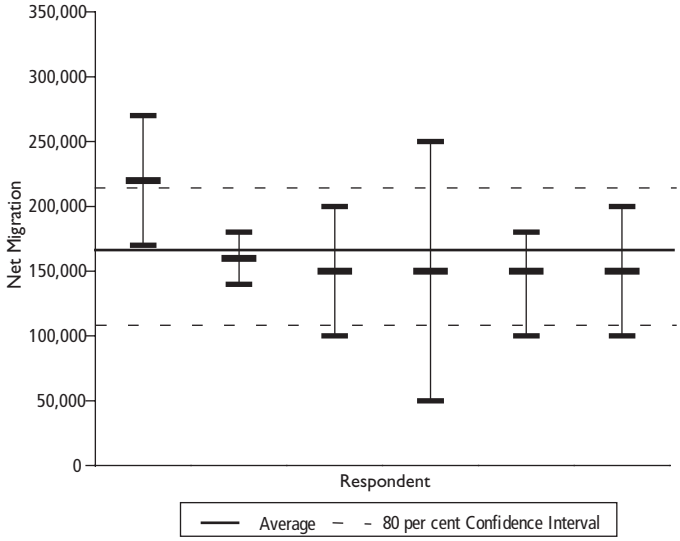
Respondents' estimates of EOL(65) in 2030, females



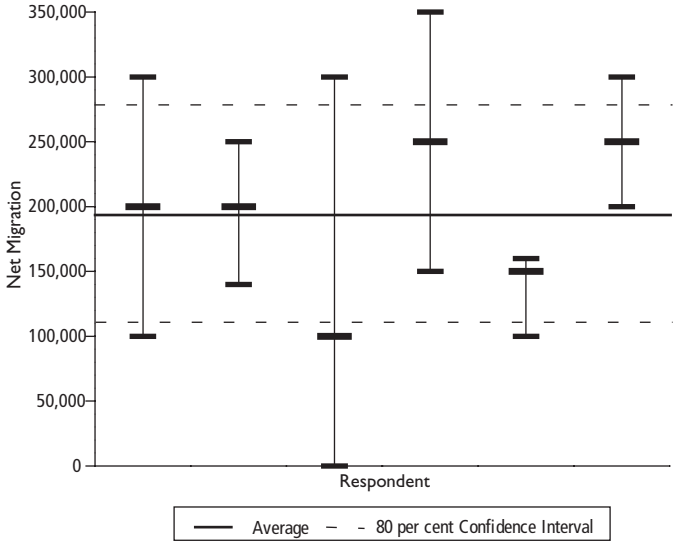
Responses on migration assumptions

Annual net migration

Respondents' estimates of average annual level net migration in 2009–2011



Respondents' estimates of average annual level net migration in 2029–2031



Does the respondent think net migration will increase between 2009–2011 and 2029–2031

Increase	3
No change	1
Decrease	2