Population Trends

Contents

Regulars

In brief 3

Population Trends: Readers’ views invited; Proposed change in methodology for calculating the Total Fertility Rate for subnational areas within England and Wales; Mid-2007 population estimates for Scotland; The Registrar General’s review of Scotland’s population; Mid-2007 population estimates for Northern Ireland; Migration estimates for Northern Ireland (2007); New population and migration statistics; Births and deaths 2007

Demographic indicators 6

Features

Have national trends in fertility between 1986 and 2006 occurred evenly across England and Wales? 7
Nicola Tromans, Eva Natamba, Julie Jefferies, Paul Norman

Explores fertility trends in statistical regions and local authorities over a 20-year period to improve understanding of changes in fertility at the subnational level

Home births in the UK, 1955-2006 20
Andrea Nove, Ann Berrington, Zoe Matthews

Reviews long term trends in childbirth at home using various data sources

The Development of a Postcode Best Fit methodology for producing population estimates for different geographies 28
Andy Bates

Highlights a methodology for producing population estimates for a range of different geographies all entirely consistent using postcode data

Tables

List of tables 35
Tables 1.1-9.3 36
Notes to tables 64

Reports

Marriages abroad 2002-2007 65
Divorces in England and Wales during 2007 71
Sub-national population projections for local authorities in Wales 76
Internal migration estimates for local and unitary authorities in England and Wales, year to mid-2007 81
Live births in England and Wales, 2007: area of residence 98
Death registrations in England and Wales, 2007: area of residence 106

Annual update

Civil partnerships during 2007: United Kingdom 117

Other population and health articles, publications and data 123
### Proposed change in methodology for calculating Total Fertility Rate for subnational areas within England and Wales

The Total Fertility Rate (TFR) represents the average number of live children a group of woman would expect to have if they experienced the age-specific fertility rates for a particular calendar year throughout their childbearing lives. The TFR is often used as an indicator of the level of fertility in a particular area in a specific year.

The Total Fertility Rate is calculated by summing the age-specific fertility rates for an area in a particular year. ONS currently uses fertility rates by single year of age (from 15 and under, 16, 17... to 43, and 44 and above) to calculate the TFR both at national level and for subnational areas.

In 2009 ONS intends to make a small change to the method used to calculate the TFR at geographies below national level. The proposal is to continue using the single-year-of-age method for calculating the TFR at national level (England, Wales and ‘England and Wales’). However, at geographies below national level (including government office regions, counties, local and unitary authorities, and health authorities/boards), ONS plans to use age-specific fertility rates for five-year (quinary) age groups to calculate the TFR.

This method of calculating the TFR involves summing the quinary age-specific fertility rates for an area in a particular year and then multiplying by five. For example, the age-specific fertility rate for age 20–24 is the number of births to mothers aged 20 to 24, divided by the population of women aged 20 to 24. Age-specific fertility rates would be calculated for the following five-year age groups: ‘under 20’, 20–24, 25–29, 30–34, 35–39 and ‘40 and above’. The TFR would then be calculated by summing these quinary rates and multiplying by five.

Advantages of the proposed methodology:

- The quinary method gives more robust TFRs for areas with small populations
- Using quinary groups at subnational level is consistent with the recommendation published alongside population estimates, that single-year-of-age data for local areas should be aggregated to at least five-year groupings for use in further calculations, since local population estimates by single-year-of-age are less reliable than those for five-year age groups
- The proposal is in line with the majority of international practice

ONS intends to implement this change for 2008 fertility rates, due to be published in 2009. To give users an idea of the impact of this future change, the report ‘Live Births in England and Wales, 2007: area of residence’ in this edition of Population Trends shows provisional TFRs for subnational areas in 2007 using both the current single-year-of-age method and the proposed quinary method. In addition, the article in this publication, ‘Have national trends in fertility between 1986 and 2006 occurred evenly across England and Wales?’, uses TFRs calculated by the quinary method for consistency over time, since data are not available to calculate subnational TFRs by single-year-of-age for the 1980s.

Any comments from users on the proposed change in methodology for calculating the TFR should be emailed to: fertility@ons.gov.uk by the end of December 2008. Alternatively comments may be sent to the following address:

Fertility Analysis Unit
Room 2300
Office for National Statistics
Segensworth Road
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### Mid-2007 population estimates for Scotland

On 24 July 2008, the General Register Office for Scotland published its Mid-2007 Population...
Estimates Scotland. The key points of this report are:

- The estimated population of Scotland on 30 June 2007 was 5,144,200, a rise of 27,300 on the previous year and the highest since 1983.
- Between mid-2001 and mid-2007, Scotland’s population increased by 1.6 per cent (+80,000) from 5.06 million to 5.14 million.
- Between mid-1997 and mid-2007, Scotland’s population increased by 1.2 per cent (+60,860) from 5.08 million to 5.14 million.
- In the twelve months up to 30 June 2007, the number of births exceeded the number of deaths by 1,100. The last time that births exceeded deaths in Scotland was in 1996–97. In 2005–06 there were around 300 more deaths than births.
- Over the year there was a net migration gain of 26,800, the largest level recorded since current records started in 1952. This includes net gains of 8,800 people from the rest of the UK, 16,800 people from overseas (including asylum seekers), and 1,200 due to armed forces movements.
- Over the year 51,500 people came to Scotland from England, Wales and Northern Ireland and 42,700 left Scotland to go in the opposite direction. The net inflow of 8,800 is about the same as the previous year’s, 8,900, net inflow although the numbers of people entering and leaving Scotland have both fallen.
- The net inflow from overseas exceeded that from England, Wales and Northern Ireland. Over the year 37,800 people (including asylum seekers) came to Scotland from overseas and 21,000 left Scotland to go overseas. The net inflow of 16,800 is the highest ever and compares to an inflow of over 80,000 people from the rest of the world. Once other adjustments are made, the total increase in the population was 27,300.
- For council areas, between mid-2006 and mid-2007, Clackmannanshire had the largest percentage population increase at +6.0 per cent followed by Highland (+5.6 per cent) and Strathclyde (+5.4 per cent). East Dunbartonshire had the largest percentage decrease at –0.6 per cent, followed by Eilean Siar and West Dunbartonshire with percentage decreases of –0.2 per cent.
- For NHS board areas, Lothian and Borders (both +1.1 per cent), Grampian (+1.0 per cent) and Forth Valley (+0.8 per cent) had the largest percentage population increases. The only NHS board area to have experienced a decline in population was Western Isles, although this amounted to only 50 fewer people (–0.2 per cent).
- In the year to mid-2007 the city council areas experienced net losses of migrants to the rest of Scotland. However, more migrants entered from overseas than went in the other direction and, in most cases, there were also net gains from the rest of the UK.
- Population density was 66 persons per square kilometre for Scotland and ranged from 8 persons per square kilometre in Inverclyde Council area to 38,316 persons per square kilometre in Glasgow City Council area.


The Registrar General’s review of Scotland’s population

Migration was the biggest contributor to population growth in Scotland last year.

This is one of the key findings in Scotland’s Population 2007: The Registrar General’s Annual Review of Demographic Trends, which was published on 15 August.

For the fifth year running, Scotland’s population increased in the year to 30 June 2007, reaching 5,144 million – the highest figure since 1983. A small part of the increase was because there were 1,100 more births than deaths. But migration was the biggest contributor to the increase. There were net gains of around 8,800 from the rest of the UK and 16,800 from the rest of the world. Once other adjustments are included, the total increase in the population was 27,300.

Duncan Macniven, the Registrar General for Scotland, said:

Records are being broken. The total population is the highest since 1983. Births are at their highest level since 1998–99. The number of births exceeded the number of deaths by 1,100, the largest natural change since 1992–93. Gains from migration were higher than in any year since our current records started in 1951. The population increase during the year was the highest since 1946–47.

Other key points in the Review are:

Population

For the fifth year running, Scotland’s population rose in the year to 30 June 2007 – by 27,300 to 5,144,200. There were around 1,100 more births than deaths in the year to 30 June 2007 and, in the 2007 calendar year, there were 1,800 more births than deaths. Migration was the biggest contributor to the increase in population, with net gains of around 8,800 from the rest of the UK (including gains from every region of Great Britain) and 16,800 from the rest of the world. The biggest percentage increases in population during the last 10 years were in West Lothian (+1.1 per cent), East Lothian (+0.8 per cent) and Perth and Kinross (+0.6 per cent). Edinburgh, with an increase in population of 22,350, saw the largest increase in absolute numbers. But more than half of the council areas decreased in population, with the greatest falls in Inverclyde, Dundee City and Eilean Siar, each with a reduction in population of 6 per cent.

Births

There were 57,781 births in 2007, over 2,000 (4 per cent) more than in 2006, and highest since 1997. Almost half of births were to unmarried parents. The average age of the mothers in 2007 was 27.4 in 1991. The total fertility rate rose to 1.73 in 2007, 17 per cent higher than the historic low of 1.48 in 2002 and the highest since 1982, although still much lower than the 1964 peak of 3.09 and the ‘replacement’ level of about 2.1.

In 2007, four out of five births in Scotland were to Scots-born mothers. But Scots-born mothers accounted for a much smaller proportion of the increase in the number of births since 2004 – 2 out of 5, compared with Polish-born mothers who accounted for 1 in 4. The age of mothers in 2007 varied significantly by socio-economic class: for mothers in ‘managerial and professional’ categories, there was a particularly marked peak of childbearing in the 30–34 age group, while those in ‘routine’ and ‘semi routine’ categories were the most likely to have children in their twenties. In the century leading up to the late 1950s, there was a gradual decline in births to unmarried parents, from around 10 per cent to around 4 per cent but, since the 1960s, the proportion has increased steeply and almost half of all children are now born to unmarried parents.

Deaths

There were 55,986 deaths in 2007. While this was almost 900 higher than the total for 2006, it was the third lowest total recorded since the introduction of civil registration in 1855. The three most common causes of death were cancer (15,274 deaths), coronary heart disease (9,343 deaths) and strokes (5,333 deaths). The proportion of deaths from the three most common causes has fallen from 65 per cent in 1981 to 53 per cent in 2007. Of people who died of cancer, more died from lung cancer (4,115) than any other kind. A male baby born around 2006 can expect to live for 74.8 years and a female baby for 79.7 years – an improvement since 1981 of almost 6 years for men and over 4 years for women – but still about 4 years lower than for the best-performing states in the European Union. The total number of suicides and probable suicides in 2007 was 838, a rise of 73 on 2006. There were 272 deaths of children aged under one in 2007, 24 more than in 2006.

Marriages

There were 29,866 marriages in Scotland in 2007, almost exactly the same as in 2006 but considerably lower than the typical number of
40,000 in the 1970s. ‘Tourist weddings’ are still an important feature – just over a quarter of the marriages in 2007 involved couples where neither party lived in Scotland. Almost half of those marriages took place at Gretna. About 48 per cent of marriages in 2007 were religious ceremonies and about 52 per cent were civil ceremonies, compared with 55 per cent and 45 per cent respectively in 1997. In 2007, almost 8,000 civil ceremonies (over a quarter of all marriages) were conducted at ‘approved places’ without registration offices – an option only introduced in 2002.

Divorces
There were 12,773 divorces in Scotland in 2007, 2 per cent fewer than in 2006.

Civil Partnerships
There were 688 civil partnerships registered in 2007 – 339 male and 349 female couples. That compared with 1,047 registered in 2006, the first full year of the new legal status.

The report can be viewed in full online at:
www.gro.scotland.gov.uk/statistics/publications-and-data/annual-report-
publications/rgs-annual-review-2007/index.html

Chapter 1 explains how Scotland’s population has changed in 2007. Chapter 2 contains extra information about fertility. Chapter 3, contributed by fertility experts from the Universities of St Andrews and Edinburgh, considers fertility, policy and the future of Scotland’s population.

Mid-2007 population estimates for Northern Ireland

On 31 July 2008, the Northern Ireland Statistics and Research Agency published the Mid-2007 Population Estimates for Northern Ireland. The estimates show that between mid-2006 and mid-2007 the number of people living in Northern Ireland increased by 17,500 (1.0 per cent) from 1.74 to 1.76 million people. The mid-2007 estimates can be found at: www.nisra.gov.uk/demography/default.asp?lnk=17.htm

Migration estimates for Northern Ireland (2007)

On 31 July 2008, the Northern Ireland Statistics and Research Agency published a report illustrating the impact of changing migration patterns in Northern Ireland. Migration has added almost 10,000 residents to the Northern Ireland population in each of the last two years and has had a greater effect on the population than the excess of births over deaths.

The report looks at a number of administrative/statistical sources to help estimate long-term international migration. The report and data can be found at: www.nisra.gov.uk/demography/default.asp?lnk=18.htm

New population and migration statistics

As part of the ‘coherent reporting’ programme whereby demographic statistics for different government departments are presented in a coordinated manner on a limited number of dates throughout the year (as reported in Population Trends 132 in brief), a number of statistics were published on 21 August 2008, including:

- Local authority population estimates for the UK and constituent countries, mid-2007
- Internal migration estimates for local authorities in England and Wales, mid-2006 to mid-2007
- Parliamentary constituency, National Park and ward population estimates (all covering England and Wales), mid-2006
- Ethnic group population estimates for local authorities in England, mid-2006

Statistics planned for publication in September 2008 include:
- Short-term migration estimates for England and Wales, mid-2006
- Inter-regional migration movements for the UK, year to December 2007
- Primary Care Organisation population estimates (provisional) for England, mid-2007
- Very elderly population estimates (revised) for England and Wales, mid-2002 to mid-2006
- Very elderly population estimates (provisional) for England and Wales, mid-2007
- Ethnic group population estimates for Primary Care Organisations in England, mid-2001 to mid-2006

Births and deaths 2007

Annual figures for births and deaths in England and Wales were published on 10 July 2008.


These annual figures and the reports, ‘Live births in England and Wales, 2006: area of residence’ and ‘Death registrations in England and Wales, 2006: area of residence’ in this edition of Population Trends are normally published in the summer edition. Publication was delayed due to problems encountered with the implementation of the registration online system (RON) at register offices in England and Wales during 2007. Provisional quarterly figures for births, deaths and childhood mortality for the quarter ending March 2008 are available in this edition, to the usual timetable.
Demographic indicators England and Wales

Figure A  Population change (mid-year to mid-year)

Thousands

- Natural change
- Total change

Year

Figure B  Total fertility rate

TFR (average number of children per woman)

Year

Figure C  Live births outside marriage

Percentage of all live births

Year

Figure D  Infant mortality (under 1 year)

Rate per thousand live births

Year
Have national trends in fertility between 1986 and 2006 occurred evenly across England and Wales?

Introduction

Throughout the 1990s, the total fertility rate (TFR see Box one) in England and Wales fell steadily; in contrast fertility has increased fairly rapidly since 2001. During this period, notable changes have also occurred in the ages at which women give birth. While national fertility trends are relatively straightforward to assess, fertility trends at regional and local level are more complex and many questions remain. In particular, do all areas exhibit the trends seen at national level? In addition, why do some areas have much higher fertility than others? Does high or low fertility in an area persist over time? How do age patterns in fertility vary across local areas?

This article looks at fertility trends within England and Wales over the last two decades, exploring how levels and age patterns of fertility have changed over time. In particular, it focuses on fertility trends in statistical regions and local authorities (LAs) over this period and compares the changes seen in these subnational areas with those observed for England and Wales as a whole. Several local authorities have been selected as case studies to enable a more in-depth analysis of fertility trends. Three case study areas where the total fertility rate (TFR) has been comparably high or low during the period 1986 to 2006 are discussed. Two local authorities experiencing large changes in the TFR are also explored in greater detail.

When examining trends for subnational areas over a 20-year period, geographic consistency over time is essential, but not easy to achieve – this explains the scarcity of work in this area. Changes in the boundaries of some local areas and changes in the geography used at regional level between 1986 and 2006 mean that time trends cannot be readily analysed using the births data published for each year. For this reason a consistent 20-year time series of births on the latest available boundaries has been
produced. Box one contains further information on the data and method used to calculate the fertility rates for this article.

A good understanding of fertility is important, as births are a key component of population change. Understanding fertility trends at subnational level may become increasingly important in the future. Assumptions about future levels of fertility are required for subnational population projections, which are used widely for planning in a number of different fields. ONS currently bases subnational fertility assumptions on observed fertility in each area, mainly over the previous five years. However, ONS is currently exploring the feasibility of producing variant projections at subnational level, which would require ‘high’ and ‘low’ fertility assumptions for each area. The analysis in this paper can be seen as a first step in gaining a better understanding of fertility trends and variations at subnational level that should help to inform possible work in this area.

What were the national trends between 1986 and 2006?

Total Fertility Rate

During the past 20 years the TFR for England and Wales has experienced several changes. Between 1986 and 1990 fertility generally increased; however, during the 1990s it experienced a steady decline and in 2001 the TFR hit a record low of 1.63 children per woman. Since 2001 the TFR has been increasing rapidly, reaching 1.86 in 2006 (Figure 1).

Age patterns of fertility

Major transformations in age-specific fertility have also taken place. Throughout the period 1986 to 2001, fertility decreased for women aged under 30 but consistently increased at older ages (30 and above). Since 2001 there has been a reversal in fertility trends for younger women, with rates starting to rise among women in their twenties. Fertility rates have continued to rise at older ages, with the greatest increases occurring among women aged 30 to 34. As a consequence, in 2004, the fertility rate for women aged 30 to 34 rose above the rate for women aged 25 to 29 for the first time, making the early thirties the most fertile age group within England and Wales.

In 1986 the peak age for having children was the 25 to 29 age group (Figure 2). Fertility at age 20 to 24 was also relatively high, while above age 30, fertility rates were considerably lower. By 2001 the curve had shifted downwards and to the right. This means that, compared with 1986, rates for the 20 to 24 group were substantially lower. The peak in 2001 was considerably flatter with similar rates at ages 25 to 29 and 30 to 34. Rates for women in their late 30s and 40s were higher than in
1986. By 2006 the curve had risen overall with a small increase in rates for the 25 to 29 age group. However, a much larger increase occurred among women aged 30 to 34, making this the new peak age for fertility. Since 2001, rates for women aged 35 to 39 and 40 and above have also continued to rise.

The initial fall in fertility observed in 2001 was driven by declining fertility rates for women aged 20 to 24 and 25 to 29. In contrast the recent increases in the TFR in England and Wales since 2001 have been driven mainly by increasing fertility rates for women in their thirties.

The proportion of total fertility contributed by women aged over 30 increased from 30 per cent in 1986 to 46 per cent in 2006, illustrating the postponement of childbearing. Fertility rates for women aged 35 to 39 and 40 and above, have more than doubled in the past 20 years and as a consequence the mean age of mothers has increased from 27.4 in 1986 to 29.1 in 2006 when considering all births in England and Wales.

Recent trends in UK fertility and some possible underlying explanations for these have recently been explored in more detail as part of the process of setting fertility assumptions for the 2006-based national population projections.

Exploring trends across the statistical regions

This section compares changes in the TFR over the period 1986 to 2006 for the statistical regions of England and Wales, and reports on regional differences in the age patterns of fertility. Government office regions are used in this report for comparison purposes across England. Wales is not a government office region but is referred to here as a statistical region for the purpose of representing trends across the whole of England and Wales.

Regional Total Fertility Rates

The TFR pattern noted above for England and Wales is evident for each region. All areas experienced a slight rise in fertility up to the early 1990s, with fertility then dipping to a record low between 2001 and 2002 before rising again until 2006. The regions with relatively high TFRs in 1986 and 2001, particularly the North West and West Midlands, continued to have high fertility in 2006, although all regions remained below the theoretical replacement TFR of 2.1 (Table 1).

The region with the highest TFR has varied somewhat over the last 20 years. Prior to 1993, the highest TFRs occurred in the North West, Wales and the West Midlands. Between 1994 and 2006 the West Midlands had the highest TFR every single year. In 2006, the TFR for West Midlands was 1.96, with the next highest TFR being seen in the North West (1.89).

The North East had the lowest TFRs during the late 1980s and from the mid-1990s onwards. London had the lowest TFRs during the early 1990s but its fertility then rose steadily up to the national level. The South West is also a relatively low fertility region and in 2006 shared the lowest TFR with the North East (1.79).

The North East displayed the largest decrease in TFR between 1986 and 2001 and, along with London and the North West, the greatest increase in TFR since then. Despite the recent increases in the North East (the region with the smallest population), fertility remains comparatively low.

Only Wales had a lower TFR in 2006 than in 1986. Relative to England and Wales as a whole, Wales itself was the only area with a downward trend throughout the period. In 1986 and 2001 the TFRs were 4.9 per cent and 1.1 per cent above the national level, but by 2006 was 0.25 per cent lower.

Over the 20-year period, regional TFRs in England and Wales do not show a clear geographical pattern, for example east-west or north-south. The West Midlands and North West tended to have relatively high TFRs whereas the South West, the South East and the North East had relatively low TFRs.

Regional age differences in fertility

The age-specific curves for three example regions are illustrated in Figure 3. In all three regions, overall fertility fell between 1986 and 2001 and increased to 2006.

In 1986, the curves for the North West and the East were relatively ‘young’ compared with the curve for London. By 2001, the rates for the 20 to 24 and 25 to 29 age groups in all three regions had substantially declined with the biggest decreases occurring in London. The rates for women aged 30 to 34 increased substantially in the East but only marginally in the North West and London. However, London saw the greatest rise in fertility at ages above 35. As a result of all of these changes, the peak age for childbearing had increased to 30 to 34 in London by 2001, but remained at 25 to 29 for the North West and the East.

In all three regions the fertility curves ‘aged’ between 2001 and 2006. By 2006, the East had joined London with a peak age for fertility of...
While there is no clear geographical pattern in terms of the TFR, looking at the age at which women are most likely to have a child, a north-south divide is evident within England and Wales. In 2006, the fertility of women in northern regions and Wales was highest between the ages of 25 and 29 whereas in southern regions fertility was highest at ages 30 to 34.

### Table 1: Total Fertility Rates by Statistical Region, 1986, 2001 and 2006

<table>
<thead>
<tr>
<th>Total Fertility Rate</th>
<th>Statistical Region</th>
<th>Total Fertility Rates</th>
<th>Actual Change in Total Fertility Rates¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>North East</td>
<td>1.79</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>North West</td>
<td>1.86</td>
<td>1.65</td>
</tr>
<tr>
<td></td>
<td>Yorkshire and The Humber</td>
<td>1.80</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>East Midlands</td>
<td>1.74</td>
<td>1.61</td>
</tr>
<tr>
<td></td>
<td>West Midlands</td>
<td>1.85</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>1.75</td>
<td>1.67</td>
</tr>
<tr>
<td></td>
<td>London</td>
<td>1.72</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td>South East</td>
<td>1.71</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td>South West</td>
<td>1.71</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>Wales</td>
<td>1.86</td>
<td>1.65</td>
</tr>
<tr>
<td></td>
<td>ENGLAND AND WALES</td>
<td>1.77</td>
<td>1.63</td>
</tr>
</tbody>
</table>


1 The actual change in fertility rates represents the increase or decrease in the number of children per woman over the period shown and has been calculated using the TFRs reported to 2 decimal places.

30 to 34, while the peak age remained unchanged in the North West at 25 to 29. In England and Wales as a whole, age 30 to 34 became the peak age group for fertility in 2004. In other parts of the UK, the changeover from highest fertility at ages 25 to 29 to ages 30 to 34 occurred slightly earlier – in 2001 for Northern Ireland and 2002 for Scotland.
Fertility trends in local authorities can differ quite substantially from the same region. The amount of variation present in local authority TFRs within each individual region has, in most cases, increased over the last 20 years. While the variation has generally increased, the distribution of TFRs has also shifted upwards in 2006 compared with 1986 – this is in line with the increased fertility at national and regional level over the same period.

Figure 4 illustrates how local authority TFR values were spread within selected regions in 1986 and 2006. Information on interpreting box plots can be found in Box two. The TFR distributions for the three selected regions have shifted upwards to differing degrees, with the lower end of the distribution (the point to which the lower whisker extends) seeing much less change than the upper end, thereby suggesting a persistence of low fertility behaviour in LAs with the lowest fertility.

Over the last 20 years the spread of TFR values has increased most notably in London. In 1986, the TFRs for Tower Hamlets and Newham were far higher than other authorities in London. By 2006 there was an increased number of local authorities in London with a relatively high TFR illustrated by the much extended upper whisker. In the East, the TFRs have also become more dispersed. In contrast, the North West has not experienced such a marked increase in the range of TFR values.

Population denominators – these are outlined in Box three. Any impacts are likely to be negligible although they should be borne in mind, particularly when examining fertility rates for areas with small populations, since local effects could be important.

Changing Total Fertility Rates across local authorities

At local authority level, the changes seen in the TFR over the last 20 years can differ considerably from those observed at national and regional level. The majority of local authorities (97 per cent) did however have a higher TFR in 2006 than in 2001, matching the increase in fertility observed for all individual regions and England and Wales as a whole.

At regional level the lowest TFR over the last 20 years was observed in either 2001 or 2002 – this is not the case for all local authorities. Figure 5 does illustrate, however, that the distribution of local authority TFRs generally follows a similar pattern to the TFR trends observed nationally and across all regions. The majority of local authorities experienced a fall in the TFR between 1986 and 2001 and a rise in the TFR between 2001 and 2006 as indicated by the initial downwards shift of the box plot followed by an upwards shift. In 82 per cent of local authorities the TFR was higher in 2006 than in 1986.

The TFRs are more widely spread in 1986 and 2006 compared to 2001. The lowest TFR value observed remained fairly stable over the period at around 1.2; however, the highest TFR varied quite considerably. When excluding the TFRs falling outside the whiskers, the spread of TFRs is similar in 1986 and 2001 but greater in 2006. This is also true when comparing the interquartile range.
Population Trends
Autumn 2008

In 2006 there were 25 local authorities with either a very high or very low TFR (falling beyond the upper or lower whisker) compared with 11 local authorities in 1986 and 12 in 2001. Local authorities for which the TFR was one of the ten highest or ten lowest in England and Wales in 1986, 2001 or 2006 are reported in Table 2 and Table 3 respectively.

The final column of each table lists the ten local authorities which feature most frequently in the ten highest or ten lowest TFRs when considering each individual year between 1986 and 2006.

Changing age patterns of fertility for local authorities

Over the last 20 years fertility rates at ages 30 to 34 have been steadily rising and as a result have overtaken fertility rates for women aged 25 to 29 in many local authorities (Figures 6a and 6b). In 1986, nearly all local authorities (94 per cent) experienced their highest fertility rates at ages 25 to 29. In 2006 this proportion had reduced to 51 per cent.

Box three

Correspondence between birth event numerators and population denominators

When calculating fertility rates it is important that the events in the numerator (the number of births) correspond to the women included in the denominator (exposed to risk of having a birth). This correspondence may not be exact in practice for two main reasons:

1. The assumption that the mid-year population estimate is representative of the population over the course of the year may not hold in areas with high migration flows among women of reproductive age

Age-specific fertility rates and the total fertility rate for a subnational area are calculated for a calendar year using:

- the number of births between the 1st January and 31st December to women usually resident in the area
- the estimated resident mid-year population for the area on 30th June

Women moving within the UK or as long-term international migrants may not be included in the mid-year population estimate of the area they provide as their ‘usual address’ at birth registration. For example, if a woman moves into area A from area B after the 30th June, and gives birth before the 31st December, the birth will be included in the numerator for area A, whereas the woman will not be included in the denominator for area A.

2. A definitional difference exists between ‘usual residence’ used in the population estimates, and ‘usual address’ of mothers collected at birth registration

Population estimates are produced on a usual residence basis; people arriving into an area from outside England and Wales will only be included in the population estimates if they are staying for 12 months or more. Similarly, those who are temporarily absent from England and Wales for less than 12 months will still be included in the population estimates.

This detailed definition of ‘usual residence’ is not used at birth registration. The ‘usual address’ at the time of the birth, as provided by the mother, is recorded regardless of how long she intends staying.

This means some births could appear in the numerator for area A whereas the mother would not appear in the population denominator for area A. In this instance area A could be England and Wales as a whole or a subnational area. For example, if a woman staying in England and Wales for 6 months gives birth in area A, the birth will be included in the numerator for the area if the mother gives a ‘usual address’ in area A, but she will not be included in the population denominator for that area. Conversely, women could be included in the mid-year population estimate for an area but due to temporary absence outside England and Wales, any births they have while absent from the country will not be registered within England and Wales.

At the subnational level there is a risk of imbalance in the number of births to residents of England and Wales occurring outside the country and the number of births occurring in England and Wales to visitors usually resident elsewhere. In most areas these effects are likely to be negligible but they may be noticeable in small areas where large numbers of people from outside England and Wales are staying for less than 12 months.
At the regional level, it was noted how by 2006 only southern regions had experienced the crossover of highest fertility rates from ages 25 to 29 to ages 30 to 34. The north-south divide was not as clear at local authority level – there were a fair number of local authorities in the north where in 2006 fertility was highest between the ages of 30 and 34.

In 1986, no areas experienced their highest fertility at ages 35 to 39. In 2006, Islington was the only area where the peak age of fertility was 35 to 39. The number of areas where the highest fertility levels were seen at ages 20 to 24 decreased only slightly from 15 in 1986 to 12 in 2006. Figures 6a and 6b, however, show that in most cases the areas experiencing the highest fertility at ages 20 to 24 differed in 1986 and 2006.

Relationship between the total fertility rate and the age pattern of fertility

Local authorities with a high TFR generally display high fertility at younger reproductive ages (under 30). In contrast, local authorities with a much lower TFR tend to have relatively low fertility at ages below 30 compared with areas with a high TFR but similar fertility levels at ages above 30. **Figure 7** highlights these differences in age patterns for local authorities with a high and low TFR.

In both sets of areas, women aged between 20 and 29 had lower fertility in 2006 than in 1986. This drop in fertility over the last 20 years was largest in areas where the TFR was low. However, for women over the age of 30, fertility was considerably higher in 2006 in both sets of local authorities.
Figure 6a

Map 1: Age group at which fertility rates are highest by local and unitary authority\(^1\), 1986

England & Wales

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1 Due to very low numbers of births, data for City of London has been combined with Hackney, and data for Isles of Scilly combined with Penwith. This is consistent with published figures.

Source: Office for National Statistics
Figure 6b

Map 2: Age group at which fertility rates are highest by local and unitary authority\(^1\), 2006

England & Wales

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1. Due to very low numbers of births, data for City of London has been combined with Hackney, and data for Isles of Scilly combined with Penwith. This is consistent with published figures.

Source: Office for National Statistics
Local Authority case studies

The following sections consider in detail the variations in fertility in five individual local authorities over the 20-year period. Figure 8 shows the TFRs in these five local authorities.

Three are in the regions highlighted earlier:

- Two local authorities with consistently high fertility from 1986 to 2006 – Newham in the London region, and Blackburn with Darwen UA in the North West
- One local authority with low fertility throughout the 20 year period – Cambridge in the East

In addition, two local authorities with a large change in the TFR are considered:

- Boston in the East Midlands, which has experienced a rising TFR since 2004
- Exeter in the South West, where the TFR has gradually decreased between 1986 and 2006

The changing age patterns of fertility underlying the TFR trends in these five authorities are discussed, alongside other local factors that may be related to fertility change.

High fertility: Newham LA and Blackburn with Darwen UA

Blackburn with Darwen and the London Borough of Newham were the only two areas to feature in the ten local authorities with the highest TFRs in every single year from 1986 to 2006 (Table 2). Both authorities experienced total fertility rates above two children per woman throughout the 20-year period.

As noted earlier, this high overall fertility is associated with high fertility rates among women in their twenties. Comparing Newham with the London region as a whole (Figure 9), fertility rates for women aged 35 and above were remarkably similar in the two areas in both 1986 and 2006. However Newham’s high TFR relative to London clearly results from above average fertility among women in their twenties, as indicated by the larger gap in the chart at ages 20 to 24 and 25 to 29. The same pattern can be seen when comparing Blackburn with Darwen UA with the North West region (Figure 10).

Despite having similar TFRs, Newham and Blackburn with Darwen UA do have distinctive age patterns of fertility. Newham has a slightly older fertility pattern, in line with the London region as a whole. In Newham, women aged 25 to 29 had the highest fertility throughout the 20-year period. In contrast, Blackburn with Darwen UA saw women aged 20 to 24 generally experiencing the highest rates, although fertility at age 25 to 29 was also high and exceeded that of the younger group in 1986 and from 2004 onwards. Between 1986 and 2006, fertility rates for women in their twenties were generally higher in Blackburn with Darwen UA than in Newham, whereas fertility rates for women in their thirties and forties were generally higher in Newham. Fertility rates for women aged 35 to 39 and 40 and over have roughly doubled in Newham over the last 20 years, while fertility at older ages has not increased to the same extent in Blackburn with Darwen UA.

The characteristics of the women giving birth also vary between the two local authorities. In 2006, Blackburn with Darwen UA had a slightly higher proportion of births to women born outside the UK (27 per cent) than England and Wales as a whole (22 per cent). In contrast, three-quarters of births in Newham (74 per cent) were to non-UK born mothers. The proportion of births to mothers born outside the UK is a consequence of the size and age structure of the UK born and the overseas born population in an area. The estimated fertility rates for these two groups can have an additional effect.

Previous research has suggested that women born in certain countries\(^7\), including Pakistan, India, Bangladesh and African countries, may have higher fertility than UK born women\(^8,9\). In Blackburn with Darwen
women born in Pakistan and India made the largest contribution to births, with one-fifth of all births in the area in 2006. In Newham, mothers came from a wider range of countries. Over one-quarter of births in 2006 were to women born in Bangladesh, India or Pakistan, and a further 14 per cent to women born in African countries in the New Commonwealth. It is possible that the fertility contribution of these communities is one factor keeping the total fertility rates in these authorities above average.

**Low fertility: Cambridge**

Cambridge has had a consistently low TFR over the past 20 years, featuring in the ten local authorities with the lowest TFRs each year between 1986 and 2006 (Table 3). The TFR in Cambridge did not rise above 1.50 during this period (Figure 8).

Cambridge had both a lower level and an older age pattern of fertility than the East region as a whole in 2006 (Figure 11). However both areas experienced a clear shift in the age pattern of fertility between 1986 and 2006. The highest fertility rates occurred in the age group 25 to 29 in 1986, but by 2006, women aged 30 to 34 were experiencing the highest rates of childbearing. In Cambridge the fertility rate for women aged 25 to 29 has almost halved over the last 20 years, making 30 to 34 and 35 to 39 the two most fertile age groups in 2006.

The presence of higher education institutions in Cambridge is likely to be having a large impact on its fertility. The large student population in this local authority boosts its population not just around ages 18 to 22 but well into the twenties age groups. It is not the fact that the population is high at these ages that affects the TFR (an age-standardised measure) but the characteristics of this additional population. Students are likely to have lower fertility while studying than women of the same age who are not in higher education and graduates tend to enter motherhood later than women without higher qualifications. This impact may be more noticeable in authorities such as Cambridge and Oxford where the size of the student population relative to the non-student population is high compared with other cities.

Like Newham and Blackburn with Darwen, Cambridge also had an above average proportion of births to mothers who were born outside the UK in 2006 (41 per cent). These mothers originated from a diverse range of countries, with no particular group dominating. Women born in other EU countries contributed 13 per cent of births in Cambridge, while 5 per cent of babies had mothers born in the USA, Canada, Australia or New Zealand.

These three case studies demonstrate that there is no clear-cut relationship between the proportion of births to mothers born outside the UK and the level of fertility in an area. This is because the non-UK born population is not homogeneous – although the TFR for non-UK born women is higher than for UK born women, there is considerable variation in fertility levels of women from different countries of birth.

**Changing fertility: Exeter and Boston**

In 1986, the TFRs in Boston (1.64) and Exeter (1.63) were very similar. However over the last 20 years their TFRs have diverged considerably (Figure 8). By 2006, Boston’s TFR (2.37) was over one child higher than that of Exeter (1.28).

Boston, a relatively small local authority in the East Midlands, saw the biggest increase in the TFR of all local authorities in England and Wales between 1986 and 2006. Boston’s TFR fluctuated between 1.61 and 1.80 during the 1980s and 1990s, but after 2003 increased rapidly, placing Boston in the ten authorities with the highest fertility in 2006 (Table 2).

In contrast, Exeter in the South West experienced one of the greatest decreases in the TFR over the whole 20-year period. Although there were some year-on-year increases, the overall trend was downwards and by 2006 Exeter’s TFR had fallen to 1.28, lower than that of Cambridge.

Between 1986 and 2006 there has been a clear shift towards an older age pattern of fertility in Exeter (Figure 12). Over this period fertility rates for women aged 20 to 24 and 25 to 29 more than halved. For example, fertility at age 20 to 24 fell from 78 births per 1,000 women in 1986 to 30 births per 1,000 women by 2006. Fertility among women aged 30 to 34 remained relatively stable over the two decades, while the rate for women aged 35 to 39 more than doubled.

These trends are likely to be influenced by changes in Exeter’s population, relating to students in particular. The number of students at Exeter University increased from around 5,000 FTE (Full Time Equivalent) in 1986 to around 12,000 FTE in 2006. As noted earlier, the presence of a university is likely to influence the population size at age 25 to 29 as well as the younger ages, due to those studying for higher degrees and graduates staying on in the area, perhaps encouraged by organisations such as the Met Office relocating to Exeter in recent years.

In Exeter, the female population aged 20 to 29 grew by 44 per cent from 1986 to 2006, compared with a decrease in numbers in this age group in England and Wales as a whole. At the same time the number of births in...
this age group fell faster in Exeter, hence fertility rates among women aged 20 to 29 in Exeter decreased at a far greater rate than nationally. As in Cambridge, this is likely to relate to the postponement of fertility to later ages among higher education students and graduates.

In contrast to Exeter, fertility rates in Boston increased considerably between 1986 and 2006 for all age groups except teenagers (Figure 12). The age pattern of fertility has remained young, with the highest rates among women aged 25 to 29 in both 1986 and 2006 but high rates also among women aged 20 to 24 throughout the period. Much of the rise in the fertility of younger women has been recent – for example fertility rates among women aged 25 to 29 increased by more than a half, from 99 births per 1,000 women in 2003 to 156 births by 2006. In recent years Boston’s age pattern of fertility has become similar to that of Blackburn with Darwen. However, other aspects of fertility are different – for example 45 per cent of births occurred within marriage in Boston, compared with 62 per cent in Blackburn with Darwen.

Examining mothers by country of birth can provide some information on this recent increase in fertility. In 2006, over 19 per cent of births in Boston were to women themselves born outside the UK. This is just below the average proportion for England and Wales but represents a rapid rise from the 8 per cent of Boston births to non-UK born mothers in 2003. This reflects the inflows of short-term and long-term migrant workers from abroad that Boston has experienced in recent years.

Much of the increase is due to a rise in the number of births to mothers born in eight out of the ten countries that acceded to the European Union in 2004. Births to these mothers increased from zero in 2003 to nearly 8 per cent of all births in 2006 (compared with 1 per cent in England and Wales as a whole). Women born in other EU countries, in particular Portugal and Germany, contributed a further 4 per cent of births in 2006. This reflects the inflows of short-term and long-term migrant workers from abroad that Boston has experienced in recent years.

This does not necessarily imply that these recent migrants have higher fertility; if the foreign born make up an increasing proportion of an area’s female population, the proportion of births to mothers born outside the UK will increase even if both groups have the same fertility rates. However, migration may have an impact on the timing of childbearing. For example, research in France has noted that immigrant women typically have low fertility prior to immigration, followed by high fertility immediately after immigration. If this were also the case in England and Wales, the TFR could be inflated by this timing effect. The impact would be particularly noticeable in an area with a small population such as Boston.

In addition, fertility rates in areas that are home to significant numbers of short-term migrants, such as Boston, may be pushed upwards if there is a mismatch between the numerator and denominator used to calculate the fertility rate. This may occur if some births to short-term migrants are included in the numerator because the mother gives a usual address in England and Wales at birth registration, but the mothers are not included in the population estimates (the denominator) since they are not considered usually resident in England and Wales (see Box three). It is likely that Boston’s rapidly rising TFR since 2004 is due to a combination of these factors.

Conclusions

During the past 20 years fertility patterns within England and Wales have changed considerably. Both the general decline in fertility experienced nationally between 1990 and 2001 and the fairly rapid increase in fertility since 2001 are also evident at the regional level. Fertility trends within individual local authorities are, however, much more wide ranging and can differ quite substantially from the trends of the region within which they are located.

This paper has also demonstrated that local authorities with a high TFR generally display much higher fertility at younger reproductive ages than local authorities with a low TFR. At older ages fertility levels in both types of area are generally very similar.

The local authority case studies have helped to highlight local factors which may impact upon fertility within small areas – at the regional level these effects are masked. While studying, students are likely to have lower fertility than women of the same age not in higher education and graduates are likely to enter motherhood later than women without higher qualifications. The presence of large numbers of students in a local authority is therefore likely to have a downward effect on fertility. There is less of a clear-cut relationship between the proportion of births to mothers born outside the UK and the level of fertility in an area, due to the considerable variation in fertility levels of women from different countries of birth. However, the fertility contribution of women born in certain countries such as India, Bangladesh, Pakistan and African countries could be associated with higher fertility in certain areas. Recent increases in the number of births to women born in countries that acceded to the European Union in 2004 could also be boosting period fertility in some areas. However, it is unclear whether this results from higher fertility among these women or simply timing effects.

Exploring fertility trends within regions and local authorities has provided a better understanding of the recent changes in fertility at the subnational level and the changing patterns of fertility by age group. This will aid any future work on subnational fertility variants which will be required if variant subnational population projections are to be produced.

### Key findings

- Changes in the Total Fertility Rate (TFR) for England and Wales as a whole between 1986 and 2006 are reflected closely at the regional level but are not always mirrored at local authority level.
- In 1986, the most fertile age group in all statistical regions was 25 to 29. By 2006, the most fertile age had increased to 30 to 34 years for the East and all southern regions of England, giving an older pattern of fertility in the south than the north.
- Within each statistical region, local authority TFRs were more widely spread in 2006 than in 1986.
- Local authorities with a relatively high TFR display much higher fertility at younger reproductive ages compared with local authorities with a low TFR.
- Local authorities exhibiting a relatively low TFR have an older age pattern for childbearing. The fertility levels observed at older ages are however very similar to those observed in areas where the TFR is relatively high.
- Particular population groups such as students, graduates and migrants, which may be more dominant in certain areas, can impact upon period fertility. Changes in the level and age pattern of fertility could result from timing effects or actual differences in the completed family size of particular population groups.

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Notes and references
4 In developed countries such as the UK, a fertility rate of 2.1 is usually taken as the approximate number of children per woman needed for the population to replace itself (2.075 is used as a more accurate estimate for the UK in this context). For a more detailed discussion of replacement fertility, see Smallwood, S and Chamberlain, J (2005) Replacement fertility, what has it been and what does it mean? Population Trends 119, 16–27.
5 The term ‘local authorities’, is used here to cover both local authorities and unitary authorities.
7 Country of birth of mother is used for this analysis since this information is collected at birth registration, unlike ethnicity or migration history. Care is needed in interpretation as country of birth cannot be used as a proxy for these variables. For example, not all women born outside the UK will be recent in-migrants. Similarly, the UK born group will include the children of earlier in-migrants (the second and third generation).
9 Birth Statistics, Series FM1, Table 9.5. Available at: www.statistics.gov.uk/downloads/theme_population/FM1_35/FM1_No35.PDF
11 TFRs for UK and non-UK born women living in England and Wales have recently been produced by the Office for National Statistics for 2004 to 2007. These new estimated TFRs use estimated populations from the Annual Population Survey for the denominators. Country of birth of mother is collected at birth registration. In 2006, the estimated TFR for women born outside the UK was 2.43 – this was considerably higher than the estimated TFR for UK born women, 1.76. Available at: www.statistics.gov.uk/downloads/theme_population/mothers_country_of_birth_further_tables_commentary.xls (Table 1)
12 Personal correspondence with Exeter University.
13 Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia joined the European Union in May 2004. Cyprus and Malta also joined the EU in May 2004; however, births to mothers born in these countries are not included here because as members of the Commonwealth their nationals had less restrictive rights of entry to the UK before joining the EU.