

**This document refers to estimates produced prior to the revisions on 22 August 2007. It will be updated in due course.**

## **National Statistics**

### **Population Estimates**

#### **A Short Guide to Population Estimates**

Revised November 2004

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## 1. Introduction

This short guide aims to answer some frequently asked questions about population estimates.

The Office for National Statistics (ONS) produces annual estimates of the resident population as at 30 June each year. The population estimates tell us how many people live in the UK as a whole and in each local area and provide information on age-sex structure of the population in these areas by age and sex.

The most authoritative population estimates come from the Census, which takes place every 10 years in the UK, the most recent being held in April 2001. Population estimates from the Census are updated each year to produce mid-year population estimates for the years in between Censuses.

## 2. Population estimates – what is available?

The latest population estimates can be found on the National Statistics web site at:

<http://www.statistics.gov.uk/popest>

Under the ‘population estimates – current releases’ link, it is possible to download various estimates of the resident population for:

- The UK as a whole and England, Wales, Scotland and Northern Ireland separately by sex and single year of age.
- Government office regions, counties, unitary authorities and local government districts in England and unitary authorities in Wales by sex and five-year age group or broad age group (children, working age and older people).
- Health areas in England and Wales (strategic health authorities in England and local health boards in Wales) by sex and five-year age group or broad age group.
- Legal marital status for England and Wales as a whole.
- Population estimates by primary care organisation in England are also due to be published in late 2004.

Datasets may be viewed on screen or downloaded free of charge in Excel or CSV format. For further information on availability of population estimates, please contact the Population Estimates Unit at ONS (see section 10).

Further population statistics are also available on the ONS web site at:

<http://www.statistics.gov.uk/CCI/nscl.asp?ID=7588&x=10&y=17>

These include estimates of migration to and from the UK and within England and Wales, statistics relating to events such as births, deaths, marriages, divorces and projections of the population in the future.

## 3. What are population estimates used for?

Mid-year population estimates currently have a wide variety of uses within central government, as well as being used by local authorities and health bodies, other public bodies, commercial companies and individuals in the private and academic sector. These uses can be categorised into two broad groups:

- Those where the absolute numbers are of key importance. This may be in terms of allocating financial resources from central government, planning services or grossing up survey results.

Some of the main central government uses are concerned with resource allocation. These are carried out by the Office of the Deputy Prime Minister for England, and by the Welsh Assembly Government.

- Those where the population figures are used as denominators in the calculation of rates and ratios, for example death rates.

The above requirements are met by the annual population estimates for local and health areas. Local authorities and health bodies make use of these estimates for their own planning and resource allocation procedures, but frequently they require information for smaller areas. The Census also provides more detailed information on the population once every ten years. From the Census, information is available for smaller areas subject to constraints imposed by the need to preserve the confidentiality of individuals. Some local authorities also conduct research of their own (for example using electoral register data) to obtain a more detailed understanding of changes in and characteristics of the population in their areas between Censuses.

#### 4. How is the 'population' defined?

The latest series of population estimates (mid-2001 onwards) are based on the 2001 Census and relate to the **usually resident** population. In simple terms, this means that population estimates are estimates of people where they usually live. The usually resident population does not always coincide with the number of persons to be found in an area at a particular time of the day or year. The daytime populations of city centres and the summertime populations of holiday resorts will normally be larger than their usually resident populations.

The population base from the 2001 Census underpins the mid-year population estimates resident base and is defined as follows:

*'The 2001 Census has been conducted on a resident basis. This means the statistics relate to where people usually live, as opposed to where they are on Census night. Students and schoolchildren studying away from home are counted as resident at their term-time address. As in 1981 and 1991, residents absent from home on Census night were required to be included on the Census form at their usual/resident address. Wholly absent households were legally required to complete a Census form on their return. No information is provided on people present but not usually resident.'*

For most people, defining where they 'usually' live for the purposes of the Census is quite straightforward. However for a minority of people the concept of 'usual residence' is more difficult and it may be difficult to apply a general rule as to where they should be assigned as 'usually' living. Groups included in this category are:

- students
- armed forces
- prisoners
- seasonal workers
- contract workers and others who frequently move with their job
- some people living in communal establishments
- rough-sleepers
- people with frequently used second homes in the UK or abroad
- foreign students and au pairs.

- people who live and work away from a family home for part of the week
- those with informal living arrangements (for example children who regularly move between a mother and father's home, or adults who live with a partner for part of the time but maintain a separate residence).

The usual residence for students is specifically referred to in the definition of resident population for the 2001 Census given above. For other groups, the definitions used in the 2001 Census are carried through into the population estimates. For example, communal establishments are regarded as being the usual residences of people who have been living there for six months or more.

In practice, when compiling a population estimate, a number of data sources have to be used, each with its own definition of usual residence. For example, in the Census, individuals are left to provide their own interpretation of their usual residence whereas in the International Passenger Survey (IPS), used to estimate international migration, a more precise definition of residence is used. These differences in definition are becoming increasingly important, and are the subject of current research into population estimates.

## **5. How does ONS estimate the population?**

Population estimates are made using the cohort component method. This is a standard demographic method also used by several other national statistics institutions that have access to high quality data sources for the components of population change. For example, this method is used by the Australian Bureau of Statistics and by the US Bureau of the Census.

Mid-year population estimates are made for the population resident on 30 June of the reference year. The starting point for the estimate is the resident population on 30 June in the previous year. This population by single year of age is then aged on by one year (for example all three-year-olds become four-year-olds one year later). Those who have been born during the 12 month period are then added on to the population and all those who have died during the 12 month period are removed according to their age, sex, and their usual place of residence.

The other factor to be taken into account in estimating the national population is the movement of people in and out of the UK (international migration). An international migrant is defined as a person who changes his or her country of residence for a period of at least a year. When estimating the population of different areas of the UK, movements within the UK (internal migration) must also be accounted for. Internal migration includes both cross-border moves between the four constituent countries of the UK and moves between local areas within each part of the UK. Migration is the most difficult part of the population estimate process to estimate precisely, as migratory moves are not registered in the UK, either at the national or local level. The best proxy data available on a nationally consistent basis are used to estimate migration. ONS is continually researching ways of ensuring and improving the quality of the population estimates. This research includes analysis of possible new data sources that may become available.

### **Summary of the cohort component method**

- Take the previous mid-year resident population and age-on by one year.
- Then estimate the population change between 1 July and 30 June by:
  - Adding births occurring during the year
  - Removing deaths occurring during the year
  - Allowing for migration to and from the population of the area

In addition to the process summarised above, adjustments are also made for some mobile population groups that are not captured by the migration estimates. More detail on these groups is provided in section 7.

When the Population Estimates Unit receives data for the various components, checks are carried out and comparisons made with previous years' data to gauge consistency and completeness of coverage. The data are then processed electronically to produce the mid-year estimate. Quality assurance takes place at each stage of this process. This may include calculation of demographic rates and ratios to help check the plausibility of the data; for example the sex ratios for births in each area are examined.

The method above describes how mid-year population estimates are calculated for years when there is no Census. For Census years such as 2001 a slightly different approach is necessary. Rather than ageing on the population by one year, the population only needed to be aged on by the nine weeks between the Census in April and 30 June 2001. Similarly, the components only needed to account for change during the nine-week period rather than a whole year.

## **6. Where do the data for estimating population change come from?**

### **a. Births and deaths**

The compulsory registration of births and deaths ensures that ONS receives very high quality data for these events from the Registrar General's office.

### **b. Internal migration**

From the mid-1999 population estimate onwards, data from General Practitioner (GP) patient records have been used to estimate flows of internal migrants between areas within England and Wales and also to and from Northern Ireland and Scotland.

Every former health authority in England and Wales holds a register of the patients registered with GPs within their area of responsibility. This contains each patient's NHS number, date of birth, sex and postcode. ONS obtains an annual download from each patient register as at 31 July each year. This date is based on the assumption that it takes about a month to register with a GP and hence appear on the patient register after moving to a new area. By combining all these extracts together and removing duplicate and temporary records, ONS creates a total patient register for the whole of England and Wales. Comparing records in one year with those of the previous year by linking on NHS number enables identification of people who change their postcode. A migrant is defined as a person who, between one year and the next, changes their area of residence. This method of comparing registers at two snapshots in time will miss certain groups of people who do not appear on the patient registers in two consecutive years (births, deaths, those joining or leaving the armed forces or entering or leaving the UK). To overcome this issue, the estimates of the number of

migrants from the patient register are constrained to the National Health Service Central Register (NHSCR), which measures moves between former health authorities only but has the benefit of being constantly updated. By combining the two data sources, ONS can produce the best possible estimates of internal migration.

Prior to the mid-1999 population estimates, the NHSCR was used to estimate internal migration at the former health authority level and local changes in electoral registers were then used to distribute the estimates down to local authority level.

### c. International migration

The sources of international migration data are as follows:

- Data on the number of people intending to stay in the UK or leave the UK for a year or more are obtained (at national and former health authority level) from the International Passenger Survey (IPS), an ONS sample survey of passengers arriving at and departing from the main UK air and sea ports and the Channel Tunnel.
- Visitor and migrant data from the IPS are used to estimate changes in intentions. Visitor switchers are people who initially visit or leave the UK for a short period but subsequently stay for a year or longer and therefore become migrants. In contrast migrant switchers are those who intended to migrate but in fact stay in the UK or abroad for less than one year and should not be counted as migrants.
- Data on asylum seekers and their dependants are provided by the Home Office. Applications for asylum (excluding an estimate of those removed from the UK within one year and a small number of asylum seekers captured by the IPS) provide the basis for estimated inflows of asylum seekers. Data on removals, refusals, withdrawals and appeals for principal applicants and dependants are used to estimate outflows of unsuccessful asylum seekers leaving the UK without being captured by the IPS.
- Estimates of migration flows between the UK and the Irish Republic are produced using information from the Irish Quarterly National Household Survey and the National Health Service Central Register.

Data from these sources are combined to provide estimates of total international migration. For the purposes of producing population estimates, the migrant flows are apportioned by age and sex and to local authority level either using the information provided as part of the data or by applying the best distribution available. For example, IPS inflows are apportioned from former health authorities to local and unitary authorities using an in-migrant distribution from the 2001 Census. Flows of asylum seekers and their dependants are apportioned to local areas using distributions showing asylum seekers accommodated by the National Asylum Support Service (NASS) by local authority under the Government's dispersal legislation and the stock of asylum seekers supported but not accommodated by NASS.

## **7. How are armed forces, prisoners and school boarders accounted for in the population estimates?**

Prisoners, boarding school pupils, armed forces (home and foreign) and foreign armed forces' dependants living in the UK are estimated separately from the rest of the population. This is because these groups are not covered by the migration data sources used and therefore movements of these groups between areas will not be accounted for. These groups also need to be estimated outside the ageing-on process because they have specific age structures that differ from the rest of

the population. For example if school boarders aged 17 were aged on each year between Censuses, they would be aged 27 by time of the next Census, which would clearly be incorrect!

Because the number of people within these groups can change from year to year, their populations are estimated separately each year using data collected from the sources listed below. When producing the population estimates, school boarders, prisoners, home and foreign armed forces and foreign armed forces' dependants for the previous mid-year are removed from the base population (the population resident at the end of the previous mid-year). The remaining population is then aged on by one year, before adding on the numbers in each group at the current mid-year. This method allows for any increase or decrease in resident populations within these groups in each area and also maintains their age structure.

a. Home armed forces

The Defence Analytical Services Agency (DASA) supplies data on where England and Wales troops of home armed forces are stationed. ONS normally consults with local authorities regarding the validity of the armed forces estimates for their areas – this provides valuable quality assurance of the input data.

Not all UK armed forces personnel live on the base where they are stationed. Since mid-year population estimates are on a 'residence' basis, armed forces need to be assigned to their area of residence rather than the area of the base on which they work. This is done using a 'base to residence' matrix from the 2001 Census which allocates armed forces to the authorities where they are likely to be living. This means that some personnel will be based in one local authority but living in another local authority.

b. Foreign armed forces and dependants

For foreign armed forces, ONS uses data on US troops plus dependants (children and spouses) stationed in England and Wales by area of residence. The US forces supply these data.

c. School boarders

Data for boarding school pupils are provided for England by the Department for Education and Skills (DfES) and for Wales by the National Assembly for Wales.

d. Prisoners

For the purposes of population estimates, prisoners are regarded as usually resident in a prison if they have been convicted and spent at least six months in prison. Those who are awaiting trial or have shorter sentences are included in the population estimates at their usual residence address rather than at the prison. The Home Office provides ONS with data on prisoners by age and sex for each individual prison.

## **8. Why are population estimates sometimes revised?**

It is not ONS' usual policy to revise population estimates between Censuses. The only time that the accuracy of a population estimate can be assessed is when authoritative, independent estimates of the population become available on a nationally consistent basis – this normally occurs when a Census takes place. The 2001 Census was seen as an opportunity to assess the accuracy of the population estimates over the previous decade.

Following the 2001 Census, an assessment of accuracy was made by comparing the expected population in mid-2001, as rolled-forward from the 1991 Census using the cohort component method, with the 2001 Census-based population estimate for mid-2001. The original report from this assessment can be seen here:

<http://www.statistics.gov.uk/populationestimates/01/commentary.asp>

Following the assessment of accuracy, ONS carried out an extensive program of research into population estimates for local areas, culminating in the Local Authority Population Studies final report published in September 2004:

[http://www.statistics.gov.uk/about/Methodology\\_by\\_theme/LAStudies.asp](http://www.statistics.gov.uk/about/Methodology_by_theme/LAStudies.asp). Accompanying this report, were revised population estimates for mid-2001 and mid-2002 that incorporated the results of the Local Authority Population Studies. In October 2004, a revised series of population estimates for 1992 to 2000 was also published in order to provide a consistent series of population estimates between the 1991 and 2001 Censuses.

ONS carries out an ongoing programme of research aimed at ensuring that the best methods and data sources continue to be used in compiling the mid-year population estimates.

## **9. Does ONS produce population estimates for areas smaller than local authorities?**

Census data for 2001 are available at ward level from Neighbourhood Statistics:

<http://neighbourhood.statistics.gov.uk/Default.asp?nsid=false&CE=True&SE=True>

The Census is the best source of population statistics for small areas; however Censuses are only carried out every ten years. In the years between Censuses, the smallest geographic area for which ONS currently publishes annual population estimates is at local authority level in England and Wales. However ONS has set up a research project to investigate the production of population estimates in the years between Censuses for geographical areas smaller than local authorities in England and Wales. This is in response to the increasing demand for small area statistics identified by initiatives such as New Deal for Communities, Best Value, the National Strategy for Neighbourhood Renewal (encompassing Neighbourhood Statistics) and a review of customer needs for population statistics carried out by ONS. Users are keen that ONS takes the lead in producing small area population estimates, which will be available to all on a nationally consistent basis. The research project is being advised by a Steering Group that includes experts in demography and methodology from central and local government as well as the academic sector.

Results from the 2001 Census gave ONS the ideal opportunity to evaluate possible data sources and methods that might be suitable for producing small area population estimates. As part of the research process, Census-based ward estimates for mid-2001 were produced and used to produce mid-2002 ward estimates consistent with the mid-2002 LA estimates available at the time. Three different sets of ward estimates for mid-2002 were produced using three shortlisted methods and these estimates were evaluated in order to identify a preferred method.

ONS Methodology Group have undertaken some quality assurance of the project work and proposed that the project team carry out some further work to see if the recommendation for a preferred method can be strengthened. It is now intended that ward estimates for mid-2001 and mid-2002 (consistent with the latest local authority estimates) using a preferred method are published in early 2005 for consultation purposes as ONS experimental statistics.

Further details of this work can be found at <http://www.statistics.gov.uk/sape/default.asp>

## **10. How can I contact the Population Estimates Unit at ONS?**

For further information or specific questions about population estimates, please contact us by:

Email: [Pop.Info@ons.gov.uk](mailto:Pop.Info@ons.gov.uk)

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