Office for National Statistics

Compendium

Comparing Subnational Population Projections to Mid-Year Estimates for 2015

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1. Executive summary

This report compares the subnational population projections (SNPPs) that are produced by the Office for National Statistics (ONS) for local authorities (LAs) in England for 2015 from the 2014-based and 2012-based SNPPs with the mid-year population estimates (MYEs) for 2015.

In this report the difference between the population estimates and the population projections is termed “error”. The report shows that:

- the level of error is lower for higher level geographical areas and when the period between the projection and the estimate (base) year increases
- “international migration in” was overprojected for all regions
- the 0 to 15 age groups for both males and females were underprojected in all regions, as was the female 65+ age group

2. Overview of methods

This report provides a snapshot of the short term accuracy of recent projections. For a more detailed accuracy assessment of projections, please see the accuracy report on the subnational population projections (SNPPs) which was published in August 2015. The methodology used to produce the population projections and the mid-year population estimates (MYEs) are supplied in Annex A. Projections are produced using past changes and trends to the population components which are then extrapolated into the future. In contrast, MYEs use changes to the population components observed in the previous year. For more detail please refer to the difference between population estimates and population projections.

Approach to analysis

In this report, the projected population for mid-2015 from the 2012-based and 2014-based subnational population projections (SNPPs) have been compared to the published mid-year population estimates (MYEs) for 2015. The differences between these are used as an indicator of accuracy and these are expressed as the MYE minus the projections. An “overprojection” is where the projection is higher than the equivalent population estimate and an “underprojection” is where the projection is lower than the equivalent population estimate.

Projection values for internal migration and cross border migration have been summed to create one set of internal migration values (in and out) that are comparable to the MYE values for internal migration (in and out).

Local authorities (LAs) “City of London” and “Isles of Scilly” have been excluded from the analysis due to the small population size of these areas. As the methodology used to produce the 2014-based subnational population projections for England explains, small population size contributes to highly volatile birth and mortality rates in these LAs.

3. Data analysis

Assessment of accuracy by level of geography

The 2012-based and 2014-based subnational population projections (SNPPs) for 2015 have been compared with the 2015 mid-year population estimates (MYEs) for the national, regional, county and local authority (LA) level in England. Table 3.1 provides the mean absolute differences for these geographical areas.

Table 3.1. Mean absolute error between population projections and mid-year population estimates by region, county and local authority in England for 2015

Level of Geography	2014-based Mean Absolute Percentage Error	2012-based Mean Absolute Percentage Error
National (England)	0.01%	0.32%
Region	0.11%	0.32%
County	0.13%	0.48%
Local Authority	0.28%	0.81%

Source: Office for National Statistics

Notes:

1. Absolute error is the absolute difference between the population estimates and the population projections (all values are expressed as positive).

The mean absolute error for regions is less than half that for local authorities. Based on the two sets of SNPPs, the closer the projections are to the base year the more accurate they are. Some of the error occurs at the national level (0.01% for the 2014-based projections).

It is harder to estimate the population in areas that have larger flows of international migrants or internal migrants (for example, persons and students moving to an area to work or study). This may explain the larger error at LA level where internal moves (across LA boundaries) may fall within larger counties and regions.

Table 3.2 presents error by region. The greatest 2014-based percentage error is observed for London while the greatest 2012-based percentage error is observed for the East Midlands.

Table 3.2. Error and percentage error between subnational population projections and mid-year population estimates for 2015 by region in England*

Region	2014-based Error	2012-based Error	2014-based % Error	2012-based % Error
North West	12,200	19,740	0.17%	0.28%
South West	7,660	25,990	0.14%	0.47%
East Midlands	6,350	24,960	0.14%	0.53%
East	4,320	25,410	0.07%	0.42%
Yorkshire and The Humber	2,730	-4,990	0.05%	-0.09%
West Midlands	1,400	19,790	0.02%	0.34%
South East	-1,810	28,290	-0.02%	0.32%
North East	-2,740	1,420	-0.10%	0.05%
London	-23,650	32,300	-0.27%	0.37%

Source: Office for National Statistics

Notes:

1. *Positive values signify an underprojection and negative values signify an overprojection

The regional errors are explored further in the assessment of accuracy by component of change section.

The accuracy of the projections has also been considered by population size. We would expect absolute error in general to be larger for local authorities with a large population size and this is illustrated by the positive trend shown in Figure 3.1 where the absolute error has been plotted by the size of LA. When the SNPPs are plotted against the MYEs for the LAs (Figure 3.2) the relationship between them is linear.

Figure 3.1. Absolute differences between the 2014-based population projection and the mid-year population estimate for 2015 by area size for local authorities (LA) in England

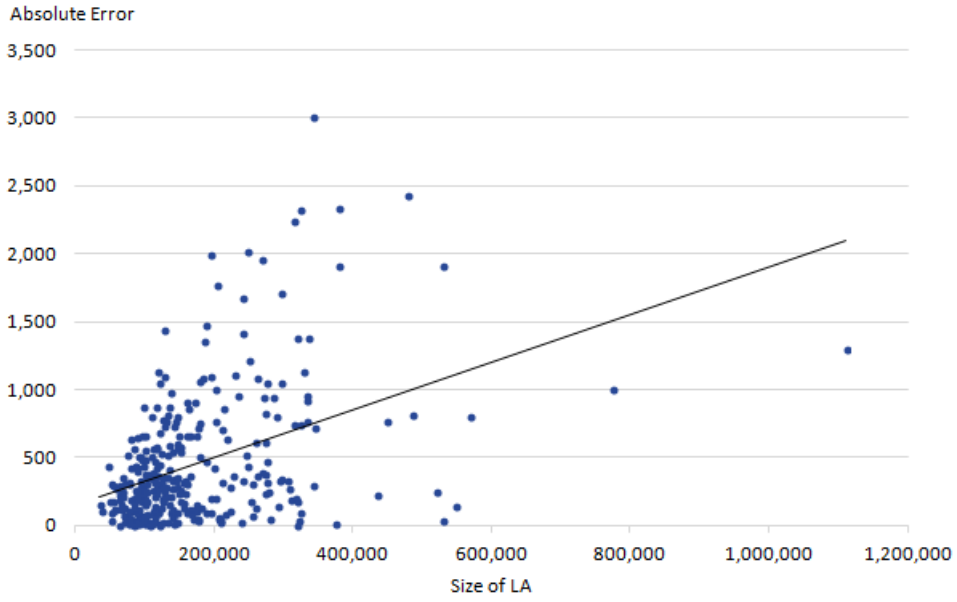
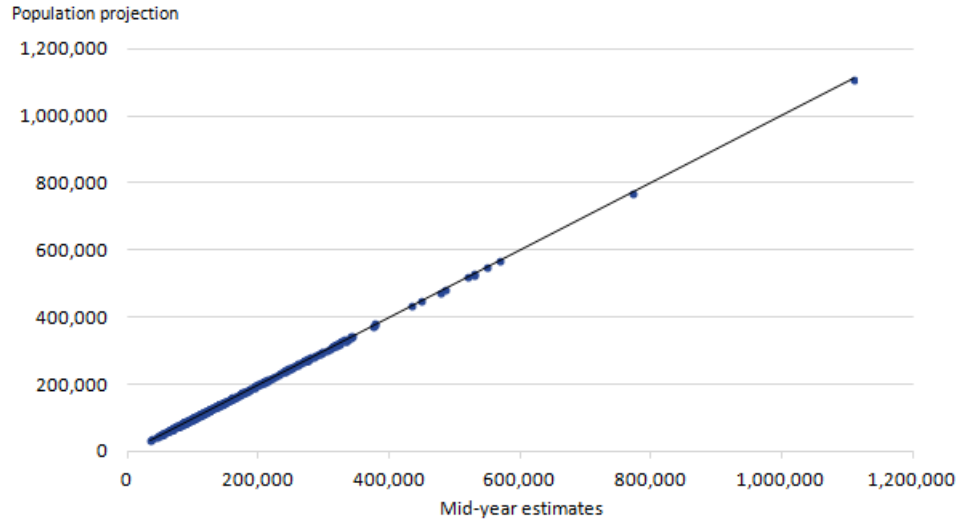


Figure 3.2. Comparison of the 2014-based population projections to the mid-year population estimates for 2015 for local authorities in England



The LAs with the greatest total 2014-based underprojection errors and percentage errors are shown in Table 3.3 and Table 3.4 respectively. The error of the projections for 2015 increases with distance from the base year of the projections.

Table 3.3. Top local authorities in England by greatest total underprojection error for 2015

LA	2014-based Error	2012-based Error	2014-based % Error	2012-based % Error
Liverpool	2,430	7,600	0.51%	1.59%
Manchester	1,920	8,140	0.36%	1.54%
Aylesbury Vale	1,470	5,110	0.78%	2.71%
Exeter	1,440	6,230	1.13%	4.89%
Westminster	1,410	9,670	0.58%	3.99%

Source: Office for National Statistics

Table 3.4. Top local authorities in England by greatest percentage underprojection error for 2015

LA	2014-based Error	2012-based Error	2014-based % Error	2012-based % Error
Exeter	1,440	6,230	1.13%	4.89%
Purbeck	440	630	0.96%	1.36%
Welwyn Hatfield	1,140	2,950	0.95%	2.48%
North West Leicestershire	880	2,050	0.91%	2.11%
Wychavon	1,050	2,770	0.86%	2.28%

Source: Office for National Statistics

Table 3.5 and Table 3.6 display the LAs with the greatest total 2014-based overprojection errors and percentage errors respectively. The areas of greatest overprojection, with the exception of Eastleigh, are London boroughs which have not grown at as fast a rate as was projected.

Table 3.5. Top local authorities in England by greatest total overprojection error for 2015

LA	2014-based Error	2012-based Error	2014-based % Error	2012-based % Error
Ealing	-3,020	-8,080	-0.88%	-2.36%
Barnet	-2,340	-2,090	-0.62%	-0.55%
Brent	-2,330	1,590	-0.72%	0.49%
Wandsworth	-2,250	-2,460	-0.71%	-0.78%
Harrow	-2,020	-3,660	-0.82%	-1.48%

Source: Office for National Statistics

Table 3.6. Top local authorities in England by greatest percentage overprojection error for 2015

LA	2014-based Error	2012-based Error	2014-based % Error	2012-based % Error
Richmond upon Thames	-2,000	-1,780	-1.03%	-0.91%
Ealing	-3,020	-8,080	-0.88%	-2.36%
Merton	-1,770	-5,760	-0.86%	-2.81%
Eastleigh	-1,100	-1,250	-0.85%	-0.97%
Harrow	-2,020	-3,660	-0.82%	-1.48%

Source: Office for National Statistics

Assessment of accuracy by component of change

This section will investigate the accuracy by individual components of change.

The 2014-based projections for components of change (births, deaths and migration) in 2015 have been compared with those in the 2015 MYEs. Table 3.7 displays the proportions of underprojection and overprojection across the LAs for each component. More than half of the errors for “international migration in” and “international migration out” were overprojections, while more than half of the errors for “internal migration in” and “internal migration out” were underprojections. This means that greater levels of movement between LAs are estimated to have occurred than were assumed in the projections.

Table 3.7. Percentage of local authorities in England that were underprojected or overprojected by components of change in 2015

% of LAs	Births	Deaths	Internal migration in	Internal migration out	International migration in	International migration out
Overprojected	42.0	54.9	29.0	30.2	68.8	58.3
Underprojected	58.0	45.1	71.0	69.8	31.2	41.7

Source: Office for National Statistics

Table 3.8 presents the percentage error for each component of change for the regions (and the national level), these are displayed for the regions in Figure 3.2. “International migration in” was overprojected for all regions while the greatest percentage errors were observed for “international migration out”.

Table 3.8. Components of change (percentage error) by region and at national level in England for 2015*

%

Region	Births	Deaths	Internal migration in	Internal migration out	International migration in	International migration out
North West	1.24	-0.93	3.61	-5.42	-1.78	-0.64
South West	-1.05	0.33	2.23	-4.28	-2.81	3.80
East Midlands	0.59	-0.46	1.06	-3.69	-0.22	-4.74
East	0.94	0.48	1.43	2.18	-4.47	-29.34
Yorkshire and The Humber	0.88	-0.59	-1.07	-4.06	-3.27	1.60
West Midlands	-0.40	1.02	1.28	-1.36	-2.12	1.56
South East	0.33	-0.24	-1.17	0.58	-4.11	-8.25
North East	-1.60	2.47	-0.92	-4.47	-12.25	13.70
London	-1.64	-2.14	-2.44	8.46	-2.11	-13.34
England	-0.06	0.00	-1.48	0.70	-2.82	-7.12

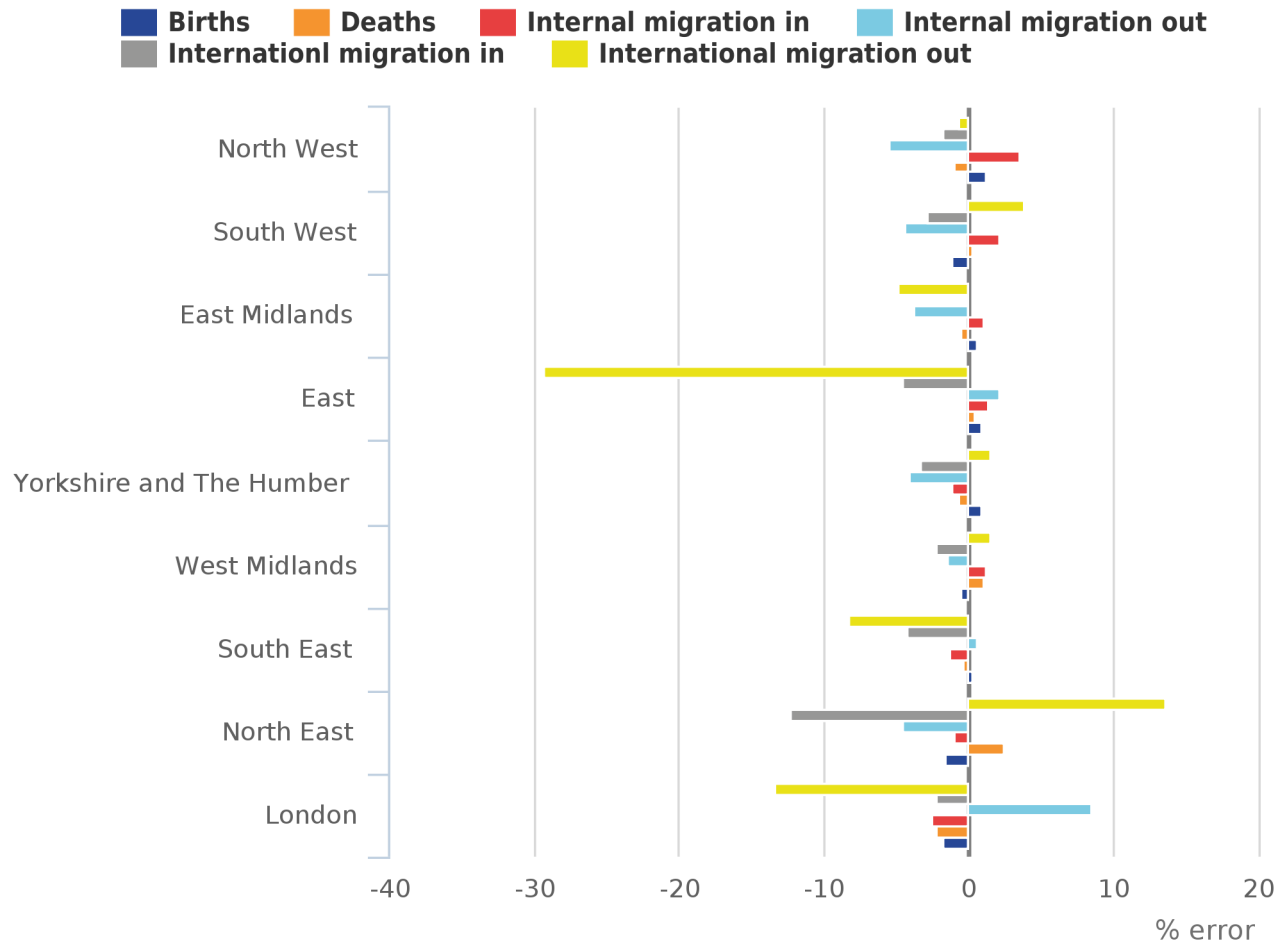
Source: Office for National Statistics

Notes:

1. *Positive values signify an underprojection and negative values signify an overprojection

The errors associated with births and deaths are comparatively low when compared to the size of some of the errors for internal and international migration. The methodology guide for mid-2015 UK population estimates (England and Wales) explains that “migration is the most difficult part of the estimate process to measure precisely because the UK has no population register”. The migration estimates are produced by using the best available proxy data in a nationally consistent manner. The numbers of births and deaths are obtained from the Civil Registration System and should therefore more closely reflect the true values. Similarly the migration assumptions for the SNPPs are generally more volatile.

Figure 3.3. Components of change for the regions across England in 2015 (percentage error)



Source: Office for National Statistics

Notes:

1. Positive values signify an underprojection and negative values signify an overprojection.

Assessment of accuracy by age and sex

The 2014-based projections for 2015 have been compared with the 2015 MYEs with the data grouped by age and sex. Table 3.9 presents the percentage error for each age and sex group for the regions which are displayed in Figure 3.4. The 0 to 15 age group for both males and females were underprojected in all regions, as was the female 65+ age group.

There were overprojections for both males and females aged 16 to 64 for London and the North East.

Table 3.9. Percentage error of age and sex groups by region across England in 2015*

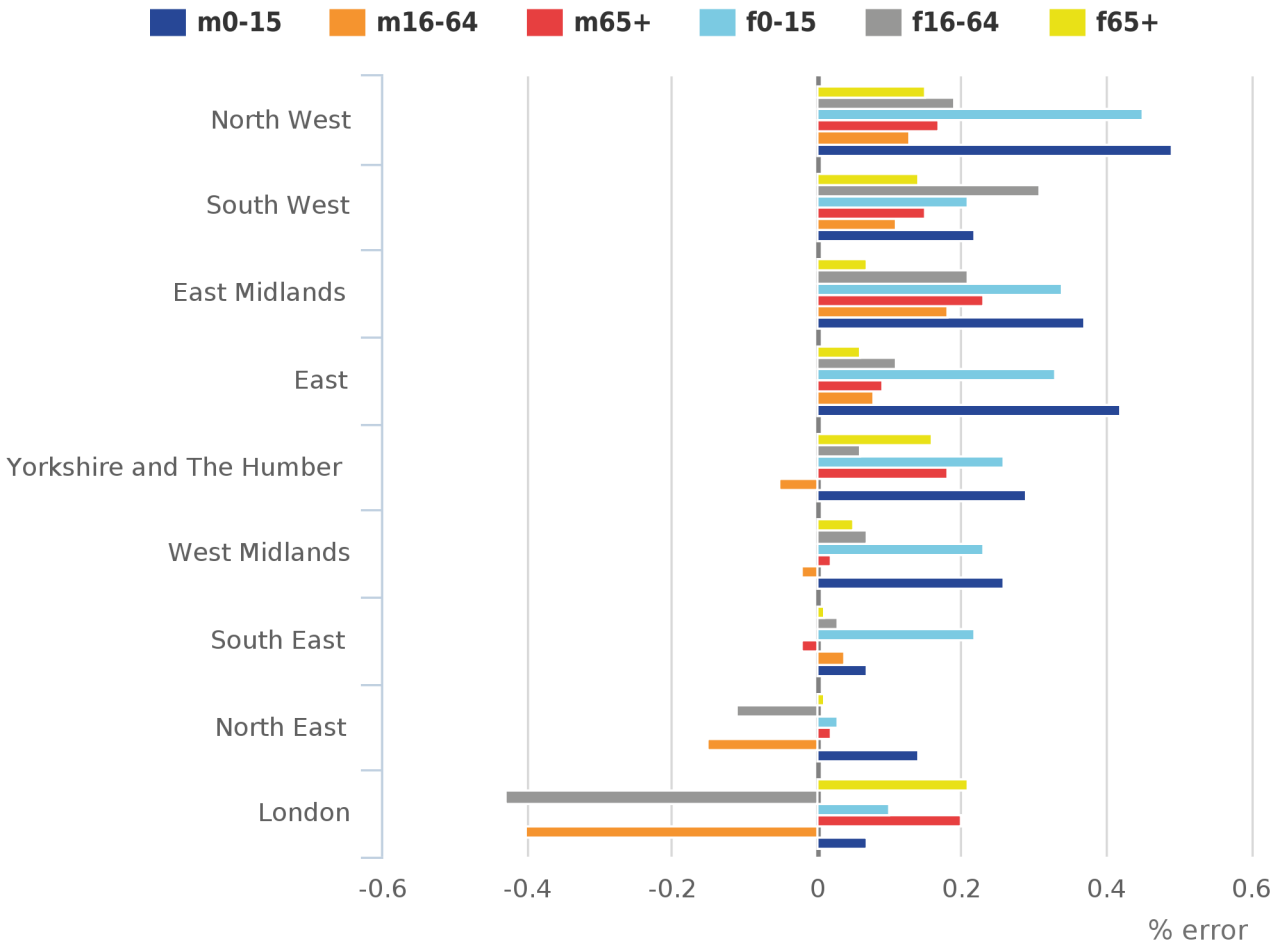
Region	m0-15 (%)	m16-64 (%)	m65+ (%)	f0-15 (%)	f16-64 (%)	f65+ (%)
North West	0.49	0.13	0.17	0.45	0.19	0.15
South West	0.22	0.11	0.15	0.21	0.31	0.14
East Midlands	0.37	0.18	0.23	0.34	0.21	0.07
East	0.42	0.08	0.09	0.33	0.11	0.06
Yorkshire and The Humber	0.29	-0.05	0.18	0.26	0.06	0.16
West Midlands	0.26	-0.02	0.02	0.23	0.07	0.05
South East	0.07	0.04	-0.02	0.22	0.03	0.01
North East	0.14	-0.15	0.02	0.03	-0.11	0.01
London	0.07	-0.40	0.20	0.10	-0.43	0.21

Source: Office for National Statistics

Notes:

1. *Positive values signify an underprojection and negative values signify an overprojection

Figure 3.4. Age and sex groups for the regions across England in 2015 (percentage error)



Source: Office for National Statistics

Notes:

1. Positive values signify an underprojection and negative values signify an overprojection.

4. Conclusions

This report has compared the population projections for 2015 from two sets of projections with population estimates for 2015.

The main findings are that there are greater errors with the projections for lower level geographical areas and when the period between the projection and the estimate year (2015) increases.

It was found that at regional level, there was an overprojection for London, the North East and the South East but the projections were closer to the mid year population estimate (MYE) from the 2014-based projections than the 2012-based projections. Across the local authorities, London boroughs had the highest overprojection error where they had not grown as fast as expected.

5. Annex A

1 – Subnational population projections (SNPPs) methodology

Population projections are produced every 2 years and project the population 25 years ahead. The subnational population projections (SNPPs) are produced for geographies below the national level (for example, region and local authority). We produce SNPPs for areas in England only. These provide an indication of the possible size and structure of the future population based on the continuation of recent demographic trends (births, deaths and migration).

It is also important to emphasise that these projections are not forecasts and do not attempt to predict the impact that future government or local policies, changing economic circumstances or other factors might have on demographic behaviours.

The SNPPs are produced for each local authority and Clinical Commissioning Group (CCG) in England by age and sex. They are produced using the cohort component method, which is a standard demographic method and use high quality data sources to inform the components of population change. The SNPPs take the local authority population estimates as their starting point and then apply assumptions about future fertility, mortality and migration levels based on trends in recent estimates over the previous five to six years.

The population from the previous year is aged on by one year and local fertility and mortality rates are applied to calculate projected numbers of births and deaths, and then the population is adjusted for projected internal, cross-border and international migration. Prior to ageing on, the population of armed forces are removed as these are a “static population”, whose size and age-sex structure is assumed not to change over the projection period. Each of these components (except internal migration) is constrained to its respective total from the corresponding national population projections, and once the static population has been added back, the projected population is controlled to the national population projections total for England. This process is repeated for each year of the projection period. The population at the end of each cycle becomes the base population of the next cycle.

The latest set of projections are based on the 2014 mid year population estimates (MYEs) and are consistent with the principal 2014-based national population projections for England. Further detail on the subnational population projections methodology can be found on our website.

2 – Mid year population estimates (MYEs) methodology

The mid-year population estimates (MYEs) are produced every year and provide an estimate of the resident population of England and Wales as at 30 June each year. The population estimates are also produced using the cohort component method. Firstly, the population is aged on by one year. Then births are added on and deaths are removed, by age and sex, and usual area of residence. Movement of people in and out of the UK (international migration) and movements between different areas in the UK (internal migration) are then accounted for. Internal migration includes both cross-border moves between countries of the UK and moves between local authorities within England and Wales. Adjustments are made for prisoners and armed forces as they are not captured by the usual internal or international migration estimates. They are referred to as “static populations” because they have specific age structures which remain fairly constant over time.

The method above is applied in years when there is no census. For every tenth year when there is a census, the population estimates are based on the most recent census estimates following an adjustment for population change between Census day and 30 June. The latest set of population estimates were published in 2016 and estimate the population as at 30 June 2015. Further detail on the population estimates methodology can be found on our website.