Office for National Statistics

Population estimates for the UK, mid-2019: methods guide

Methodology guidance on national and subnational mid-year population estimates for the UK and its constituent countries, which are broken down by administrative area, age, sex and components of population change.

Notice

25 June 2021

This page has been superseded by Population estimates for the UK, mid-2020: methods guide.

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1 . Introduction

Population estimates for England and Wales

The Office for National Statistics (ONS) produces annual estimates of the resident population of England and Wales at 30 June every year. The most authoritative population estimates come from the census, which takes place every 10 years in the UK. Population estimates from a census are updated each year to produce mid-year population estimates (MYEs), which are broken down by local authority, sex and age.

Population estimates for the UK

We produce population estimates for England and Wales. We also collate estimates from Scotland and Northern Ireland to produce UK totals. Estimates for Scotland are produced by the National Records of Scotland (NRS), while the Northern Ireland Statistics and Research Agency (NISRA) produces the estimates for Northern Ireland.

Estimates for each of the UK constituent countries are compiled using a common methodological approach and aim to be as consistent as possible. Details of the specific data sources and methods used across the UK are summarised in a UK comparisons note.

This article relates to the estimates for England and Wales only.

A guide to the methodology used to produce the MYEs for Scotland is available from the NRS website. Details on the methodology used to create the Northern Ireland population estimates are available from the NISRA website.

Usually resident population

Population estimates refer to the usually resident population. This can mean that estimates of population do not necessarily coincide with the number of people to be found in an area at a particular time.

For most people, defining where they usually live – for the purposes of the census, for example – is straightforward. For a minority of people, the concept of usual residence is more difficult to define, for example, for students, members of the armed forces, prisoners and international migrants.

Specific rules are used for these groups:

- higher education students and schoolchildren studying away from home are resident at their term-time address

- members of the armed forces are usually resident at the address where they spend most of their time

- prisoners are usually resident in the prison estate if they have a sentence of six months or more

- international migrants are usually resident if they intend to stay in England and Wales for more than 12 months

Protection against disclosure

The estimates are produced using a variety of data sources and statistical models, including some statistical disclosure control methods. Small estimates should not be taken to refer to particular individuals.

Quality assurance

We consistently monitor the quality of the MYEs. This includes quality assurance of the administrative and survey data sources that are used to calculate the estimates, the statistical methods applied to produce the estimates, and the tables of data published on our website.

Further details are available in the MYEs QMI and in the quality assurance of administrative data (QAAD) reports listed in Appendix 1.

2 . Cohort component method

Rolled-forward estimates

Population estimates are produced using a cohort component method. This is a standard demographic method that uses high quality data sources to inform components of population change. The three major components of population change are natural change, migration and special populations.

Natural change (births, deaths and ageing)

The starting point for producing the estimates is the resident population from 30 June of the previous year. This population is aged on by one year. Births during the 12-month period are added to the population, while deaths during this period are removed according to recorded age, sex and usual area of residence.

Migration

Movement of people into and out of the UK (international migration) and movements between different areas in the UK (internal migration) are also accounted for in the population estimates. Internal migration includes both cross-border moves between the countries of the UK and moves between local areas within each country of the UK. Migration is the most difficult part of the estimation process to measure precisely because the UK has no comprehensive or mandatory population registration. Rather, we use the best proxy data available on a nationally consistent basis to estimate migration.

Special populations

Adjustments to the population estimates are made for some special population groups that are not captured by the usual internal or international migration estimates: members of the armed forces and prisoners. These populations have specific age structures, which remain fairly constant over time so are not aged-on with the rest of the population. Such populations are referred to as static populations.

The cohort component method has seven stages:

- stage one: take the resident population of the previous year on 30 June and remove the static populations (prisoners, home and foreign armed forces)

- stage two: age on by one year

- stage three: add children born between 1 July and 30 June as the population aged zero

- stage four: subtract from the population the number of deaths between 1 July and 30 June

- stage five: add or remove people who have entered or left the country between 1 July and 30 June

- stage six: adjust areas' populations to account for those that have moved within the UK between 1 July and 30 June

- stage seven: add updated static populations (prisoners and home and foreign armed forces), and account for people entering and leaving them from areas of the UK; this produces the resident population of the current year on 30 June

Census-basing

The method in this section describes how mid-year population estimates (MYEs) are calculated for years when there is no census. For years in which there is a census, the MYEs are based on the census estimates, and a slightly different approach is necessary. Rather than ageing-on the population by one year, the population is only aged-on by the period of time between the census and 30 June. Similarly, the components only need to account for change during this period rather than a whole year.

Research and development

We continue to research ways of ensuring and improving the quality of the population estimates, including analysis of new data sources that become available. The latest information can be found in our Population statistics research update articles.

Uncertainty estimates have been created to give users additional information of the quality of these estimates. Measures of statistical uncertainty are available for the unrevised data for the years mid-2012 to mid-2016.

In-depth methodology

The following sections describe in more detail how we estimate the components of population change in the MYEs produced for England and Wales.

3 . Births

Change in population resulting from births

Births in England and Wales occurring between 1 July of the previous year and 30 June of the current year are added to the population at age zero, by sex, and allocated to the local authority of usual residence of the mother.

Births data

Data on live births by sex are obtained from the Civil Registration System administered by the Office for National Statistics (ONS) and are based on births occurring (and then registered) in England and Wales. As registration of births may legally take place up to 42 days after a birth, the data received refer to the date of birth rather than the date of registration.

Births to mothers outside England and Wales

The Civil Registration System captures information on all births in England and Wales. This includes births to mothers who are usually resident elsewhere, but not necessarily those births to mothers who are usually resident in England and Wales that take place elsewhere.

We assume that the number of births for the two groups are similar in number and on average balance each other out. In this way, births to non-usually resident mothers are added to the population estimates as a proxy for those births elsewhere to usually resident mothers. We impute local authorities of residence for these births using the distribution of births we know about during the year.

4 . Deaths

Change in population resulting from deaths

Deaths that are registered in England and Wales between 1 July of the previous year and 30 June of the current year are subtracted from the population by sex, age and local authority of usual residence.

Deaths data

Deaths data are obtained from the Civil Registration System administered by the Office for National Statistics (ONS). The data are supplied by sex, age and local authority of usual residence in England and Wales. To be consistent with the mid-year reference date, we adjust age at death to 30 June.

The Civil Registration System captures information on all deaths in England and Wales. This includes deaths of people usually resident elsewhere (outside England and Wales). In the calculation of subnational population estimates, these people are allocated to a local authority, imputed using the distribution of deaths by age and sex we know about during the year.

The Civil Registration System does not record deaths of usual residents of England and Wales that have occurred abroad and that are not registered in England and Wales. These deaths are excluded from the deaths data and do not feature in the calculation of the mid-year population estimate (MYE).

Unknown local authority of residence

Local authority of residence is not recorded for a number of deaths. For these, a local authority is imputed using the distribution of deaths by age and sex we know about during the year.

Late registrations

We make a small adjustment for anticipated late registrations to allow for deaths that were not registered at the time the data were extracted. The number of late registrations in the previous year is used as a proxy for late registrations in the current year as the number of late registrations does not vary significantly year-to-year.

5 . Internal migration

To account for migration of people within the UK, data are obtained for flows of migrants between each pair of local authorities in England and Wales as well as for flows of migrants between England and Wales and the rest of the UK (cross-border flows).

Internal migration data

Internal migration estimates are primarily based on data that flag up when people change their address with their doctor. Since most people change their address with their doctor soon after moving, these data are considered to provide a good proxy indicator of migration.

Mid-2019 internal migration estimates have used the same combination of three administrative data sources used since mid-2017 as a proxy for internal migration within England and Wales and for cross-border flows from England and Wales to Scotland and Northern Ireland: the Patient Register (PR), the Personal Demographic Service (PDS) from NHS Digital and Higher Education Statistics Agency (HESA) data.

For mid-2012 to mid-2016, the NHS Central Register (NHSCR) was used in combination with the PR and HESA) data. However, in February 2016 the Central Health Register Inquiry System was turned off, so data for within-year moves and cross-border flows are now sourced from the PDS.

Patient Register data – for transitions within England and Wales

We get a snapshot of data extracted from each area's PR as at 31 July each year. This reference date is based on the assumption that it takes about a month to register with a GP and appear on the PR after moving to a new area. This enables migration estimates to be produced for the year ending 30 June.

The records are compared between the current year and the previous year, and this enables the identification of people who have changed their postcode during the period. For the purpose of estimating the population, we assume that a person who changes their local authority of residence (within England and Wales) between one year and the next is a migrant. This is known as a transition, as it does not cover within-year moves.

Personal Demographic Service data – for within year moves and cross border flows

From mid-2017, the PDS replaced the NHSCR in our methods. Like the NHSCR, the PDS weekly updates file records the movements of patients and is combined with PR data to produce estimates of migration between local authorities. The PDS records a higher number of moves than the NHSCR did, and we do not fully understand all of the reasons for this difference. Consequently, we have used a combination of PDS data and the relationship between the PDS and historical NHSCR data for the mid-2017 to mid-2019 estimates. Further details of this are given in Appendix 2.

From mid-2017, the counts of cross-border flows between England and Wales and Scotland and Northern Ireland were also obtained using the PDS weekly updates file. The total flows to and from constituent countries of the UK are agreed between the Office for National Statistics (ONS), National Records of Scotland (NRS) and Northern Ireland Statistics and Research Agency (NISRA), based on records of in-migration to the relevant country.

NHS Central Register data – until February 2016

The NHSCR recorded the movements of patients between health authority areas (HAs) and was combined with PR data held by individual HAs, to produce estimates of migration between local authorities. Similar data sources were used to obtain estimates of cross-border flows to and from Scotland and Northern Ireland.

The NHSCR data source was discontinued in February 2016. Consequently, England and Wales internal migration estimates for mid-2016 were calculated by combining the 2016 PR data with the 2015 NHSCR data. For mid-2017, we moved to using the PDS.

Estimating within-year moves – reconciling PR with PDS (mid-2017 to mid-2019) and NHSCR (mid-2012 to mid-2016)

The majority of internal migration moves reflect someone living in one area of England and Wales at the start of the year and another area at the end of the year. This type of move is called a "transition", but not all moves are of this type. For example, if people move multiple times in a year, babies move within the year they are born, or if people die or emigrate before the end of a year, these are collectively called "within-year moves". The PR cannot capture the migration of those who move during the year but who were not registered with a GP at one of the two mid-year time points. However, the PDS (and formerly, the NHSCR) pick up these types of moves.

Higher Education Statistics Agency data and Higher Education Leavers Methodology

The fundamental approach to estimating internal migration within England and Wales is to compare people's area of residence on the PR in the current year with that in the previous year. We know one weakness of this approach was that people moving to or leaving higher education might be slow to update their health registration (with a GP). This would mean we would not identify all the moves into student areas or into areas where graduates tended to move to after completing their studies. We have used several methods to try to account for these moves.

For the mid-2012 to mid-2016 internal migration estimates, we improved our methods by linking the PR data with data from the HESA. The HESA data showed where students were registered by their university as living, and this allowed us to make more accurate estimates of people moving to study in each area. However, it did not tell us where people – in particular, those slow in updating their health registration – moved to after completing their studies. Rather than assuming those people stayed in the area where they studied (which would result in overestimating the population of that area), we used a model that assumed people completing their studies and not updating their health registration record would move back to their PR address over time.

For mid-2017 onwards, we have improved this method by introducing a new end-of-studies approach – the Higher Education Leavers Methodology (HELM). This method distributes those higher education leavers who have not updated their PR address after leaving higher education using the movement patterns of students who have previously left higher education.

The method can be summarised as follows:

- stage one: identify people who need their area of residence imputed; this will be from their PR records (not updated during the year) previously linked to HESA data but no longer with a HESA record as the person has left higher education

- stage two: identify similar people (those who have left higher education but not updated their health registration during the first year) from three years previously and use their PR records to estimate the distribution of destinations; three years is judged to be the best balance of using recent and older data to both reflect current patterns and maximise the proportion of updated registrations

- stage three: apply the estimated distribution to people to be imputed; the random imputation avoids systematic bias in destinations chosen, but the final distribution will be close to the initially estimated distribution

We can reasonably expect that the estimates produced using HELM are more accurate than those produced using the previous method. Recognising that higher education leavers might disperse to any of the 336 local authorities (339 in April 2019 and 348 before April 2019) in England and Wales will mean the internal migration estimates should better reflect the real patterns of moves that occur.

By not simply keeping the higher education leavers at their HESA address or returning them to their PR address, we can also expect the methodology to improve the number of post-student-aged individuals remaining in "student" local authorities and the number of post-student-aged individuals moving to popular graduate destinations (often large metropolitan areas).

It is important to note that some people remain in their local authority of study following higher education. HELM recognises this, as the destination distributions still reflect a number of individuals staying in their local authority of study.

Unlike the previous methodology, which distributed students over time, HELM distributes all higher education leavers to their imputed destination in the first year after they finished higher education. There is some inaccuracy because a number of moves informing the destination distributions took place in the second or third year after leaving higher education. This is offset by the fact that some moves may have been "lagged"; that is, occurring in the first year, but recorded in the second or third year after leaving higher education. There is a further offsetting effect in that the destination distributions assume that any individuals who did not change address in any of the three years after leaving higher education remained in their local authority of study while some of these may have moved (but not updated their health registration).

As with the previous method, the approach of imputing place of residence for individual records has substantial advantages over making aggregate adjustments as any incorrect imputation would be automatically corrected when that person updates their health registration. The impact of using HELM, as opposed to the previous method of estimating graduate migration patterns for mid-2017, is presented in Appendix 2.

Internal migration and special populations

Movements of members of the armed forces are not included in the internal migration estimates. While the NHSCR records movements of people into and out of the armed forces, movements of serving members are not recorded. For similar reasons, movements of prisoners are also not included in the internal migration estimates. The population of armed forces and prisoners are estimated separately.

6 . International migration

An international migrant is defined as a person who changes his or her country of usual residence for a period of at least a year. International migration estimates are made up of immigration, emigration, asylum seekers and refugees, plus their dependants. Estimates of international migration exclude the armed forces, whose movements are estimated separately.

International Passenger Survey

The Office for National Statistics' (ONS') national estimates of international migration are based on the International Passenger Survey (IPS). The IPS is a long-running ONS survey that operates at UK ports of arrival and departure. The IPS is the only source of data on UK migration that is specifically designed to identify people who intend to change their country of usual residence for at least 12 months. This is consistent with the usual residence definition for international migrants in the population estimates.

Sample survey

The IPS is a sample survey and so only a sample of migrants to or from the UK are interviewed. Within this sample, only a small proportion will be long-term international migrants.

The IPS is based on voluntary, face-to-face interviews with a sample of passengers travelling via airports, sea routes and the Channel Tunnel. The migrant respondents sampled are scaled to produce national migration estimates using a complex weighting system. Because the IPS is a sample survey, the results are subject to a degree of statistical uncertainty.

Limitations of use at local authority level

The IPS estimate is not reliable enough to be used at local authority level, as the sample of people in each local authority is too small, with many local authorities having few or no IPS respondents.

Furthermore, a migrant's initial intentions about where they will settle may not be realised. For example, there is a tendency for in-migrants to state an intention to migrate to London but actually settle in another part of the UK. Therefore, the IPS estimate at local authority level may not be a reliable indicator as to where people migrate from or to.

Local authority estimates of international migration are derived using a variety of data sources and methods, as described in the following methodology for immigration and emigration.

Visitor switchers and migrant switchers

The IPS does not take into account the changing intentions of passengers. Some migrants intend to remain in or out of the UK for 12 months, but actually go on to spend less than a year. These are called migrant switchers. Other migrants intend to remain in or out of the UK for less than a year but actually spend longer. These are called visitor switchers.

Migrant and visitor switchers are identified by the IPS as they complete their journey. The passenger is asked how long they intended to stay in the UK or overseas when they initially arrived or departed and for how long they actually remained in or out of the UK. An estimate is calculated for the proportion of migrants or visitors who changed their intentions on the duration of their stay.

The likelihood of a visitor changing their intentions can vary depending on their citizenship and place of last or next residence. Therefore, visitor switchers are split into four groups:

- those entering the UK who are European Economic Area (EEA)

- those entering the UK who are non-EEA citizens

- those leaving the UK who are EEA citizens going to the EU

- all other citizens leaving the UK going to anywhere in the world

However, unlike visitor switchers, there is no distinction between citizenships or countries of last or next residence for migrant switcher calculations.

International migration estimates are adjusted for migrant and visitor switchers as part of the methodology for immigration and emigration.

Immigration

Local authority level

Streams

The IPS total data for England and Wales are streamed mainly by reason for migration (for example, worker, student or other), and relevant administrative sources are used to distribute immigrants to each local authority. Record linkage is used both within and between the administrative sources to minimise definitional differences and duplication.

Table 1: Data sources

Data source	Description
Migrant Worker Scan (MWS)	Provides a count of foreign nationals applying for a National Insurance Number (NINo); this is the main source used to distribute immigrant workers.
Higher Education Statistics Agency (HESA)	Used for distributing publicly funded higher education students and private higher education students.
Administrative data sources from the Department for Business, Energy and Industrial Strategy (BEIS) and the Welsh Government	Used to distribute further education student immigrants from the EU.
Home Office visa data	Provides the numbers of non-EU international migrants at educational institutions with a Certificate of Acceptance to Study and data on non-EU international migrants granted Leave to Remain status; these are used to estimate the distribution at local authority level of non-EU international migrants who are further education students.
Census data	Used for distributing UK-born returning migrant flows.
Patient Register Data Service (PRDS)	Data on migrants who register for a GP whose previous address was outside of England and Wales; these are used alongside the other administrative sources to distribute the remaining immigrants, such as children, those aged 17 to 59 years who are not students or workers, and those aged 60 years and over.
Customer Information System (CIS)	Provides data that enable the MWS, HESA and PR to be more accurately linked together (this only applies to mid-2015 onwards).

Source: Office for National Statistics – Population estimates for the UK, mid-2019: methods guide

Our method is critically dependent on timely access to the MWS, CIS, HESA and PR. Where one of these datasets is unavailable, it is necessary to use a slightly different method that involves producing an average distribution based on the past three years' data. This was the case for the mid-2019 population estimates. The impact of this method is generally minor, but an indication of the impact of using this approach for the mid-2015 and mid-2016 estimates can be found in the Population estimates: revision Tool. The impact when this method was applied in mid-2017 is discussed in greater detail in the Mid-year population estimates (MYEs) QMI.

Sex and age breakdown

Census cluster analysis

2011 Census data on immigrants have been used to group local authorities into clusters with similar age and sex structures. Census immigrants are defined as those who stated that they had arrived in England and Wales in the year before the census and intended to stay more than 12 months. Recent research, carried out by the ONS, has confirmed that the 2011 Census is still the best available data source for sex and age distributions of immigrants at local authority level.

Sex and age breakdown

Each year, the cluster analysis of immigrants is used to inform the sex and age distribution of the local authority immigration estimates. Each local authority level record is assigned to the cluster group based on local authority, and sex and age are imputed based on the average sex and age distribution of that cluster group.

International emigration

Local authority level estimates

Modelling the estimates

A statistical model is used to estimate emigration at local authority level. The model estimates the numbers of emigrants over the year using relationships established between the estimate of emigration from the IPS and estimates from other data sources (covariates). This can produce a more robust estimate of emigration at local authority level than the IPS alone can provide.

Unlike the previous model, the new model includes an "offset term" representing the (previous year's) population of an area. This transforms from a model of counts to a model of rates – in effect, modelling the "risk" of a resident emigrating over the year. This is a standard approach adopted for such models and ensures that the modelled emigration remains related to the population at risk.

Response variable

The IPS weighted estimate of emigration is used as the response variable and is based on a three-year average: the year estimated and the previous two years. This is necessary because the number of emigrants sampled in one year is small and the spread of the sample across the country is uneven, with many local authorities having no sampled emigrants.

Covariates

The covariates used in the model come from the census, administrative and survey data sources and have been found to have a strong relationship with emigration at local authority level. Each covariate is fixed in the model to avoid problems of instability in the year-on-year emigration estimates.

The covariates in the model are listed in Table 2.

Table 2: Covariates used in the emigration model

Covariate source and name	Description of covariate
2011 Census	
Itillness	Usual residents with limiting or long-term illness.
Mfeasia	Usual residents of Mid-or Far East-Asian country of birth.
oceania *	Usual residents of Oceania country of birth.
namerica *	Usual residents of North American country of birth.
Sasia	Usual residents of South-Asian country of birth.
Hostels *	Usual residents living in hostels.
Annual Population Survey (APS)	
APS_mortgage	Accommodation owned with mortgage.
APS_rent	Accommodation rented.
APS_retired	Retired people.
APS_emp16p *	Employed aged 16 years and over.
Births	
COBM_EU2	Number of births with country of birth of mother in EU2.
COBM_EU8	Number of births with country of birth of mother in EU8.
Higher Education Statistics Agency (HESA)	
HESA_FYSTUD_2025_EU	Students of EU (EU2, EU8 and EU15, excluding UK) nationality in higher education in their final year of study, aged 20 to 25 years.
Migrant Worker Scan	
MWS_EU8 *	Migrant workers of EU8 nationality.
ONS population estimates	
Intllinmig	International in-migration estimates for the year of interest.
Patient Register (PR)	
PR_515	Registered patients aged 5 to 15 years.

Source: Office for National Statistics – Population estimates for the UK, mid-2019: methods guide

Notes

1. Covariates marked with an * also appeared in the previous version of the model.

2. Annual Population Survey (APS) estimates were reweighted in 2019, the reweighted versions inform the mid-2018 model and mid-2019 models; mid-2012 to mid-2017 use un-reweighted APS estimates.

Covariates marked with an asterisk in Table 2 also appeared in the previous version of the model. One covariate was present in the previous model but was dropped from the current model: this is "Africa" – the 2011 Census estimate of usual residents with country of birth in Africa. This variable was not shown to make a statistically significant contribution to the accuracy of the model.

Constraining

The modelled estimates of emigration at the local authority level are constrained to the IPS estimates at regional level.

Sex and age breakdown

A combination of 2011 Census and IPS data are used to add sex and age detail to the modelled local authority emigration estimates. This process groups local authorities into clusters based on sex, age and citizenship data gained from the census.

Local authority cluster analysis

Census data for immigrants are used to classify local authorities into clusters that have similar patterns of UK born and non-UK born migration, as a proportion of the total population.

We use census data to classify local authorities into groups, as IPS data are not reliable at local authority level.

Immigration data are used because census data on emigration are unavailable to produce estimates of emigration. We assume that immigration data are likely to show similar patterns of UK-born and non-UK-born migration to that exhibited in emigration patterns at local authority level.

Citizenship and sex

Using the local authority clusters derived from census data, IPS data for emigrants are used to create a distribution by citizenship (British and non-British) and sex for each cluster. The IPS data are broken down by citizenship because it is assumed that British and non-British emigrants are likely to have a different age structure.

Single year of age

Three years of IPS data (current year and previous two years) are used to provide a detailed single year of age distribution, by citizenship and sex. This age distribution is smoothed using a centred average to remove noise.

The smoothed single year of age distribution is applied to the cluster, citizenship and sex distribution.

Applying to modelled emigration estimates

The local authority level emigration estimates are assigned a cluster group. Citizenship, sex and age are then imputed onto each record, based on cluster group.

Asylum seekers and dependants

Most movements of asylum seekers are not captured by the IPS. The UK Border Agency of the Home Office provides us with data on asylum seeker applications and their dependants, including removals, refusals, withdrawals and appeals. This information is used to adjust the estimated international migration inflows and outflows for asylum seekers.

Any asylum seekers counted by the IPS on arrival or departure to or from England and Wales are excluded from our processing, and Home Office data for asylum seekers are used to ensure flows are not double-counted.

Asylum seeker inflows

Estimates of asylum seeker flows into England and Wales are based on the number of asylum seeker applicants. An adjustment is made for the small number of asylum seekers who are recorded as both a principal applicant and a dependant. Counts of applicants who returned to their country of origin within a year of their application are removed.

Asylum seeker outflows

Data on asylum seeker flows out of England and Wales are estimated based on asylum applicants that are assumed to have left England and Wales after staying for at least a year, using information on removals, refusals and withdrawals.

Local authority

Estimates of asylum seeker inflows and outflows are only available by region. Data for asylum seekers at local authority level are available for those who receive support from the National Asylum Support Service (NASS). There are no data sources that provide local authority level information for those who claim asylum but do not request any associated support.

Estimates of asylum seekers are broken down from region to local authority using a broad assumption that 60% receive support and 40% are unsupported. The 60% assumed to receive support are distributed to local authority level using the local authority distribution for asylum seekers receiving support for accommodation. The remaining 40% are assumed to have the same geographic distribution of residence as those given subsistence-only support by NASS (for example, those who are not dispersed to accommodation in particular areas).

Single year of age

A single year of age distribution for both asylum seekers and their dependants is derived using a combination of data from the Home Office and the national MYEs from the previous year.

Refugees

The Home Office operates several international resettlement schemes that result in people entering the UK. Such people are granted humanitarian protection and, while they are commonly referred to as "refugees", it is important to note that they do not have refugee status according to the strict UN definition.

The Home Office database covering such schemes includes:

- [Gateway Protection Programme](#)

- [Mandate Scheme](#)

- [Syrian vulnerable person resettlement programme (VPR)](#)

- [Vulnerable Children's Resettlement Scheme (VCRS)](#)

These data do not include those resettled to the UK under the ["ex gratia scheme" for Afghan locally engaged civilians](#). In September 2015, the [government pledged to receive 20,000 Syrian refugees over the subsequent five years](#). Consequently, flows of refugees became sufficiently large to justify refugees being treated as a separate component within the calculation of the MYEs for England and Wales.

Refugee inflows

For the purpose of the MYEs, refugee inflows are estimated by single year of age and sex for each local authority in England and Wales.

Most movements of refugees into the UK are not captured by the IPS; any that are counted are excluded from processing to ensure that no double-counting occurs. We are sent an extract of the resettlement database by the Home Office for people arriving in the year up to 30 June of the reference year. The data include information on the age, sex and citizenship of the refugees.

For those refugees entering under the VPR, information on their initially assigned local authority is also available.

These refugees are allocated to a local authority in advance of resettlement, and this has been recorded on the Home Office dataset that we receive. Analysis on the actual regional distribution of VPR people within England and Wales supports the use of the initially assigned local authority as their place of usual residence.

For a minority of refugees, information on their initial local authority of residence is not known. For these, a local authority is imputed using the distribution of SVPR refugees within England and Wales.

Refugee outflows

Outward flows of refugees are thought to be very small at this stage; refugees leaving the UK would be covered by the IPS, as they would leave from a UK port of departure.

7 . Home armed forces

Who is included

The population estimates include all members of the UK armed forces (UKAF) stationed in England and Wales. Members of UKAF deployed on operations and temporary assignments overseas are also included in the population estimates where their last permanent station is in England and Wales. Personnel who are serving on overseas postings are removed from the population estimates, but we account for their flows and those of their accompanying dependants into and out of England and Wales.

Special population

UKAF are treated as a special population as the movements of military personnel are not captured by the data sources used to estimate international and internal migration.

We assume that UKAF personnel and their dependants travel by military flights into and out of England and Wales when serving in posts overseas; these are routes that are not covered by the International Passenger Survey (IPS). We also assume that UKAF personnel are not on GP registers and are therefore not counted in the internal migration estimates. However, it is assumed that dependants are on GP registers, so movements of dependants within England and Wales are not part of the special population.

Home armed forces data

We receive aggregated UKAF data from the Ministry of Defence (MoD). These data include military personnel counts by age, sex and local authority of base.

We also receive aggregate data from British Forces Germany (BFG) by sex and age, of dependants (partners and children) who accompany members of UKAF stationed in Germany. Germany has the second largest population of UKAF after the UK; in mid-2019, this accounted for approximately 25% of all UKAF posted overseas. The proportion of the UKAF population in Germany has been decreasing year on year as part of the MoD's plan to withdraw troops from Germany by 2020.

Census data for the home armed forces are also used to inform distributions for local authority of usual residence.

Change in UKAF stationed in England and Wales

Data are obtained from the MoD for UKAF by sex, age and local authority of base, stationed in England and Wales. To fit in with the population estimates' usual residence definition, the UKAF population is estimated at the residence at which they spend most of their time. A base-to-residence distribution based on census data is used to adjust UKAF from their local authority of base to their local authority of residence.

Change in civilian population

Any change in the population of UKAF from one year to the next will be reflected in the civilian populations of England and Wales – those joining and leaving UKAF will create a resulting inflow and outflow between UKAF and the civilian population.

This flow between the UKAF population and the civilian population must also take account of UKAF serving overseas if they are usually resident in England and Wales.

A reduction factor is applied to all members of UKAF (including those stationed overseas) to estimate those who would be usually resident in England and Wales, as opposed to other parts of the UK. The proportion of UKAF stationed in England and Wales is used as a proxy for calculating this reduction factor.

To account for the change in the population of UKAF stationed in England and Wales, the previous year's estimated population is subtracted from the current year's estimated population, by sex, age and local authority of usual residence.

A local authority of residence is imputed for each net flow using a local authority distribution derived from the census for the permanent home of members of UKAF.

Change in overseas dependants

We assume that dependants (partners and children) of members of UKAF who are serving overseas are not picked up by the IPS and are therefore treated as part of the home armed forces special population.

BFG data on dependants accompanying UKAF stationed in Germany are used to provide a ratio (number of dependants per UKAF member) and sex and age distribution that can be applied to UKAF serving overseas to estimate the overseas dependant population.

A reduction factor is also applied to the estimated overseas dependant population to estimate those who are usually resident in England and Wales. The reduction factor is calculated using the same proportion as previously, so that only the overseas dependants who are usually resident in England and Wales are estimated.

To account for the change in the overseas dependant population, the current year's estimated population who are usually resident in England and Wales is subtracted from the previous year's population, by sex and age.

A local authority of residence is imputed for each net flow using a local authority distribution derived from the census for members of UKAF living with a partner.

Compilation

To calculate the total change of UKAF, we calculate by sex, age and local authority: net change in UKAF stationed in England and Wales, plus net change in the civilian population, plus net change in overseas dependants.

8 . Foreign armed forces

Special population

Foreign armed forces based in England and Wales are treated as a special population in the population estimates, as we assume they are not captured by the methods used to estimate internal and international migration.

We again assume that foreign armed forces personnel travel by military flights into and out of England and Wales; these are routes that are not covered by the International Passenger Survey (IPS). We also assume that foreign armed forces personnel are not on GP registers and are therefore not counted in the internal migration estimates.

Changes as part of the revised back series of population estimates for mid-2012 to mid-2016, mid-2017 and onwards

The movements of dependants of foreign armed forces personnel are covered by the IPS. However, the methods used to distribute international migration flows to local authority level are unlikely to capture the movements of this group accurately as they tend not to appear on the GP Patient Registers (PRs), Migrant Workers Scan (MWS) or data on higher education. As a result, we have tended to "age-on" the dependants found in the 2011 Census rather than updating them in line with the foreign armed forces personnel. To produce more accurate population estimates, we have extended our special population adjustment for foreign armed forces personnel to cover dependants.

Given that the dependants of foreign armed forces are now theoretically counted twice by the mid-year population estimates (MYEs) (through international migration and the special population adjustment), we have introduced a further adjustment that counterbalances this: the population estimate of England and Wales, including the special population adjustment for dependants, is constrained back to the population excluding the adjustment.

Who is included

All foreign armed forces personnel and their dependants (partners and children) usually resident in England and Wales should be included in the population estimates. The US Air Force (USAF) makes up the majority of foreign armed forces; however, there are a number of military personnel from other US service arms (US Army, Navy and Marine Corps) who are also based in England and Wales.

The foreign armed forces component only accounts for military personnel and their dependants from USAF, with the exception of a small adjustment made for other US service arms currently located in Harrogate and North Kesteven. Foreign armed forces who are not from the US are not accounted for as part of the special population as there are no data currently available. However, these are considered very small in number.

Imputation of missing sex and age

For 2019, we received data on the ages of children, but USAF were unable to supply data on the sex of children. We imputed the sex of children using the sex distribution of the previous year's data. Spouses data were supplied by proportions in age bands by sex. We imputed the missing single year of age data using the proportions supplied by USAF by assuming that each age within each age band accounted for an equal share of the total. For example, for the age band 20 to 24 years we assumed that one-fifth were aged 20 years, one-fifth aged 21 years and so on.

US Air Force data

Data for USAF based in England and Wales are supplied to the Office for National Statistics (ONS) annually on or around the reference date of 30 June for the number of USAF personnel and their dependants, by sex, age and base in England and Wales.

Adjustment for Harrogate and North Kesteven

An adjustment is made for the local authorities of Harrogate and North Kesteven for other US service arms to account for pockets of localised foreign forces resident in these local authorities. The adjustment is based on data from the US Defence Manpower Data Centre on the total number of US Army, Navy and Marine Corps personnel based in the UK.

Base to local authority of residence

The population of England and Wales is estimated at the local authority of usual residence. USAF data are only provided by base, and therefore local authority of usual residence is imputed using data derived from the 2011 Census. For any bases in the USAF data where there is no base to residence information available in the census, residence is assumed to be at the local authority of the base. This is a valid assumption as the majority of members of the US armed forces live on base.

Change in foreign armed forces population

The change in the foreign armed forces population between the two mid-year points is estimated by subtracting the previous year's estimated foreign armed forces population from the current year's estimated foreign armed forces population, by local authority of residence, sex and age.

The exception to this approach is the method for estimating zero-year-olds. At the beginning of the process of calculating the MYEs, all zero-year-olds of the previous year's special population must be subtracted. This is to avoid ageing-on any zero-year-olds that will be accounted for at the end of the MYE calculation process through addition of the current year's special population one-year-olds.

However, when the current year special population is added at the end of the MYE calculation process, none of the zero-year-olds should be added. The zero-year-olds in the current year special population will already have been counted into the population because they were born in the UK and are part of the births data that are added to the MYEs.

Some additional special population zero-year-olds will have been born outside the UK and migrated in within the last year and will not be counted. These would be broadly balanced by those zero-year-olds born to the special population in the last year who then migrate out of the country, assuming a broadly similar resident special population over the year. There may be larger variations in this fraction if bases increase or decrease their personnel significantly.

Assumptions not stated elsewhere

A further assumption is made in how we estimate the foreign armed forces special population. It is assumed that joiners and leavers of the foreign armed forces population are not taken from or put back into the general England and Wales population.

9 . Prisoners

Special population

Population estimates include all prisoners in England and Wales with a sentence of six months or more. Prisoners are treated as a special population in the population estimates as it is assumed that movements of people into and out of prisons are not picked up by GP registers used to estimate internal migration.

Prisoner data

The Ministry of Justice supplies data on the number of people resident in prisons in England and Wales on 30 June of the reference year, by prison location, sex and age. For the purposes of the population estimates, a person is regarded as usually resident in a prison if they have been sentenced to serve six months or more.

Change in prisoner population

Change in the prisoner population between the two mid-year points is estimated by subtracting the previous year's estimated prisoner population from the current year's estimated prisoner population, by local authority, sex and age. This change can only be indicative as the prison estate population can fluctuate widely between mid-year points as a result of operational needs.

Change in non-prisoner population

Any change in the estimated prisoner population from one year to the next will be reflected in the general population of England and Wales; those joining and leaving the prisoner population will create a resulting inflow and outflow between the general population.

To distribute inflows and outflows of prisoners to and from the general population of England and Wales, we use the local authority distribution of the previous year's population estimate and distribute flows to the local authorities with the highest populations.

Foreign national offenders and offenders from other parts of the UK

The prisoner component of the population estimates assumes that all prisoners in England and Wales remain in England and Wales following the completion of their sentence. Foreign national offenders who are deported following completion of their sentence, or ex-prisoners who move to other parts of the UK, are not accounted for in this method. Owing to difficulties in accurately estimating this population, we assume that the flow of ex-prisoners returning to England and Wales from elsewhere balances out these flows.

10 . Compilation

National (England and Wales) and subnational (local authority) estimates from each component are compiled to produce national and subnational estimates.

The previous year's population estimate by sex, age and local authority of usual residence is aged-on by one year. The number of births between the two mid-year points is added into the population at age zero years. Deaths between the two mid-year points are removed from the population estimates.

Net flows of international and internal within-UK migration are then added into the population estimates. Changes resulting from special populations are also added into the population.

The resulting population estimate is the final population estimate for 30 June of the current year, by sex, age and local authority.

11 . Appendix 1: Quality assurance of administrative data reports

We quality assure the administrative data used in the estimation of the annual mid-year population estimate (MYE) to ensure that they are suitable. For further information regarding data quality issues and its impact on population statistics, please see the quality assurance of administrative data (QAAD) articles for each data source, which are available on our website:

- [Births](#)

- [Deaths](#)

- [UK Armed Forces](#)

- [US Armed Forces](#)

- [Patient Register (PR)](#)

- [Higher Education Statistics Agency (HESA)](#)

- [Prisoners](#)

- [NHS Central Register (NHSCR)](#)

- [Migrant Worker Scan (MWS)](#)

- [Asylum seeker data and non-asylum enforced removals](#)

- [Home Office immigration](#)

- [Asylum seekers support](#)

- [University of Warwick halls of residence data](#)

12 . Appendix 2: Understanding the impact of changes to internal migration methods

Understanding changes to internal migration estimates for mid-2017

There have been three changes to our internal migration methodology for mid-2017. The first change relates to how we account for the movements of the highly mobile population leaving higher education each year. The second change is in response to the unavailability of an important dataset used in the construction of internal migration estimates. The final change relates to an improved method for georeferencing record-level data (this is the process by which we determine the geographic location of those on administrative data).

This appendix gives further details on the first two of these changes and outlines the impact they have had on our data. No details on the impact of changes to georeferencing are provided in this appendix; this reflects the relatively small impact this change has had in comparison to the other two changes.

Higher Education Leavers Methodology (HELM)

The Higher Education Leavers Methodology (HELM) has been introduced to better address the movements of people leaving higher education each year. This builds on the method introduced in 2012 by moving people who leave higher education but do not update their Patient Register (PR) information to local authority destinations based on the movements of past cohorts of similar higher education leavers.

As with the previous internal migration method, the movement of individuals when they start higher education is accomplished by linking together data from the PR and Higher Education Statistics Agency (HESA) and comparing this with a similar dataset from the previous year.

In the method used between mid-2011 and mid-2016, those leaving higher education but who did not update their PR information in the year they left higher education were, over a period of years, moved back to their location on the PR.

HELM is designed to address two limitations of the previous method. First, the previous method only moved people back to their location on the PR, often their place of residence before attending higher education. In practice, the end of study is often accompanied by a move to seek work or for additional education. Secondly, the previous method used a conservative approach whereby individuals were moved out of their place of study at too slow a rate in the first year and too quick a rate in the second year.

HELM is a two-stage process.

Matrices of destinations for higher education leavers are calculated for each local authority in England and Wales, separately for males and females, based on the movements of a past cohort of higher education leavers. Those leaving higher education three years before but who did not update their PR in the year they left higher education are used to inform the matrices. The destinations are either the first change in output area in the second year following leaving higher education or their location on the PR three years after leaving.

The matrices are applied to those people leaving higher education in the reference period but who do not update their PR. The application of the matrix occurs in one step in the year that people leave higher education.

How HELM has been implemented

To allow for a smooth transition between methods, HELM has been run on data for each year from 2012 to 2017. This means that the mid-2017 internal migration estimates are based on a stock file for mid-2016 (in effect, the internal migration origins for mid-2017) that was not constructed using the previous method of building internal migration estimates. Consequently, any shortcomings in the previous graduate adjustment are excluded from the estimates for mid-2017. A comparison of the previous graduate adjustment method used and HELM is given in Table 3.

Table 3: Comparison between previous student graduate adjustment and Higher Education Leavers Methodology (HELM)

|	Graduate adjustment mid-2012 to mid-2016 and mid-2017 onwards	HELM mid-2017 onwards
Target population	Those on HESA and PR data in the previous year and only on the PR this year if they have a pre-study local authority recorded.	All those on HESA and PR data the previous year and only on the PR this year.
Timeliness	Gradually over a period of years, slightly too slow in first year and slightly too fast in second year. Based on a set of static moving-out factors.	Immediately, in the year after they are no longer present on HESA data.
Graduate destination	Pre-study local authority as recorded on the PR.	Based on distribution of destinations of higher education leavers from three years previously. Distribution is based on data for those who did not update their PR in the year following leaving.

Source: Office for National Statistics – Population estimates for the UK, mid-2019: methods guide

The impact of HELM on internal migration estimates

One of the most obvious impacts of using HELM is that we estimate a higher number of internal moves: using HELM results in around 160,000 more moves in the mid-2017 internal migration estimates compared with the old method of accounting for higher education leavers.

The explicit aim of introducing HELM was to increase the outflow of graduates from local authorities with higher education institutions at ages 22 and 23 years and to increase the inflow of graduates to local authorities that are popular graduate destinations (such as London and other major urban centres) at the same age. This is illustrated in Figure 1, which shows a higher number of internal migration moves at ages 22 and 23 years.

Figure 1: Pyramid of internal migration moves, England and Wales, mid-2017
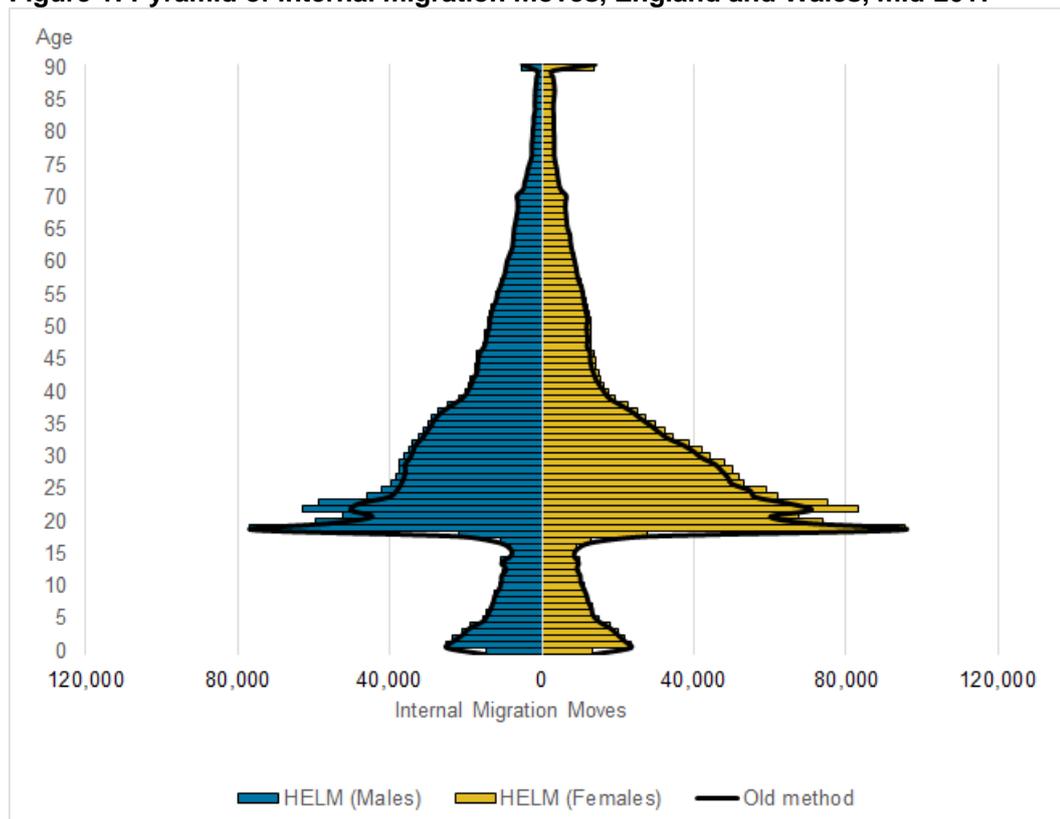
Source: Office for National Statistics – Population estimates

Local authority impacts of HELM

A comparison of internal migration estimates between HELM and the old method of accounting for moves by those leaving higher education is available in the comparison tool accompanying this article (published as part of the mid-2017 quality information). This provides internal migration estimates by single year of age and sex for administrative areas (local authorities and above) for England and Wales based on the new and old methods.

Tables 4 and 5 show the local authorities that have been impacted the most by the introduction of HELM. The list of the 20 local authorities with the largest increases in their net internal migration flows features 11 London boroughs. The 20 local authorities with the largest decreases in their net internal migration flows are home to large higher education institutions.

Table 4: Local authorities with the largest increases in net internal migration flows using HELM

Local authority	HELM	Old method	Difference between HELM and old method
Wandsworth	-1,580	-2,280	710
Lambeth	-2,190	-2,880	690
Bristol, City of	210	-320	530
Southwark	-2,710	-3,080	370
Oadby and Wigston	870	540	330
Croydon	-3,410	-3,710	300
Brent	-6,800	-7,070	270
Islington	-2,250	-2,510	260
East Hertfordshire	20	-220	240
Wiltshire	2,700	2,470	230
Broxtowe	360	140	220
Milton Keynes	-1,470	-1,690	210
Hammersmith and Fulham	-1,380	-1,570	190
Merton	-3,580	-3,770	190
Lewisham	-2,400	-2,580	190
Windsor and Maidenhead	-390	-560	180
Hackney	-2,050	-2,230	170
Bromley	-340	-510	170
Shropshire	3,260	3,100	170
Thurrock	250	100	150

Source: Office for National Statistics – Population estimates

Table 5: Local authorities with the largest decreases in net internal migration flows using HELM

Local authority	HELM	Old method	Difference between HELM and old method
Birmingham	-7,640	-6,310	-1,340
Leeds	-1,490	-380	-1,120
Nottingham	-1,180	-260	-910
Welwyn Hatfield	130	1,000	-870
Sheffield	-1,270	-690	-580
Leicester	-2,630	-2,050	-570
Bath and North East Somerset	920	1,460	-540
Liverpool	930	1,460	-530
Plymouth	-470	20	-490
Canterbury	530	1,000	-470
Neath Port Talbot	530	980	-450
Newcastle-under-Lyme	430	840	-410
Newcastle upon Tyne	-170	240	-410
Manchester	-3,560	-3,190	-370
Coventry	-1,010	-670	-350
Lancaster	320	660	-350
South Gloucestershire	1,210	1,520	-310
Luton	-5,350	-5,080	-270
Southampton	-1,090	-830	-270
Runnymede	-250	10	-260

Source: Office for National Statistics – Population estimates

Accounting for multiple moves and moves made by those not present at either the beginning or end of the year

The target concept for internal migration is all moves that cross local authority administrative boundaries in the reference year. This includes:

- moves by those appearing on the PR at both the beginning and end of the year (often referred to as transitions)

- moves by those born after the beginning of the year

- moves by those who die before the end of the year

- moves by those who immigrate into England and Wales after the beginning of the year

- moves by those who emigrate before the end of the year

- multiple moves during the year (for example, moving from Manchester to Leeds to London in the reference period)

From mid-2017 onwards, we have largely moved to the Personal Demographic Service (PDS) to account for these moves, but it is important to note that the NHS Central Register (NHSCR) is still an important part of the method.

The PDS picks up a far greater number of moves than the NHSCR; using the PDS to account for these moves would result in a much larger number of extra moves in the internal migration estimates. While the inconsistency between the number of moves picked up in the PDS and the NHSCR is not an indicator of any errors in the PDS data, we could not account for these moves purely on PDS data without further research into the causes of differences between the data sources.

If we had changed purely to the PDS for mid-2017, it would have introduced a substantial discontinuity in the time series of internal migration data. On that basis, we have decided to use a combination of data, using the pattern of geographic variation picked up by the PDS and adjusting for the differences between the PDS and NHSCR.

Movement factor example (mid-2015) shows how scaling factors, used to account for non-transition moves, were calculated for mid-2015. Movement factor example (mid-2017) shows how they have been calculated for mid-2017.

Movement factor example (mid-2015)

Let us say that there are two health authority areas (HAs), X and Y. According to the NHSCR, there were 20,000 moves into HA X and 30,000 moves out of HA Y.

Note that this is the total moves, not just the moves between these two HAs.

According to the PR, there were 15,000 transitions into HA X and 25,000 transitions out of HA Y.

We calculate the movement factors for this pair of HAs as:

$$\frac{\text{Total NHSCR inflow to destination} + \text{total NHSCR outflow from origin}}{\text{Total PR inflow to destination} + \text{total PR outflow from origin}}$$

$$= \frac{20,000 + 30,000}{15,000 + 25,000}$$

$$= 1.25$$

The result is that every internal migration flow between a local authority in HA X and a local authority in HA Y will be multiplied by 1.25.

Movement factor example (mid-2017)

Let us say that there are two HAs, X and Y. According to the PDS movers file, there were 25,000 moves into HA X and 35,000 moves out of HA Y.

Note that this is the total moves, not just the moves between these two HAs.

According to the PDS transitions, there were 15,000 transitions into HA X and 25,000 transitions out of HA Y.

We calculate the initial movement factors for this pair of HAs as:

$$\frac{\text{Total PDS movers inflow to destination} + \text{total PDS movers outflow from origin}}{\text{Total PDS transitions to destination} + \text{total PDS transitions from origin}}$$

$$= \frac{25,000 + 35,000}{15,000 + 25,000}$$

$$= 1.5$$

We adjust the initial scaling factor based on the relationship between the 2015-based NHSCR scaling factors and those based on the PDS movers and transitions for 2017 (this relationship is given by a regression line between the two series).

$$= 1.5 * 0.61149 + 0.4054$$
$$= 1.32$$

The result is that every internal migration flow (based on the PR, HESA and HELM) between a local authority in HA X and a local authority in HA Y will be multiplied by 1.32.

Frequently asked questions about the impact of HELM on internal migration estimates

The PDS results in scaling factors that are slightly higher for 2017 than previous years, which means that the total number of moves estimated in mid-2017 is higher. As scaling is applied as a uniform factor to both inflows and outflows between areas, it makes the underlying trends in the transitions data for either a net inflow or outflow more pronounced.

- Internal migration for my area is higher or lower than last year, is this purely because of the methodological changes that have been implemented?

There are several reasons why internal migration patterns change each year. The change in methods will have had an effect on internal migration levels. The move to HELM results in more graduate-age people moving than previously, and the change to our scaling method results in more moves at all ages. Further information on the impact of HELM can be found in the revision tool accompanying this release.

- Why does HELM lead to more moves by people in their 30s, 40s and 50s?

The main aim of HELM was to better address the large-scale migration of those in their early 20s when they leave higher education. For practical purposes, we have implemented the method for all of those leaving higher education each year, including those at older ages. This means that HELM generates extra moves for those at older ages.

HELM moves those leaving higher education to a local authority destination based on the pattern of movements of a previous cohort. While the migration patterns that HELM generates are reasonable in aggregate, they are only a proxy for real moves. In practice, this means that a large number of moves will assign individuals to the wrong local authority districts. In subsequent years, these individuals will update their PR records and this will generate additional moves from their proxy location to their actual location.

- Why did you not roll forward the scaling factors from mid-2015 as you did with the mid-2016 estimates?

For the mid-2016 internal migration estimates, we reused the scaling factors from the mid-2015 internal migration estimates. This was on the basis that these scaling factors were only one year out of date and represented a reasonable proxy for data for mid-2016. However, as we moved into production of the mid-2017 internal migration estimates and considered the need to produce scaling factors for future years, we could not justify rolling forward the same scaling factors indefinitely. In addition, the PDS provides us with similar coverage (multiple in-year moves and moves by those not present at either the beginning or end of the year) to the NHSCR.

- Why have you not implemented these methods in the back-series released in March 2018?

It was not possible to implement these methods as part of the back-series released in March 2018 as we were still finalising the method in the early part of 2018.

- Will you implement these as part of a back series?

In 2022 or 2023, we will revise the population estimates for 2012 to 2020 to be consistent with population estimates from Census 2021. As part of this back series, we would intend to use our improved series of internal migration estimates. There are no other planned revisions to population estimates before this.

- Will there be further changes to the internal migration methods?

Yes. The PR – the main dataset in our internal migration methods – will be unavailable after the production of the mid-2019 estimates in June 2020. For mid-2019 onwards, the main dataset in the internal migration method will be the PDS.

We will be conducting further research over the next two years to further understand the implications of changing data sources. Further research is also underway into using a wider range of data to capture the movements of those groups who are more likely to regularly interact with the tax and benefit system than the NHS or higher education.

- How can you be sure these are improvements?

Moving to HELM addresses important issues with the previous method of estimating internal migration. The effects of changes on the estimates as a result of using HELM are in line with our expectations and understanding of the issues. Unfortunately, we have no independent data sources that we can use to benchmark our method.

One of the reasons for mainly using the PDS instead of the NHSCR to account for non-transition moves has been to create as little discontinuity in our internal migration estimates as possible.

13 . Appendix 3: Summary of historical methods

The mid-year estimates release contains population estimates from 2001 to the present year. Some of the main differences between the methods outlined in this article and those used between 2001 and 2011 are discussed here.

Internal migration estimates (mid-2002 to mid-2011)

Internal migration estimates for mid-2002 to mid-2011 are based on Patient Register (PR) data (both the Patient Register Data Service (PRDS) and NHS Central Register (NHSCR)) enhanced using aggregate data from the Higher Education Statistics Agency (HESA) and 2001 Census data to better account for the movements of students. Further details on this method can be found in our methodology papers.

International immigration estimates (mid-2006 to mid-2011)

This method is broadly similar to the one currently used; international immigration at the England and Wales level is distributed to local authorities by stream using administrative data. Further details on this method can be found in Improved methodology for estimating immigration to local authorities in England and Wales.

International immigration estimates (mid-2002 to mid-2006)

For mid-2002 to mid-2006, international immigration at the local authority level was calculated using a regression model, much like that currently used for international emigration, to distribute immigrants to local authorities. Further details can be found in Estimating international long-term immigration by local authority (PDF, 1.28MB).

International emigration estimates (mid-2002 to mid-2011)

For mid-2002 to mid-2011, international emigration at the local authority level was calculated using a regression model, much like that currently used, to distribute emigrants to local authorities. Further details can be found in Estimating international long-term immigration by local authority (PDF, 1.28MB).

Migration to and from Ireland (mid-2002 to 2007)

Historically, we used data from the Central Statistics Office (CSO) in Ireland to estimate migration flows between the UK and the Republic of Ireland. Their data were used because there were no routes between the two countries surveyed by the International Passenger Survey (IPS). From mid-2008, flows to and from Ireland were covered by the IPS. Further details can be found in Improving estimates of international migration in Northern Ireland, and between the UK and Republic of Ireland (PDF, 58KB). Additional changes (PDF, 640KB) were made post-census and as part of the revised back series of population estimates for mid-2001 to mid-2010.

14 . Appendix 4: Historical geography changes – 2009 to 2020

Local government boundary names and area codes can change at any time. Since 2009, the changes listed in Table 6 have occurred. In some cases, local authority names or area codes have changed with little effect on the population estimates. In other cases, local authorities have merged into new larger bodies.

Population estimates are published each year according to the local authorities in place at the time of publication. Where changes have occurred in the 12 months before publication, data on the previous set of local authorities are also published. See the Office for National Statistics' (ONS') Open Geography Portal for more information on historical geography changes.

Table 6: Historical geography changes – 2009 to 2020

2009 changes

2008 local authority	2009 local authority	Old code	Updated code
Powys	Powys	W06000007	W06000023
Merthyr Tydfil	Merthyr Tydfil	W06000017	W06000024
Bedford	Bedford	E07000002	E06000055
Mid Bedfordshire	Central Bedfordshire	E07000001	E06000056
South Bedfordshire	Central Bedfordshire	E07000003	E06000056
Chester	Cheshire West and Chester	E07000013	E06000050
Ellesmere Port and Neston	Cheshire West and Chester	E07000016	E06000050
Vale Royal	Cheshire West and Chester	E07000018	E06000050
Congleton	Cheshire East	E07000014	E06000049
Crewe and Nantwich	Cheshire East	E07000015	E06000049
Macclesfield	Cheshire East	E07000017	E06000049
Caradon	Cornwall	E07000019	E06000052
Carrick	Cornwall	E07000020	E06000052
Kerrier	Cornwall	E07000021	E06000052
North Cornwall	Cornwall	E07000022	E06000052
Penwith	Cornwall	E07000023	E06000052
Restormel	Cornwall	E07000024	E06000052
Isles of Scilly	Isles of Scilly	E07000025	E06000053
Chester-le-Street	County Durham	E07000054	E06000047
Derwentside	County Durham	E07000055	E06000047
Durham	County Durham	E07000056	E06000047
Easington	County Durham	E07000057	E06000047
Sedgefield	County Durham	E07000058	E06000047
Teesdale	County Durham	E07000059	E06000047
Wear Valley	County Durham	E07000060	E06000047
Alnwick	Northumberland	E07000157	E06000048
Berwick-upon-Tweed	Northumberland	E07000158	E06000048
Blyth Valley	Northumberland	E07000159	E06000048
Castle Morpeth	Northumberland	E07000160	E06000048
Tynedale	Northumberland	E07000161	E06000048
Wansbeck	Northumberland	E07000162	E06000048
Bridgnorth	Shropshire	E07000182	E06000051
North Shropshire	Shropshire	E07000183	E06000051
Oswestry	Shropshire	E07000184	E06000051
Shrewsbury and Atcham	Shropshire	E07000185	E06000051
South Shropshire	Shropshire	E07000186	E06000051

Kennet	Wiltshire	E07000230	E06000054
North Wiltshire	Wiltshire	E07000231	E06000054
Salisbury	Wiltshire	E07000232	E06000054
West Wiltshire	Wiltshire	E07000233	E06000054

2012 changes

2011 local authority	2012 local authority	Old code	Updated code
St Albans	St Albans	E07000100	E07000240
Welwyn Hatfield	Welwyn Hatfield	E07000104	E07000241

2013 changes

2012 local authority	2013 local authority	Old code	Updated code
Gateshead	Gateshead	E08000020	E08000037
Northumberland	Northumberland	E06000048	E06000057
East Hertfordshire	East Hertfordshire	E07000097	E07000242
Stevenage	Stevenage	E07000101	E07000243

2018 changes

2017 local authority	2018 local authority	Old code	Updated code
Fife	Fife	S12000015	S12000047
Perth and Kinross	Perth and Kinross	S12000024	S12000048
Shepway	Folkestone and Hythe	E07000112	E07000112

2019 changes

2018 local authority	2019 local authority	Old code	Updated code
Bournemouth	Bournemouth, Christchurch and Poole	E06000028	E06000058
Christchurch	Bournemouth, Christchurch and Poole	E07000048	E06000058
Poole	Bournemouth, Christchurch and Poole	E06000029	E06000058
Weymouth and Portland	Dorset	E07000053	E06000059
West Dorset	Dorset	E07000052	E06000059
North Dorset	Dorset	E07000050	E06000059
Purbeck	Dorset	E07000051	E06000059
East Dorset	Dorset	E07000049	E06000059
West Somerset	Somerset West and Taunton	E07000191	E07000246
Taunton Deane	Somerset West and Taunton	E07000190	E07000246
Suffolk Coastal	East Suffolk	E07000205	E07000244
Waveney	East Suffolk	E07000206	E07000244
Forest Heath	West Suffolk	E07000201	E07000245
St Edmundsbury	West Suffolk	E07000204	E07000245
Glasgow City	Glasgow City	S12000046	S12000049

| North Lanarkshire | North Lanarkshire | S12000044 | S12000050 |

2020 changes

2019 local authority	2020 local authority	Old code	Updated code
Aylesbury Vale	Buckinghamshire	E07000004	E06000060
Chiltern	Buckinghamshire	E07000005	E06000060
South Bucks	Buckinghamshire	E07000006	E06000060
Wycombe	Buckinghamshire	E07000007	E06000060

Source: Office for National Statistics – Population estimates for the UK, mid-2019: methods guide