

Article

International migration research, progress update: February 2025

An update on international migration methods and research to further develop admin-based migration estimates (ABMEs).

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1 . Overview of migration statistics transformation

This article provides an update on international migration research for our estimation of EU+ migration and British national migration. We welcome feedback on our developing methods. It is an important part of our research to engage with our users. We use your feedback to ensure our statistics meet your needs as users of our statistics. We will continue to publish research updates as our research develops.

Since January 2021, freedom of movement for EU+ nationals migrating to the UK came to an end. EU+ nationals now require permission to migrate to the UK, which can be obtained in the form of a visa, or acquiring limited or indefinite leave to remain through the EU Settlement Scheme (EUSS) or otherwise. This has enabled us to start development of an EU+ long-term migration estimation method using Home Office Borders and Immigration (HOBI) data for the first time. Home Office data estimate [5.7 million people](#) had a status under EUSS as of September 2024, as described in the Home Office's [Media factsheet: EU Settlement Scheme blog](#). However, not everybody with this status is resident in the UK.

Current estimates, based on the Department for Work and Pension's (DWP's) Registration and Population Interactions Database (RAPID), cannot distinguish between EUSS and EU+ visas. Additionally, a change to our method using newly available data could allow us to overcome limitations with the data that we currently use, such as being unable to produce EU+ migration by nationality and reason for migration, as we do for non-EU+ migration.

The International Passenger Survey (IPS) had its national statistic designation removed in 2019. We have long acknowledged it has been stretched beyond its original purpose, and we need to consider alternative data sources to measure migration. While admin data sources are now used to measure EU+ and non-EU+ migration, IPS is still used to measure British national migration.

In 2023, we published our [Estimating UK international migration: 2012 to 2021 article](#) stating the IPS likely underestimated emigrating British nationals. It was estimated that 787,000 more British nationals left the UK than returned between year-ending (YE) June 2012 and YE June 2021, which was 471,000 more than our previously published estimates for this period. The IPS arrivals data collection stopped 1 July 2024, though it does still collect data on departures. There is a clear need to develop new methods for British national migration. This update provides progress on our research to develop a method based on admin data.

2 . EU+ migration methods

Our current EU+ estimates are based on the Department for Work and Pensions (DWP) Registration and Population Interactions Database (RAPID), as described in our [Methods to produce provisional long-term international migration estimates methodology](#). In 2021, we outlined quality considerations of the current method, including coverage and timeliness, in our [Methods for measuring international migration using RAPID administrative data methodology](#).

We have been researching the use of the Home Office Borders and Immigration (HOBI) data for EU+ nationals, including EU+ visa holders and those with EU Settled Status.

HOBI data combine visa and travel information, which we currently use to estimate the migration of non-EU+ visa holders. So far, we have completed exploratory analysis to assess the differences between the new EU Home Office datasets and the existing non-EU data used for our headline estimates of non-EU migration. We have checked important quality components over a time series. This has enabled us to understand how data quality changed over time. When looking at data missingness and extreme values, the quality of the data was comparable between the current non-EU data extract and the new EU data extract.

Coverage and quality considerations in using Home Office Borders and Immigration data for EU migration estimates

Population coverage

HOBI data include EU+ nationals coming to and leaving the UK. However, Irish nationals are not fully captured. We can use HOBI to produce a flows measure, because it uses travel information to show when an individual is in and out of the UK.

Timeliness

HOBİ comes from a live operational system. This allows for timely updates to estimates, in the same way we currently produce estimates for non-EU+ where we publish estimates five months after the reference period. We currently publish bi-annual international migration estimates, which require forecasting RAPID for three or nine months.

Missing travel data

HOBİ data match an individual's visa information to their travel events and there are some coverage issues with travel data included. Travel through the Common Travel Area is also not included.

Data matching

Some individuals within the HOBİ data have travel information that has not been matched to a visa. This can be because they do not require a visa to come to the UK (and will typically be short-term visits) or the system has not matched the travel and visa information.

EU+ visa holders

We updated users on our research applying the "first arrival, last departure" (FALD) method to EU+ visa holders in our [International migration research, progress update: November 2023 article](#). We already use HOBİ data for non-EU+ visa holders and have replicated the FALD method on EU+ visa holders.

We use the United Nations (UN) definition of a long-term international migrant. This means we need to wait for 12 months of travel data to confirm people's long-term migration status. Because of the user need for more timely statistics, we use assumptions about people's expected length of stay or departure based on past trends to produce adjustments. This provides provisional estimates for most recent periods. We have developed and refined these adjustments for non-EU+ nationals in collaboration with the Home Office. We have applied the same assumptions to EU+ nationals, which consider the reason for migration, nationality, and age, to reflect the distinctive behaviour patterns seen in different groups.

EU settled status

We have progressed our research to develop methods to estimate long-term migration of those with EU settled status, which requires a different approach to EU+ visa holders.

Initial research using the FALD method has shown it is unsuitable for this group. This is because most of those applying will already be resident in the UK and should not be included in our more recent long-term immigration estimates. The last departure approach makes assumptions about an absence from the UK, relative to the time remaining in a visa period. Those with EU settled status do not have a time limit on the amount of time they can reside in the UK.

Assumptions

We are working on a set of starting assumptions for those with EU settled status, in line with the legal requirements for the scheme. Most people who are entitled to EU settled status were residents in the UK before their application. This means we need to apply a set of assumptions for when this group first arrived in the UK. We do not need to rely on these starting assumptions where we can see travel data for an individual. We have travel data going back to 2015, which means we can assess travel patterns over several years.

The EU Settlement Scheme (EUSS) has two subcategories: settled and pre-settled. People with this leave type are not subject to the same migration controls as other visa types.

For those with settled status, they have been resident for five years and have no limits on their length of stay in the UK. When looking for a first arrival, our current assumption is that they have arrived at least five years before their EUSS application date.

For those with pre-settled status, our current assumption is that they arrived at the time of their application date, or we will use their earliest travel arrival date.

EU Settlement Scheme method development

We outlined our research on two methods to estimate the long-term migration of those with EUSS in our [International migration research, progress update: November 2024 article](#). These are the "12 months in 16" method and the "cumulative time spent in the UK" method.

The 12 months in 16 method requires an individual to spend 12 months in any 16-month period in or out of the UK to be considered a long-term migrant. This aligns to the UN definition of a long-term international migrant described in the Department of Economic and Social Affairs's [Recommendations on Statistics of International Migration paper \(PDF, 5.0MB\)](#). This method considers all stays in the UK.

We are also developing a cumulative time spent in the UK method to be able to produce more timely long-term international migration estimates. This method is based around travel patterns and the amount of time spent in and out of the UK. This method considers long-term stays and removes repeated short stays in the UK.

Cumulative time spent in the UK

We are developing a method that assumes if someone has settled status, and their first travel event is an emigration, they must have been resident in the UK. Using travel dates, we calculate time spent in and out of the UK, and group extended trips out of the UK, into a single travel period to assess the cumulative time in and out of the country.

The method uses three steps to calculate emigration:

1. We group together extended trips of 45 days or more outside of the UK.
2. Using this grouped period, we identify those who spend more time out of the UK than in.
3. We then look at the total amount of time spent outside the UK; if the total time out of the UK exceeds the limit of 270 days, they are classed as a long-term emigrant.

To calculate immigration, we use an inverse approach. We identify extended periods within the UK of 45 days or more, which we group together to determine whether a person meets the immigration criteria. An immigration period is counted from the earliest arrival, visa application date or, for re-arrivals, when the time in country reaches 270 days. This method also allows us to identify multiple immigration and emigration events.

To group together extended trips for immigration and emigration, we assessed four different options: grouping trips of over 31 days, 45 days, 60 days, or 90 days. These different groupings only had a small effect on the estimates. We have proceeded with our research with the grouping of 45 days.

We assessed three different options for the total amount of time spent inside and outside the UK: 183 days, 270 days, or 365 days, which relate to approximately 6, 9, and 12 months, respectively. We have made comparisons between the three options from the cumulative time spent in the UK method and compared them with the 12 months in 16 method.

Using a cumulative time spent inside and outside the UK of 183 days (approximately 6 months) option produces higher immigration and emigration estimates. We have discounted this option because it could include some short-term migrants, which would not align to the UN definition of a long-term migrant. The 365 days option appears to best match the UN definition of long-term migration. It produces lower immigration and emigration estimates when compared with the 12 in 16 method. However, the 270 days (approximately 9 months) option produced migration estimates closest to the 12 months in 16 method. We have therefore proceeded with our research using the cumulative time spent inside and outside the UK of 270 days.

Imputation

Where we see two arrivals with no departure between, or two departures with no arrival between, we have used imputation to predict when that missing departure or arrival may have been.

We have assessed the following options to understand the impact for estimating the migration of those with EU settled or pre-settled status:

- ignore or remove missing travel data
- imputing the smallest date (making the stay one day)
- imputing the largest date (making the stay in the UK the maximum possible length)
- imputing the middle date

To test these imputation options, we created a test dataset from records with complete travel data. Then we removed arrival and departure dates at random, replicating the amount of missingness seen in the actual data. We then ran the options through the test data to see which produced dates were the closest to the dates we removed. This suggested that using the option that creates the longest length of stay was the most suitable option, and this is the option we have chosen. This means that missing arrivals are imputed as the day after the previous departure and missing departures are imputed as the day before the next arrival. We will continue to monitor changes in travel patterns in the data and review whether this imputation option is the most appropriate solution.

Irish nationals

There is an acknowledged under-coverage of Irish nationals in the HOBI data. This is because they do not require a visa or EU settled status to enter the UK, and so are not captured. RAPID is currently the only available data source to tell us about the migration of Irish nationals. This is because they go through the same registration process as other EU nationals when applying for a National Insurance Number (NINo) if they have never lived in the UK. Therefore, we can use estimates produced from RAPID for Irish nationals to inform a proportional adjustment, which can be applied to HOBI estimates. Separate immigration and emigration adjustments are created, using the proportion that long-term Irish national migrants form as part of total EU immigration and emigration, respectively, in that tax year.

Continuing EU+ methods development

As we have been developing our methods, we have sought external feedback from the Methods Advisory Research Panel and the Migration Statistics Expert Group, and we have collaborated extensively with the Home Office. Over the coming months, our focus will be on the following pieces of research:

- investigate areas where we see differences in migration estimates between our methods in development and our current methods
- refine our imputation methods for the cumulative time spent in the UK method
- continue our collaboration with the Home Office to quality assure and refine our starting assumptions for the EUSS migration estimates
- continue to develop the Irish national adjustment

3 . British nationals methods

We are exploring alternative data sources to improve our estimates of British national migration. The Department for Work and Pensions (DWP) Registration and Population Interactions Database (RAPID) currently offers the best available alternative for estimating British national migration, in terms of timeliness and coverage. We can use activity data from HM Revenue and Customs (HMRC) and DWP over many years.

Defining British nationals

There are six different [types of British nationality](#):

- British citizenship
- British overseas territories citizen
- British overseas citizen
- British subject
- British national (overseas)
- British protected person

People must have British nationality to apply for or hold a [British passport](#). It is possible for someone who has never been to the UK to hold a British passport. This is because British nationality can be acquired in several ways, such as through descent (if one or both parents are British citizens), naturalisation, or registration. For example, a person born outside the UK to a British parent may automatically acquire British citizenship by descent. This would make them eligible for a British passport even if they have never been to the UK. This will still count as a British national immigration into the UK if they arrive to stay here 12 months or more, meaning they become classed as a usual resident.

Registration and Population Interactions Database

The RAPID database brings together data from multiple sources, including from DWP, HMRC, and local authorities. RAPID contains data for every National Insurance Number (NINo)'s interactions with the tax and benefits system since 2008. Each NINo is assumed to relate to a unique individual. We create a timeseries that we can use to infer the residency status of individuals. We do this by linking the individual tax years into a longitudinal dataset, based on activity within RAPID. Using a changed residency status of resident to not resident, or not resident to resident, we are able to infer emigration and immigration events of British nationals. However, there are many reasons why someone may not interact with the systems that make up RAPID, but they remain resident within the UK.

We can generate rules that alter someone's residency status if they meet certain criteria, or we make certain assumptions based on the broad demographics and characteristics of people whose inactivity may be explained by reasons other than migration. Our assumptions are set out in the Method subsection. Having done this, we are able to generate estimates of British long-term international migrants (both immigration and emigration) from RAPID.

RAPID-based estimates have been compared with Census 2021 findings. The census asked respondents whether their usual residence was the same as their usual residence one year previously, and if not, where it was.

RAPID creates a default nationality and country of origin to "UK National" for anyone not found on the Migrant Workers Scan (MWS) or in the Customer Information System (CIS) data as a migrant registration. The Migrant Worker Scan only captures NINo registrations for people who present themselves as "non-British". This means that the scan excludes some people who have never been in the UK before, but hold a British passport, for example, by dual nationality registrations or British by descent. These people will therefore correctly present themselves as British nationals in our estimates.

Of the six categories of British nationals, only British citizens will appear in RAPID as British, along with dual passport holders of the UK. This fits with our expectations when compared with stocks of the UK population based on the numbers of individuals in the RAPID data, and provides an accurate measure when compared with our mid-year estimates.

Quality considerations when using Registration and Population Interactions Database for migration estimates

RAPID was not designed to calculate migration estimates. There are certain features of the administrative data that need to be considered.

Data completeness

Certain groups, such as children, may not be fully captured in the RAPID data, unless they apply for a NINo or their parents apply for child benefit.

Timeliness and lag

RAPID data often have a lag resulting from necessary processing and validation times. We typically receive RAPID in October, covering the period to year-ending (YE) the previous March. For example, RAPID received in October 2024 will cover the period up to and including March 2024.

To account for time lags created by the annual delivery, we use a method called temporal disaggregation to project the data forward at aggregate level to the following quarters. Temporal disaggregation uses a regression approach to look for a relationship between two datasets. It is used to break down the annual RAPID data into monthly data and then reaggregate to YE quarterly data. This is then revised once we receive the next latest data. The Office for National Statistics (ONS) and DWP are continuously working together to develop methodologies to better estimate international migration and address coverage gaps in the RAPID data.

Estimation of activity

The methodology using flag rules to estimate activity (for example, the penultimate year flag) involves assumptions that might introduce errors. We have taken steps to minimise this as much as possible. For example, we have made assumptions about total activity where the data may not show continuous activity that indicates long-term presence in the UK (that they are not an emigrant). RAPID data have multiple categories, such as tax data and benefit data, to account for the complexity of individuals' lives and interactions. This distinguishes between long-term and short-term migrants.

Method

We initially assume everyone in the RAPID data is resident in the UK. We then look at people's activity in the data, for example, if they have been paying tax or receiving a benefit. If a person has no activity for more than 12 months, this suggests they may have emigrated. If they have had no activity for 12 months and then do have activity, this suggests they have immigrated. However, this could be inaccurate because people may be inactive in the data for reasons other than migration. To adjust for this, we have developed a set of rules to flag that a person is a resident. A person may receive more than one flag, but we only count the presence of a flag, not the number of flags.

Flag rules

Single tax year absence (gap year)

This rule looks for no activity in tax years either side of 12 months, marking the person as "resident" if activity is found.

Pension rule

This rule assumes someone who does not have any activity until they claim their state pension has remained resident in the UK and that emigration is not the reason for their inactivity within RAPID.

Address change rule

This rule considers anyone with no activity, but who has changed their address to the UK, as active within the tax year.

Child Benefit (school age flag rule) grace period

This rule assumes a dependant remains resident if:

- the parent stops receiving child benefit on their behalf
- there is no other activity for the dependant
- there is no evidence of a foreign address

Child Benefit for parents

This rule considers parents of children who received child benefit to be residents, even if no current activity is shown. If a person has a foreign address, they are not considered resident, even if they are claiming child benefit.

Child parent residency

This rule assumes the residence status of children is the same as their parents.

Students

The rule identifies people repaying a student loan and assumes they were resident during the ages most associated with students, if there is no evidence of a foreign address.

Penultimate year flag rule

This rule adjusts the resident population in the latest year of data for those with evidence of activity in the penultimate year.

Potential biases

Confirmation bias

Since the rules assume residency until proven otherwise, there might be a tendency to look for evidence that confirms this assumption and overlooks contradictory evidence.

Data availability bias

If the data sources used to verify residency status are incomplete or outdated, some non-residents might be incorrectly flagged as residents.

Systemic bias

The rules might unintentionally favour certain groups over others, depending on the criteria used for determining residency.

Naturalisation adjustment

RAPID is not updated when foreign nationals registered on the MWS obtain British citizenship. These people will be excluded from the British migration estimates if they subsequently migrate out of the UK or if they return. We plan to develop a naturalisation adjustment for this, to mitigate undercounting of non-UK born British nationals' immigration and emigration.

Mirror statistics

Mirror statistics involve comparing migration data reported by both the sending and receiving countries, to identify discrepancies and improve accuracy. We started to undertake a mirror statistic exercise to validate RAPID-based estimates. We did this by comparing countries that British nationals emigrate to with immigration data of British nationals to those countries. However, international data limitations mean this is not currently possible. These limitations include issues with:

- coherence between different concepts and definitions used by national statistical institutes (NSIs)
- different reference periods
- different data collection processes and methods used by NSIs

We will continue to explore the potential of alternative data sources to help provide confidence in the estimates we produce.

Error estimates for British national migration

RAPID-based British national migration estimates can use the current method developed for estimating uncertainty of RAPID-based EU+ national migration estimates. This method is a simulation-based approach, described in our [Measuring uncertainty in international migration estimates methodology](#). It quantifies uncertainty associated with adjustments and statistical modelling in the estimation process. This will allow us to add confidence intervals around future estimates for British nationals.

Continuing British nationals methods development

We have sought external feedback from the Methods Advisory Research Panel and the Migration Statistics Expert Group as we have been developing our methods. We are continuing our research to determine if it can provide a more accurate reflection of migration behaviours, compared with the under coverage and intentions-based International Passenger Survey (IPS). RAPID includes data from multiple sources. It offers a detailed view of individual activities over time, and allows for methodological flexibility through various rules and flags as outlined in this section. We will continue our work to improve biases and assumptions with the method that maybe distorting the results.

We are also in the early stages of exploring Home Office borders data provided by aircraft, ship, and Channel Tunnel rail service operators. The ability to view travel journeys over time may enable a further improvement to the estimation of British national migration. Our research over the coming year will investigate if these data can be used to estimate British national migration alongside RAPID. This research will include working closely with colleagues in the Home Office.

There will be changes to how we measure British national migration in our next long-term international migration (LTIM) release in May 2025. The IPS no longer collects arrivals information that we have used to estimate British national immigration until now. Our research to develop a new method will continue. We will also be implementing an interim solution to estimate British national immigration for LTIM in May 2025, which will still make use of IPS data.

4 . Measuring uncertainty in non-EU estimates of long-term international migration

We publish accompanying uncertainty estimates with our headline long-term international migration estimates. Our current method is a simulation-based approach that estimates some sources of uncertainty associated with LTIM estimates, as described in our [Measuring uncertainty in international migration estimates methodology](#). We quantify uncertainty for non-EU national estimates from Home Office Borders and Immigration (HOBI) data with adjustments made to the estimates (for example, early leavers and returners adjustments). However, revisions to estimates come from multiple additional sources, beyond those used for adjustments. The reasons for revisions are outlined in Section 4: Impact of revisions to provisional estimates of migration of our [International migration research, progress update: November 2024 article](#).

We are researching the feasibility of producing precocity error-based uncertainty intervals for our LTIM estimates. Precocity error is a quality metric that quantifies the difference between provisional estimates and more finalised estimates. The precocity error uncertainty intervals will include more sources of uncertainty, with the aim of being more informative to users by indicating a plausible range within which the estimates could be revised.

5 . Glossary

Administrative data

Collections of data maintained for administrative reasons, for example, registrations, transactions, or record keeping. They are used for operational purposes and their statistical use is secondary. These sources are typically managed by other government bodies.

British national

A British national is a person who holds a type of British (English, Scottish, Welsh, and Northern Irish) nationality. The six different types of British nationality are:

- British citizenship
- British overseas territories citizen
- British overseas citizen
- British subject
- British national (overseas)
- British protected person

For the purposes of our Registration and Population Interaction Database (RAPID)-based estimates, we have treated British national (overseas) as a separate category within the non-EU+ country grouping.

EU and EU+

EU includes EU14, EU8, and EU2, plus Malta, Cyprus, and Croatia from 1 July 2013. British nationals are not included in these numbers at any point in time.

- EU2 is Romania and Bulgaria
- EU8 is Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia
- EU14 is Austria, Belgium, Denmark, Finland, France, Germany, Greece, Republic of Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden
- Other EU is Malta, Cyprus, and Croatia (joined from 2013)
- EU+ is all current EU countries, plus Norway, Iceland, Liechtenstein, and Switzerland

Home Office Borders and Immigration data

Home Office Borders and Immigration (HOBI) data combines data from different administrative sources to link an individual's travel in or out of the UK with their immigration history. This system has data for all non-European Economic Area (non-EEA) visa holders and EEA nationals.

International Passenger Survey

Our International Passenger Survey (IPS) collects information about passengers entering and leaving the UK. It has been running continuously since 1961, except between March 2020 and January 2021 when it was suspended because of the coronavirus (COVID-19) pandemic. Currently, we use it for our British national estimates and for providing information on reason for migration.

Long-term international migration

Long-term international migration (LTIM) statistics estimate the flow, or movement, of migrants to and from the UK. This article uses the UN definition of a long-term international migrant, as explained in the [Recommendations on Statistics of International Migration paper \(PDF, 5MB\)](#). A long-term international migrant is defined as "A person who moves to a country other than that of his or her usual residence for a period of at least a year (12 months), so that the country of destination effectively becomes his or her new country of usual residence".

In this article, a long-term international immigrant refers to a person who has moved to the UK from abroad for a period of at least a year.

In this article, a long-term international emigrant refers to a person who has left the UK to go to another country for a period of at least a year.

Non-EU+

Non-EU+ is the sum of the rest of the world, including the rest of Europe, not included in the EU+ category. British nationals are excluded from these numbers.

Registration and Population Interaction Database

The Registration and Population Interaction Database (RAPID) is a database created by the Department for Work and Pensions. It provides a single coherent view of interactions across all benefits and earnings datasets for anyone with a National Insurance Number (NINo).

6 . Related links

[Methods to produce provisional long-term international migration estimates](#)

Methodology | Updated 28 November 2024

An explanation of the methods used to produce the latest provisional experimental statistics on migration flows into and out of the UK.

[Long-term international migration, provisional: year ending June 2024](#)

Bulletin | Released 28 November 2024

Official statistics in development of UK international migration, year ending (YE) June 2012 to year ending June 2024. Estimates from YE December 2023 and YE June 2024 are provisional and will be updated when more complete data are available.

[Estimating UK international migration: 2012 to 2021](#)

Article | Released 23 November 2023

How migration has changed over the decade, the methods used to produce the updated series and the evidence used to demonstrate confidence that the new methods are robust.

[Improving international migration statistics using administrative data](#)

Article | Released 23 November 2023

Describes how we estimate international migration and the data we use. Includes an explanation of our research, the improvements we have made and future developments.

[Long-term international migration: quality assuring administrative data](#)

Article | Released 16 November 2023

Administrative data sources and quality assurance in the production of admin-based long-term international migration estimates published in bi-annual releases.

[Dynamic population model, improvements to data sources and methodology: local authorities in England and Wales, mid-2011 to mid-2023](#)

Article | Released 15 July 2024

Update on the data used by the dynamic population model (DPM) to produce admin-based population estimates (ABPEs).

7 . Cite this article

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