

User guide to Census 2021 origin-destination data, England and Wales

Supporting information for origin-destination data from Census 2021 in England and Wales, including how to access and use public, safeguarded and secure datasets.

You might also be interested in:

[Origin-destination \(flow\) data, Census 2021](#)

1. Overview

This user guide helps you to use, analyse, and interpret Census 2021 origin-destination data for England and Wales.

About origin-destination data

Origin-destination data, also known as flow data, show the movement of people from one location to another. Some datasets show basic flows between locations, while others break down the flows by different characteristics.

Summary of Census 2021 origin-destination data

There are four types of Census 2021 origin-destination data for England and Wales. These are:

- migration, showing migration patterns (both internal and international) of individuals based on their usual address one year before Census Day, 21 March 2021
- workplace, showing commuting patterns of individuals
- second address, showing the location of an individual's second address in relation to their usual residence or workplace
- student migration, showing migration patterns of individuals living at student addresses one year before Census Day, 21 March 2021

Who uses origin-destination data

Origin-destination data help local and central government plan and fund infrastructure for:

- education
- healthcare
- housing
- transport

Academics and researchers also use them to analyse population movement and trends for migration and commuting patterns.

UK origin-destination data

England, Wales, and Northern Ireland held their censuses in March 2021, whereas Scotland held their census in March 2022. The difference in dates means we have been unable to combine these data to produce a reliable set of UK origin-destination data.

When we released Census 2021 origin-destination data for England and Wales at the Office for National Statistics (ONS), Northern Ireland were still in the early stages of releasing census data and their origin-destination data were not available. We hope to incorporate origin-destination data for Northern Ireland into our origin-destination data when it becomes available provided that including it does not put the confidentiality of respondents at risk.

Origin-destination datasets for England and Wales include the following Scottish and Northern Ireland flows:

- to Northern Ireland or Scotland, where a usual resident of England and Wales worked in Northern Ireland or Scotland
- from Northern Ireland or Scotland, where a usual resident of England and Wales had an address in Northern Ireland or Scotland one year before Census Day, 21 March 2021
- to Northern Ireland or Scotland, where a usual resident of England and Wales had a second address in Northern Ireland or Scotland

Geography overview

We produced Census 2021 origin-destination flows at various geography levels including:

- Output Area (OA)
- Middle layer Super Output Area (MSOA)
- Lower tier local authority (LTLA)
- Upper tier local authority (UTLA)
- Region

For cross-country flows within the UK, the geography level provided for the origin address matches the level of geography of the address counted on Census Day, 21 March 2021. However, where an equivalent geography for Northern Ireland or Scotland does not exist, the data shows the next higher level of geography for that country.

Read more in [9. Origin-destination data geographies and UK equivalents](#).

Quality overview

Census 2021 collected responses during the coronavirus (COVID-19) pandemic, a period of unparalleled and rapid change.

Changes, which affected the information gathered for several topics, included:

- international and national travel restrictions
- social distancing, including working from home

- furloughing

This affected census travel-to-work results in several ways, as described in our [Travel to work quality information for Census 2021](#).

The [Quality and methodology information \(QMI\) for Census 2021](#) explains what this means for the data.

We provided [extra Census 2021 questionnaire guidance in the context of the coronavirus pandemic](#) to:

- help respondents understand the questions as intended
- reduce the potential for the pandemic to negatively impact respondent burden
- maximise the quality of data collected

However, we advise users to be very cautious when using Census 2021 origin-destination data for policy and planning purposes.

Read more quality information about migration data in [3. Origin-destination migration data](#).

Read more quality information about workplace data in [4. Origin-destination workplace data](#).

Read more quality information about second address data in [5. Origin-destination second address data](#).

Read more quality information about student data in [6. Origin-destination student data](#).

Origin-destination interactive tool

Origin-destination data for migration and workplace flows will also be available through an interactive map-based tool that allows users to explore Census 2021 data across England and Wales.

You will be able to see the movement of usual residents with dot maps by selecting the geography of their origin and destination. Dot maps group people within different areas so that a single, coloured dot represents them. The legend shows how many people are represented by each dot.

You will be able to access this interactive tool on the ONS website when it is published.

2. Protecting confidentiality within origin-destination data

Our origin-destination data are designed to protect the confidentiality of individuals. We do this by applying access controls and also applying statistical disclosure control (SDC) methods to the data.

We apply record swapping to the census data we use to create the origin-destination datasets. This SDC method makes very small changes to the data to prevent identification of individuals.

We also applied another SDC method, cell key perturbation. This is a technique that adds "noise" to datasets to ensure individual record confidentiality. Read more about how and why the Office for National Statistics (ONS) carried out statistical disclosure control on Census 2021 data in our [Protecting personal data in Census 2021 results article](#).

Products to suit different needs

To make data available as widely as possible, and to maximise benefits from the census, there are three different settings in which Census 2021 origin-destination products are released. Census 2021 origin-destination data are available as public, safeguarded, and secure datasets depending on the geographical level and detail of characteristics included. This enables products which strike a balance between detail and security and ensure origin-destination datasets are available for inquiring citizens through to expert analysts.

We released our public datasets on 26 October 2023. Our safeguarded and secure datasets will be available shortly after this date.

Public datasets

Our public origin-destination data are available to download from the [Nomis origin-destination webpage](#) with minimal conditions applied to their use as stated within the [Open Government Licence \(OGL\)](#). Initially, datasets are available as a zip file. However, we aim to introduce the query tool in the future so that users can select::

- origins
- destinations
- additional variables
- download format

Our public datasets provide basic flows, which show the movement of people from one place to another with no population characteristics. The public datasets also provide some flows containing data about just one variable (univariate), such as by age. Others give flows containing data that combines multiple variables (multivariate), such as by age and by sex. Both are at various geography levels, with local authority being the most common. A small number of datasets are available for more detailed geographies.

Safeguarded datasets

Our safeguarded Census 2021 origin-destination data are available to users who have registered with the [UK Data Service](#) and who have agreed to the terms and conditions of the [UK Data Service End User Licence](#). Commercial use of the safeguarded data is subject to licensing and each project incurs administrative fees.

Safeguarded datasets contain more detail than public datasets. They include basic flows, univariate and multivariate flow datasets mostly at Middle layer Super Output

Area (MSOA) level of geography. However, some datasets are at local authority level where they contain more detailed characteristics of the population.

Data made available under the safeguarded mechanism have the following characteristics:

- data can be downloaded from the UK Data Service into the researcher's local environment
- researchers can only use data for statistical research under a set of conditions that limit and control purpose and behaviour; conditions of use are set out within the [UK Data Service End User Licence](#)
- disclosure risk is managed by the combination of the licence agreement with the researcher and the disclosure controls applied within the design of the dataset

Further information on what safeguarded data can be used for is available in section 5.2.1 of the UK Data Service [research data handling and security guide](#).

Secure datasets

Our secure origin-destination data provide univariate and multivariate flow datasets mostly at Output Area (OA) level.

Because of the disclosure risk, these data are only available to [accredited researchers](#) through the [Integrated Data Service \(IDS\)](#), a highly secure environment from which no data can be exported without specific approval.

Secure data are:

- protected in law
- cannot be distributed outside of the controlled environment
- only available to accredited researchers, working on accredited projects
- only available to use for statistical research under a set of conditions that limit and control purpose and behaviour
- only accessible to researchers who have up-to date training on how to work within a controlled, secure environment

We mainly build disclosure risk management into the access mechanisms and not the dataset. We also check all outputs from the controlled environment for disclosure risk before they are made available to the researcher. Access to our secure origin-destination data in the IDS is possible via the [SafePod Network \(SPN\)](#).

SafePods are primarily based at universities and research institutions across the UK. The SafePod Network is funded by the [Economic and Social Research Council](#) and is part of the [Administrative Data Research UK](#) programme.

Access to our secure data is also possible via Assured Organisational Connectivity (AOC). This is an agreement between your organisation and the ONS to directly allow access to the IDS from your organisation or your home office space. All AOC agreements must be approved by the ONS, and a successful application will satisfy the requested evidence concerning how your organisation meets the required physical and system security standard.

3.Origin-destination migration data

Origin-destination migration statistics show the movement of people who lived at a different address one year before Census Day on 21 March 2021.

Migration data covers two types of flows:

- all migrants – anyone living at a different address one year before the census
- only international migrants – anyone living outside the UK one year before the census.

Migration flow data that cover all migrants do not contain information on the country of origin for addresses outside the UK. These are simply represented by "Outside UK".

Migration flow datasets for international migrants provide more detail on the country of origin for migrants living outside the UK one year before the census.

Usual residents of England and Wales who had an address in Northern Ireland or Scotland one year before Census Day are included in the data.

Usual residents of Northern Ireland or Scotland on Census Day (March 2021) with an address in England or Wales one year prior to the census are not included in the data. This is because of the different time period of Scotland's Census and different processing timeline for Northern Ireland data.

People aged under one year

Migration flow data produced from the census are based on the usually resident population who were living at a different address one year before the census. The census does not capture migration data on this basis for people aged under one year. This is because people aged under one year on census day were not alive one year before the census, so they did not have an address one year ago to report.

In the 2001 and 2011 Censuses, we produced estimates of people aged under one year, who moved between birth and Census Day. We did this by attempting to identify a next of kin for the person aged under one year and assuming the next of kin's address one year before the census. In 2011, only half of people aged under one year were estimated to have moved between birth and Census Day. This took account of the fact that approximately half wouldn't have been born at the time the next of kin moved. This approach was not always straightforward, especially when needing to identify a next of kin. Foster children were counted as part of the family.

Assigning the mother or closest guardian for those aged under one year was anticipated to have become more complex since 2011. This is because there have

been significant changes to family structures over the last decade, for example, increased numbers of same-sex couples and single parents. This means that we have not estimated migration for those aged under one year for Census 2021 origin-destination data.

To reflect this change in origin-destination migration datasets, we have relabelled all the resident age classifications to begin at aged one year to make this clear to the user. Given this change, users should be cautious when comparing 2011 and Census 2021 origin-destination data.

Annual moves for this age group are routinely produced as part of the mid-year population estimates. We are also exploring new methods to improve internal migration estimates, including moves for people aged under one year, in our work to [transform population and migration statistics](#).

Read more about [dynamic population model for local authority case studies in England and Wales: 2011 to 2022](#).

Quality information and limitations

Census 2021 was conducted during the coronavirus (COVID-19) pandemic, when [travel restrictions including lockdowns were in place from March 2020 \(PDF, 169KB\)](#) to stop the spread of the virus. We advise users to be cautious in assuming that migration patterns seen in the 12 months up to the census represent patterns seen in other years.

There was a particular impact on international migration and, subsequently, disclosure risk. Because of this, we are only able to provide 60 country of origin categories for detailed datasets and 10 for less detailed datasets. You can find these categories and their associated codes in the [Census 2021 dictionary](#).

In the question "One year ago, what was your usual address?" the ONS guidance states that "If the coronavirus pandemic affected your usual address one year ago, select where you were living before your circumstances changed." This guidance potentially reduced the risk of coronavirus pandemic impact on data quality from the question on address one year ago.

You can find more quality information on migration in our [demography and migration quality information for Census 2021](#).

The [quality and methodology information \(QMI\)](#) for Census 2021 is also available for detailed information.

4. Origin-destination workplace data

Our workplace datasets provide commuting flows between usual residence and place of work for people aged 16 year and over in employment or temporarily away from work in the week before Census 2021.

On the Census 2021 questionnaire, people aged 16 and over and either in employment or temporarily away from work in the week before Census Day were asked "Where do you mainly work?". We asked them to give the address of their

workplace or report if they worked from home, an offshore installation or they did not have a fixed workplace.

Usual residents of England and Wales who had a workplace address in Northern Ireland or Scotland are included in the data.

The different time period of Scotland's census and different processing timeline for Northern Ireland data means that we have been unable to include usual residents of Scotland and Northern Ireland who worked in England or Wales in the data.

Workplace zones

Workplace zones (WPZs) are a small-area geography designed to contain a consistent number of workers allowing workplace statistics to be released at a more granular level.

Given the impact the coronavirus (COVID-19) pandemic had on how respondents answered questions related to their workplace, we are considering how and whether 2011 WPZs should be updated. The ONS Data Science Campus has produced some experimental modelled travel-to-work matrices, incorporating:

- 2011 Census travel-to-work data
- Census 2021 employment data
- National Travel Survey data
- the Department for Transport's National Trip Ends Model

We hope that this work will lead to an update of UK WPZs.

So, we have been unable to produce any origin-destination datasets using WPZs. The disclosure risk resulting from changes in workplaces over time means it was also not possible to include 2011 WPZs.

Workplace comparability with 2011

In 2011 Census origin-destination data, some workplaces were called "quasi-workplaces". This meant that they were the equivalent of a workplace or where the respondent indicated was their workplace and included:

- at or mainly from home
- an offshore installation
- no fixed place
- outside the UK

In Census 2021, pandemic travel restrictions significantly limited the number of people working outside the UK. These smaller counts have increased the risk of disclosure. So, it is not possible to produce workplace flows showing individuals with a workplace address outside the UK in detail. The usual residents who do not have a fixed place to work or work at or from home have been counted at their usual residence as place of work. They have also been grouped in one category. We advise users not to use this category to conduct any analysis for work at or from home.

Quality information and limitations

Census 2021 was conducted during the coronavirus (COVID-19) pandemic when there was a national lockdown and many travel restrictions were in place to stop the spread of the virus. The pandemic severely impacted some people's ability to work, their working patterns, their workplace and method of travel to work.

Our origin-destination data for travel to work reflect a situation when many more people than at the time of the 2011 Census were working from home. As part of the UK government's measures to reduce the impact of the coronavirus pandemic on the economy, businesses were able to furlough their workforce, this then affected the way furloughed people answered the travel to work questions. There are a number of ways in which this affected census results for travel to work as described in our [travel to work quality information for Census 2021](#).

In summary, it is unclear how representative the census statistics are of travel to work patterns on Census Day itself. Furthermore, census data are a snapshot in time, but, given the impact of lockdown and furlough, the data may have limited utility in measuring pre- or post-pandemic travel patterns.

We provided extra guidance for respondents on how to answer questions about work given it was during the pandemic. We guided:

- people who were working around Census Day to record their current circumstances
- hybrid workers to record their most typical working patterns
- people who were unable to work because of to the pandemic to report their work circumstances before they changed
- people on furlough to identify themselves as "temporarily away from work" to ensure they were considered economically active

However, we are unable to determine how people followed the guidance. The furloughed workforce responded differently than expected and may or may not have answered according to the guidance, as you can read in our [labour market quality information for Census 2021](#).

It is also anticipated that some people unable to work because of the pandemic may have misreported their circumstances. This could have resulted in these individuals being considered "economically inactive" or "economically active: unemployed". As a result, workplace address, hours worked, and method of travel would not have been collected.

Use caution when analysing Census 2021 origin-destination workplace flow data for planning and policy purposes. Not everyone will have answered about their work circumstances as at Census Day. A proportion will have answered about their pre-pandemic work circumstances or pre-Census Day pandemic work circumstances.

5.Origin-destination second address data

Our second address flow data shows the movement of usual residents to or from a second address. Second address refers to somewhere people may live for a variety of reasons including relationships, work, or study purposes.

Our available flows are from a:

- usual residence to a place of work, for people with a work-related second address
- work-related second address to a place of work
- usual residence to a work-related second address
- usual residence to a second address for dependent children

These datasets provide flows to Scotland and Northern Ireland for individuals usually resident in England and Wales with a second address in either of these two countries.

To protect confidentiality, Census 2021 origin-destination second address flow data cannot provide any further detail on place of second addresses outside the UK.

Quality information on origin-destination second address data

The coronavirus (COVID-19) pandemic affected second address data collected by the census since some people may have:

- made their second address their usual residence - made possible by the guidance to work from home
- relinquished a work-related second address and worked from home, due to government guidance and the increased acceptance of hybrid working
- opted to move in with family, their partner, or friends so they were not living alone, meaning that their previous usual residence may have been considered their second address

These factors may have some impact on second address data, but they are difficult to measure.

Limitations

The second address question in the census was designed to count people who regularly stay at the same second address.

It is challenging to record people who stay at different hotels while working. Respondents should have included hotels if they stayed at the same one for more than 30 days in the year before the census. However, anyone who stayed in a number of different hotels, and none for more than 30 days, should not have recorded this as a second address.

So, the data collected on second addresses for work purposes will not provide a complete picture of commuting patterns. For example, those with more complex commuting and working patterns, such as working from home two days a week and staying in a hotel two nights a week, will not be reflected in the data. However, the

second address data does provide a better understanding of commuting patterns than usual residence to workplace flows.

6.Origin-destination student data

Our student flow datasets show the movement of people aged 16 years and over. These people had a different address one year before Census Day, which was a student term-time or boarding school address in the UK.

These people were not necessarily students at the time of the census. For example, someone living at a student address one year before the census, who graduated in the summer before the census and was no longer a student at the time of the census, will be included in the data.

Datasets provide flows from Northern Ireland or Scotland for usual residents of England and Wales whose student term-time or boarding school address one year before the census was in either of these countries.

In origin-destination migration flows, those usual residents who had an address outside the UK one year before the census have been categorised as a single group "Outside UK". To protect the confidentiality of individuals, we have provided no detailed information for the country of origin for Census 2021.

Quality information on origin-destination student data

The coronavirus (COVID-19) pandemic will have affected student flow data. For instance, students may have lived at their parent or guardian's address for the whole academic year and not had a different term-time address, and fewer international students were living in England and Wales. Furthermore, students who graduated at the end of 2020 would have been seeking employment either during lockdown or movement restrictions. This would likely have had a large effect on the nature and extent of post-education migration.

Take care when analysing student migration flows from Census 2021 as patterns are unlikely to represent patterns seen in other years.

Limitations

Student flow data only provides partial coverage of student migration. For example, it does not include students who migrated from their parental address to another address for study purposes if the move was before March 2020. In contrast, the data does include migration flows for individuals who were a student one year before the census and lived at a student address but who on Census Day were no longer a student but lived at a different address.

Student flow data excludes:

- first year university students who lived at a parental address a year before census
- international students who lived outside the UK in the year before the census

7. Further quality considerations for origin-destination data

Impact of Brexit on the origin-destination data

The census gives us a snapshot of a moment in time. It gives us the difference in population over a decade. However, it does not tell us who has come and gone each year in between. When looking at the change between the decades, while the census gives a good indication of changes in the population at the England and Wales level, it should not be used as a detailed measure of migration flows into and out of the country over that period. Neither can it identify the reasons why people may have chosen to come to or leave the country.

While historic measures of international migration for the period from the Brexit referendum in 2016 to 2020 showed a fall in levels of EU migration, we can only speculate about whether Brexit affected people's migration behaviours.

While the UK left the EU on 31 January 2020, the country continued to be in a "transition period" until the end of 2020. During this time, which coincided with the travel restrictions and impact of the coronavirus (COVID-19) pandemic, people could continue to migrate freely between the UK and the EU without needing a visa. So, it is difficult to disentangle the effects of Brexit and coronavirus upon migration patterns.

Implausible flows affecting 2011 Census flow data

A quality issue was identified in our 2011 census origin-destination statistics that affected a very small number of areas. An element of some flows had been incorrectly recorded as a flow to another area with the same name. Our quality assurance has not identified this issue arising in the 2021 datasets.

8. Dataset naming structure

Our origin-destination datasets have been assigned names to help identify their content. In the names, the:

- first two letters show the dataset type
- second two letters show the flow type, where "MG" is migration flow, "SA" is second address flow, "ST" is student migration flow and "WP" is workplace flow
- number shows the dataset number, with "01" being the basic flow, through univariate flows and up multivariate flows with the highest numbers
- the third two letters show the dataset's geographical coverage
- suffix, "NON_UK", shows that the dataset represents the population living outside the UK one year before the census and only applies to international migration datasets

For example, ODMG01EW_NON_UK, shows that it is:

- an origin-destination dataset, as the first two letters are "OD"
- a migration flow, as the second two letters are "MG"
- a basic flow dataset, as the number is "01"
- covering England and Wales, as the third two letters are "EW"

- about the population living outside the UK one year before the census, as it has the suffix, “NON_UK”

The following lists show the dataset numbers for each flow type. Datasets are ordered starting with basic flow data, then univariate flow data, and finally multivariate flow data.

Migration (MG)

Basic flows in dataset 1

Univariate flows in datasets 2 to 9

Multivariate flows in datasets 10 to 19

Workplace (WP)

Basic flows in dataset 1

Univariate flows in datasets 2 to 14

Multivariate flows in datasets 15 to 23

Second address (SA)

Basic flows in datasets 1 to 4

Univariate flows in datasets 5 to 10

Multivariate flows in datasets 11 to 16

Student (ST)

Basic flows in dataset 1

Univariate flows in datasets 2 to 6

Multivariate flows in datasets 7 to 10

9. Origin-destination geographies and UK equivalents

The following lists give the geographies we used in the origin-destination datasets and the equivalent, if any, for these geographies across the UK.

The lists are in geographical hierarchy order, from highest to lowest, that is, from largest to smallest area type.

Region in England and Wales
 No equivalent in Northern Ireland
 No equivalent in Scotland

Upper tier local authority in England and Wales
 Local Government Districts in Northern Ireland
 Council Areas in Scotland

Lower tier local authority in England and Wales
 Local Government Districts in Northern Ireland

Council Areas in Scotland

Middle layer Super Output Area in England and Wales
No equivalent in Northern Ireland
Intermediate Zones in Scotland

Output Area in England and Wales
Data Zones in Northern Ireland
Output Area in Scotland

To read about the geographies we used in the Census 2021 in England and Wales visit [our area types page in the Census 2021 dictionary](#).

You can read about Local Government Districts in Northern Ireland on [our Northern Ireland administration page](#). To read about Data Zones in Northern Ireland, visit the [Data Zones for Census 2021 page on the Northern Ireland Statistics and Research Agency website](#).

Information about Scotland's Council Areas is available on [our Scotland administration page](#). Find details about Intermediate Zones in Scotland on the [ONS Geography portal](#) and, you can read about Output Areas in Scotland on [Scotland's Census website](#).

10.Previous uses of 2011 origin-destination data

A new geodemographic classification of commuting flows for England and Wales

Hincks, S., Kingston, R., Webb, B., & Wong, C. (2018). [A new geodemographic classification of commuting flows for England and Wales](#), International Journal of Geographical Information Science, 32:4, 663684, DOI: [10.1080/13658816.2017.1407416](#). This paper applies a geodemographic approach to the development of a new and novel flow-based classification of commuting for England and Wales.

Uneven growth: tackling city decline

Pike, A., MacKinnon, D., Coombes, M., Champion, T., Bradley, D., Cumbers, A., Robson, L. and Wymer, C. (2016). [Uneven growth: tackling city decline](#). York: Joseph Rowntree Foundation. This report shows that some cities are falling behind national trends and suggests policies to ensure growth is spread more equally across UK cities.

Leeds City Region Housing Market Areas

Coombes, M., & Bradley, D. (2016). [Leeds City Region Housing Market Areas \(PDF, 2.6MB\)](#). This research was conducted to update definitions for Housing Market Areas (HMAs) using data from the 2011 Census.

11. Related links

[Origin-destination public datasets](#)

Datasets | Released 26 October 2023

Census 2021 estimates that classify the movement of people from one location to another to migrate, work, stay at a second address or study from Census 2021 in England and Wales. The estimates are as at Census Day, 21 March 2021.

[Origin-destination data, England and Wales: Census 2021](#)

Statistical bulletin | 26 October 2023

A summary of origin-destination flows which includes the movement of people from one location to another to migrate, work, or stay at a second address from Census 2021 in England and Wales.

[Origin-destination \(flow\) data](#)

Webpage | Last updated 26 October 2023

Origin-destination (flow) data show the movement of people from one place to another.

[Demography and migration quality information for Census 2021](#)

Methodology | Last updated 6 September 2023

Known quality information affecting demography, migration and international migration data from Census 2021 in England and Wales.

[Labour market quality information for Census 2021](#)

Methodology | Last updated 27 July 2023

Known quality information affecting labour market data from Census 2021 in England and Wales to help users correctly interpret the statistics.

[Travel to work quality information for Census 2021](#)

Methodology | Last updated 8 December 2022

Known quality information affecting travel to work data from Census 2021 in England and Wales to help users correctly interpret the statistics.

12. Cite this methodology

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