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Integration of data from censuses, administrative sources and surveys for measuring migration

## Using administrative data sources to improve our understanding of movements of international migrants within the UK.

Note by Office for National Statistics, United Kingdom\*

### *Abstract*

International migration flows into and out of the UK are currently estimated using the International Passenger Survey (IPS). Whilst significant improvements have been made to the IPS in recent years, the landscape and demands for information have shifted and continue to shift. Users of our migration statistics are telling us that they need more information on the impact migrants have while they are in the UK, including the sectors in which they work, the communities they live in and the impacts on public services.

Our ambition is put administrative data at the core of UK migration statistics by 2019, to provide a more detailed evidence base on international migrant characteristics, their journeys and the impact of international migration on not just the population, but also the UK economy and public services such as health, education and transport.

This paper will present the work ONS is currently undertaking, in collaboration with other UK Government Departments and Devolved Administrations, to better understand international migration to the UK by integrating new and existing administrative data sources.

We will cover:

- Our conceptual framework for integrating administrative and other data sources to provide a more detailed evidence base for UK international migration.

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- Our experiences of working with other UK Government Departments and Devolved Administrations to access administrative data sources;
- The opportunities and challenges of aligning administrative data sources to identify long and short term international migrants;
- The opportunities and challenges of linking these data sources to produce estimates of flows and stocks of international migrants. ]

## I. Introduction

1. The Office for National Statistics (ONS) is committed to providing the right information to inform public and policy debate, as set out in our [Better Statistics, Better Decisions Strategy](#). International migration is a topic of considerable debate in the UK and there is a high demand for trusted data and analysis.

2. Over the last two decades there have been a number of changes in international migration patterns and a substantial increase in the level of net migration for the UK. A decade ago there was considerable interest in correctly estimating the migration flows from Eastern European countries following their accession to the EU. This led to many developments to migration statistics for the UK, including improvements to the International Passenger Survey (IPS) and the way that migration statistics were reported across government. There have also been improvements to other data sources, such as the decennial census, the Labour Force Survey (LFS) and Annual Population Survey (APS) where additional questions have been included to help users understand more about migrants living in the UK.

3. More recently net migration has fallen from the peak levels seen in 2015 and 2016, and has remained broadly stable since. But the landscape and demands for information have shifted in recent years and continue to shift. There is now much more interest in the characteristics of migrants who live in the UK and the impact they have on the economy and society. There are sources of data that shed some light on this but these only go so far in meeting the needs of the public, media and policymakers. We plan to improve the evidence base for international migration by putting administrative data at the core of migration statistics by 2019. However, this ambition very much depends on cross-government collaboration, data sharing, integrating data sources and understanding their statistical properties for producing statistical outputs.

4. International migration is an important element of our plans to transform to a new administrative data-led system for population and migration statistics for England and Wales<sup>1</sup> by 2020. By improving migration statistics in this way, we will in turn improve the quality of our population estimates which underpin a vast range of other information. ]

## II. An Integrated Population and Migration Statistics System

5. Decision-makers (central and local government, businesses, charities, community groups and citizens) increasingly need better local data on the size and characteristics of their population

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<sup>1</sup> Alongside the close-working relationships on the 2021 Census, Office for National Statistics, National Records for Scotland and the Northern Ireland Statistics and Research Agency are also collaborating on the use of administrative data in population statistics and the 2021 Census from a UK perspective.

to build better services such as transport links, schools, hospitals and housing. In 2021, we'll continue to meet this through the census. However, as the pace of change is increasing, decision-makers need this information much more frequently than every 10 years. We've described the work to meet the need for more frequent information as an Administrative Data Census.

6. Until now, we've largely focused on the ability of administrative data and surveys to provide the information traditionally collected through questions on the decennial census. However, integrating data from a range of sources offers much wider potential to improve population and migration statistics, particularly for producing more frequent small area population estimates (stocks), dynamics of population change (flows) and onward population projections.

7. We are currently investigating the potential for a flows-based approach for producing population estimates to derive components of population change (births, deaths and migration flows). This approach is different to the current stocks based method in that it attempts to use the components of population change (flows) to continuously update the usually resident population rather than producing an independent stock estimate of the population each year.

8. We are planning to evaluate the strengths and weaknesses for both approaches to producing population stocks and flows. By understanding where the limitations and gaps are, we can assess where surveys may be required to measure and adjust for coverage and definitional differences. It is likely that a combination of both models (including supporting surveys) will be required to produce population stocks and flows that are of suitable quality. We are calling this a hybrid approach.

### III. Access to administrative data sources – the UK experience

9. The real power of using administrative data can be realised through our ability to securely link different data sources together. This will provide a much richer integrated data source where we can drill deeper into the data to provide more detailed analysis and at smaller levels of geography. We are working with data providers across government to build up a better picture of migrants "journeys" such as when they immigrated or emigrated, the areas in which they have lived and their interactions with public services such as healthcare, education or housing.

10. To do this we need access to administrative data already held across government. The 2017 Digital Economy Act (UK) provides the basis for this so that there is a clear legal gateway for government departments to share their data with Office for National Statistics (ONS) for statistical purposes.

11. We have the expertise to securely hold data and are currently developing further systems to hold data in a secure setting so that linking can take place on an individual record basis. Outputs will be produced on an aggregate level so that confidentiality of individuals is not compromised.

12. However, ONS cannot do this alone. Working in partnership with the UK Government Statistical Service (GSS) is key to delivering our ambition to transform migration statistics and we have been working closely with the GSS so that we benefit from the expertise that exists within individual government departments to produce robust, collaborative research that adds value and [informs our transformation plans](#).

13. To facilitate this, we have set up a cross-government steering group on migration statistics. This has allowed for the creation of a shared framework for improving evidence involving ONS and other departments. This engagement has ensured a common understanding of the key policy questions around international migration relevant to the UK. Detailed discussions with government departments who hold data sources that could add to the evidence are taking place

and successful arrangements are already in place to enable ONS to access Home Office administrative data on immigration.

14. Prior to ONS accessing Home Office administrative data, analysts from ONS collaborated with the Home Office analysis teams to gain a better understanding of Home Office administrative data (Exit Checks). This collaboration was very successful as it allowed ONS analysts to work closely with Home Office analytical and operational teams to understand a complex linked dataset prior to this being made available at ONS for further analysis and linkage.

15. Once these data were available within ONS we continued to collaborate with Home Office analysts and ensured that a feedback loop was in place to draw on the statistical insights gained from ONS analysts, methodologists and data scientists, as well as learn from the Home Office's experience and expertise in linkage of travel events data. Part IV of this paper sets out the challenges but also the opportunities of linking other administrative data sources to produce estimates of flows and stocks of international migrants. It also sets out our experiences of using integrated Home Office administrative data to understand travel patterns of non-EU migrants as well as.

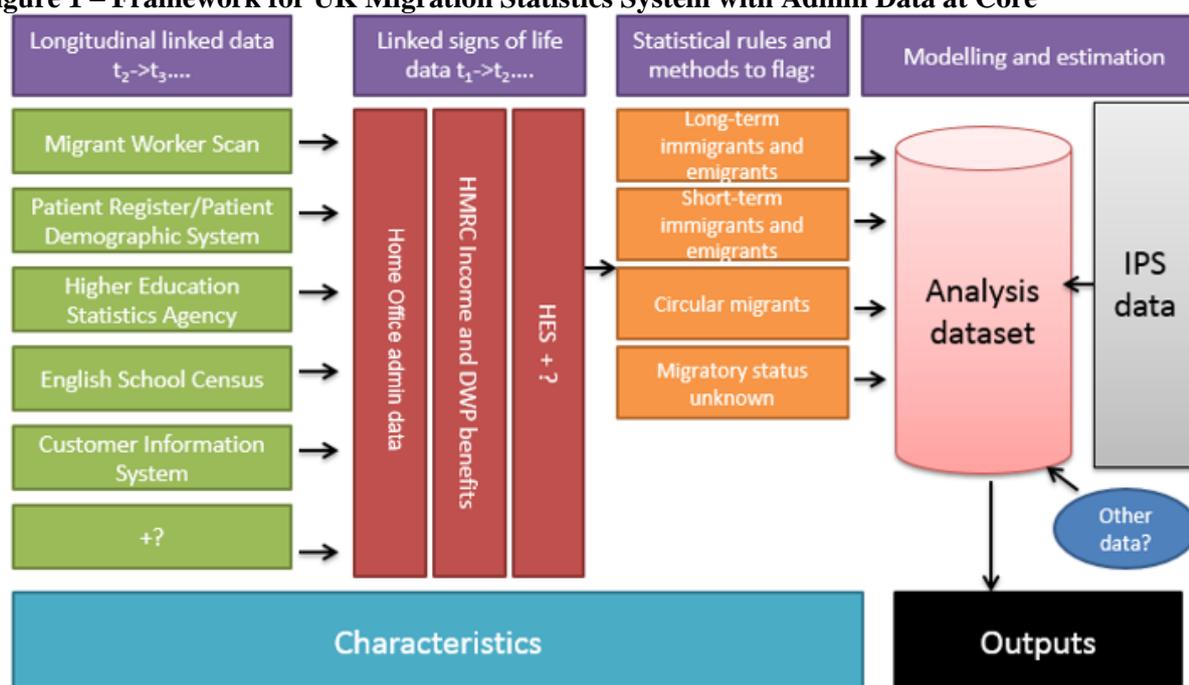
16. We are also working with other National Statistics Institutes to share international perspectives on using integrated data to transform population and migration statistics, and welcome the opportunity to do this at the 2018 UNECE Migration Statistics Work Session. Sharing experience and knowledge internationally has been a real benefit and is something we are continuing at ONS.

## **IV. Understanding migration flows using integrated administrative data**

### **A. Framework for UK Migration Statistics System with Admin Data at Core.**

17. Deriving the international migration component of the UK population according to the UN definition (resident for 12 months or more) is challenging due to the many different types of migrant travel patterns into and out of the UK. There is no single source that captures all migrant journeys. Migrants interact with government services in different ways which makes providing a coherent measure of long term immigrant and emigrant 'flows' to and from the UK a real challenge. Our goal is to integrate these data sources to produce better quality migration statistics. Figure 1 shows a framework for the proposed migration statistics system, this helps illustrate our research goals.

Figure 1 – Framework for UK Migration Statistics System with Admin Data at Core

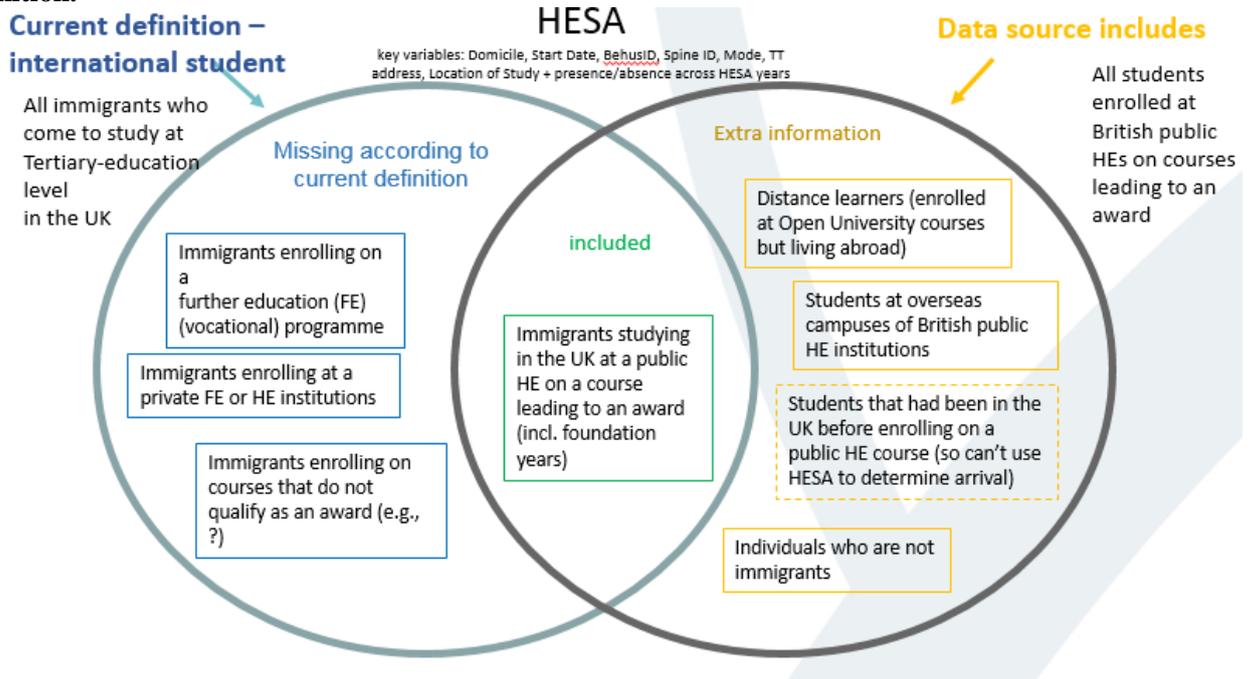


18. Our research is focused on the following key areas;

i. Understanding the data sources:

- How are migrants classified in the data sources, who is included and excluded, what are the ‘signs of arrival’ from overseas to the UK (immigration event) / or ‘signs of departure’ to overseas from the UK (emigration event).
- Are there ‘signs of activity’ that might help us determine the length of stay. Figure 2 shows an example of this analysis and highlights the importance of fully understanding the data and importantly what could be missing. In the example given in Figure 2 this would be private further or higher educational institutions which include some language schools, who might be long term immigrants.
- Assess the quality of each data source in terms of the definitions used, coverage, bias, accuracy etc.

**Figure 2 – Venn diagram to show inclusion/exclusion of international students based on UN definition.**



- ii. Design rules for linking and integrating the evidence from the different admin data sources to improve estimates of international migration flows:
- These are currently based on the UN definition i.e. resident in the country for 12 months or more. These rules will be based on our understanding of the data sources and our understanding of the administrative data ‘signs of activity’ by migrants in our data sources.
  - Figure 3 shows an example of a possible administrative data footprint for a non-EU international student. This highlights the complexity behind migrant journeys and how looking across data sources offers potential to better reflect these.

Figure 3 – Case study of a non-EU migrant who came to live in the UK to study.



19. The next section describes the collaborative analysis ONS undertook on Home Office administrative data that focused on comparing Home Office data and the International Passenger Survey (IPS) to further our understanding of how long non-EU migrants are residing in the UK based on recorded travel patterns. Going forward this initial exploratory analysis will help inform our transformation journey to put administrative data at the core of migration statistics.

## B. Using Home Office administrative (Exit Checks) data to further our understanding of non-EU international migration

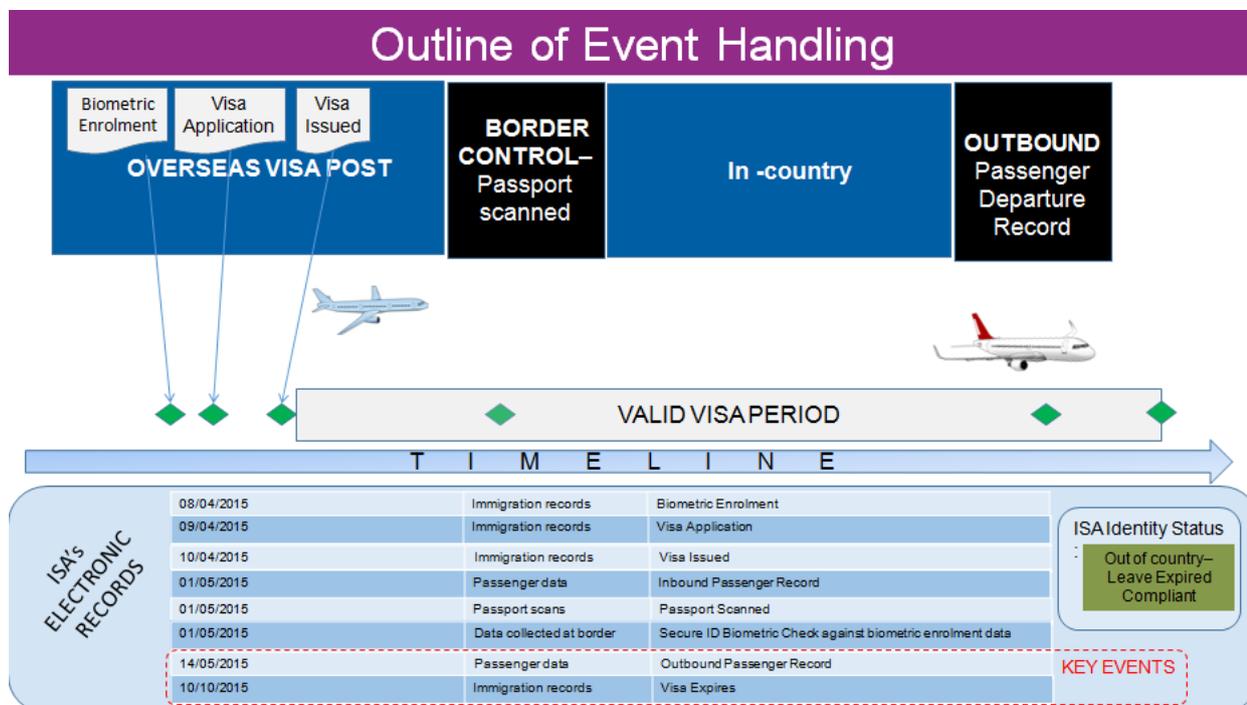
### 1. What are Exit Checks data?

20. The Home Office exit checks programme, introduced in April 2015, was designed primarily for operational (immigration control) purposes, and collected data on non-EU nationals departing from and arriving in the UK. The Initial Status Analysis system, developed by the exit checks programme, is a linked database that combines data from Home Office systems to build travel histories that consist of an individual's travel in or out of the country, together with data relating to immigration status e.g. periods of leave granted. This combined data is used by the Home Office for operational and security purposes in the assessment of an individual's immigration status.

21. Statistics are derived by integrating and matching data from multiple administrative systems, including (via carriers) from passengers' ticket bookings, from passport swipes at the border, and from immigration records. Producing statistics from these multiple sources presents a range of challenges. Nevertheless, it has been possible to produce useful statistical insights and practical operational benefits for the Home Office and to help Office for National Statistics (ONS) better understand non-EU migration patterns.

22. To analyse exit data, it is necessary to bring together, match and assess multiple individual events from different data systems to produce an ‘identity’. The resultant dataset is termed the ‘Initial Status Analysis’. An example of these relationships is shown in Figure 4.

**Figure 4 – Outline of Event Handling to create Exit Checks data**

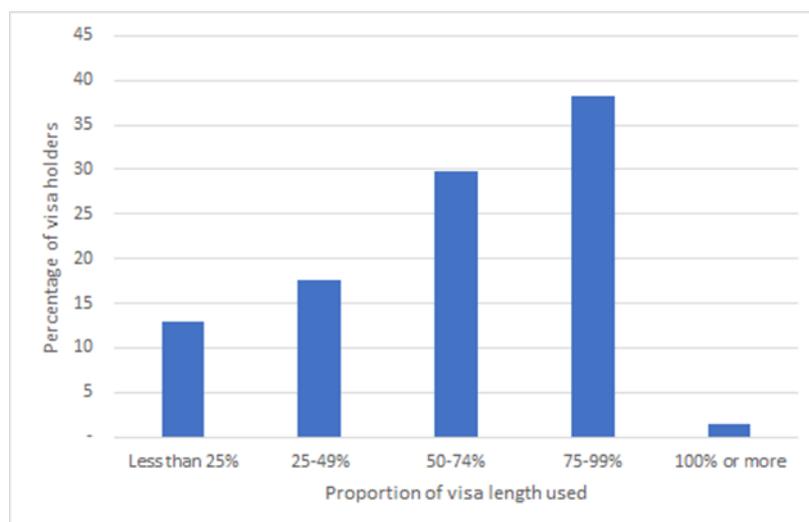


## 2. Understanding the complexity of international migration using Exit Checks data

23. Over the last two years, Office for National Statistics (ONS), in collaboration with Home Office experts, has undertaken exploratory analysis of Exit Checks data to further our understanding of migration patterns for non-EU nationals using travel events recorded in Exit Checks data.

24. What has come strongly through this work is that people’s lives are complex. In a globalized economy their movements between countries do not conform neatly to our traditional statistical definitions of migration. [Our analysis of travel patterns using Exit Checks data](#) showed this complexity. Not all non-EU nationals holding a visa for 12 months or longer remained in the UK for the whole length of their visa (Figure 5). It showed that around 60% of migrants stayed in the UK for less than three-quarters of their visa length; this does not necessarily mean they left early as they may have been in and out of the country for considerable periods.

25. The analysis also showed that around 13% of journeys made out of the UK were for at least three months, with return journeys made within a valid visa period.

**Figure 5 – Length of stay as a proportion of visa length, UK, 2015 to 2016 cohort**

Source: ONS analysis of Home Office administrative data.

Notes:

1. The chart shows length of stay (between first arrival and latest departure) as a proportion of the valid visa period or subsequent extension of that visa.
2. The chart is based on a cohort of visas expiring between 8 April 2015 and 7 April 2016, with first arrival date and last departure dates as recorded on the Home Office immigration control administrative systems.
3. Work, family, study and other visas are included.
4. Proportion of visa length is grouped into five categories: less than 25%, 25% to 49%, 50% to 74% and 100% or more.
5. The category '100% or more' includes those who departed after their visa expired.
6. Percentages are based on numbers that are rounded to the nearest thousand. Totals may not sum due to rounding.
7. Table 1 further illustrates the complexity of these travel patterns for non-EU migrants. The table shows the estimated number of visits migrants are making in and out of the UK, dependent on the length of visa they have, and the average length of each visit, based on linked travel data from Home Office administrative systems. This analysis shows that the shorter the visa, the fewer the number of visits migrants are making within this period.

26. Table 1 further illustrates the complexity of these travel patterns for non-EU migrants. The table shows the estimated number of visits migrants are making in and out of the UK, dependent on the length of visa they have, and the average length of each visit, based on linked travel data from Home Office administrative systems. This analysis shows that the shorter the visa, the fewer the number of visits migrants are making within this period.

**Table 1**  
**Experimental analysis of the distribution of the number of visits and average visit length by visa length, non-EU nationals with visas expiring April 2017 to April 2018**

Length of Visa	Number of visits (% within visa length)							Average number of visits	Average length of visit (days)
	1	2	3	4	5	6-9	10+		
Less than 1 year	59.4	18.8	9.3	4.8	2.8	4.0	0.9	2.0	75.8
1 to 2 years	21.5	19.3	15.9	12.5	9.3	16.3	5.2	3.9	83.8
2 to 3 years	11.0	16.7	13.0	9.9	8.0	20.9	20.5	6.6	80.1
3 to 4 years	10.2	13.7	10.9	8.2	6.7	20.0	30.3	8.5	82.6
4 or more years	6.9	11.6	10.6	9.3	7.7	22.0	31.9	8.7	115.6

Source: ONS analysis of Home Office administrative data

Notes:

1. This table is based on experimental analysis of Home Office administrative data. We are still developing methods; therefore, numbers may change in further iterations of this table.
2. A cohort was selected based on those whose visas were due to expire between 8 April 2017 and 7 April 2018.
3. Based on all visas or extensions of leave granted for work, study, family or other categories; excluding categories granting permission to stay permanently (settlement) or those with right of abode who are family members of European Economic Area (EEA) nationals exercising Treaty rights.
4. To calculate the average length of visit, only those that had complete information for arrival and departure for each visit were included in the analysis.
5. Travel history data from Home Office administrative systems is incomplete prior to the introduction of the Exit Checks programme in April 2015, therefore the number of visit estimates for visas in the categories 2 to 3 years, 3 to 4 years and 4 or more years may be undercounts as the distributions shown in Table 1 may be less reliable.
6. The large majority of non-EU nationals who come as visitors (for up to 6 months) do not need a visa, so the distributions presented are not representative of all travel patterns.

## V. Conclusion

27. Working alongside Home Office experts, Office for National Statistics (ONS) research using Home Office administrative data has highlighted that migrant journeys are complex and that it is challenging to define migrant activity by standard UN definitions alone. Our insights are preliminary and increasingly show the complexity of people's lives. They show that the definitions of short-term and long-term migration and the realities of the global economy do not match, and more work is needed to draw together the best information from a range of sources.

28. Home Office administrative data are a critical source for the transformation of population statistics and to understand the complexity of migrant travel patterns. The data combine multiple sources using sophisticated methods and have the potential to enhance migration statistics. However, it can only provide one part of the picture since only those that require a visa are included.

29. ONS needs to develop methods for using Home Office administrative data to identify, classify and analyse different types of international migrant. To do this, we need to develop sound methods for handling quality issues and definitional challenges within the data, which will require further analysis. Working in collaboration with the Home Office will ensure this work is of the most benefit to the ongoing Government Statistical Service (GSS) programme of work.

30. In September 2017, Office for National Statistics set out ambitious plans to transform the information that the GSS produces on migration to meet changing user needs and which will begin to put administrative data at the core of evidence on migration in 2019. This work is complex and multi-faceted, with the research we have been doing into Home Office administrative data being one component of the programme. Moving forward there is much more work to do on understanding how migrants interact with other administrative data sources and how these can be integrated, to fully understand how these might be used to enhance migration statistics.

31. Our transformation programme of work includes research into understanding how migrants impact on different sectors within society and the economy and will include research on all types of migrants including: long-term, short-term and circular migrants. This work will provide further clarity on what the available data can tell us and what further work we need to do to provide better evidence to better inform policymakers. These pieces will complement and enhance the work we have been doing with Home Office administrative data and will help to develop a more rounded picture of migration trends in the UK as they will include not only non-EU migrants, but will also start to explore EU migration.

32. In Autumn 2018, we plan to publish our findings from the exploratory research on using integrated administrative data to provide international migration flows. This will bring together work on EU and non-EU nationals from a number of different administrative sources to explore the feasibility of different approaches to putting administrative data at the core of migration statistics. The outcomes from the research will help us to improve the quality of the estimates of the population and population change (stocks and flows).

33. This work is part of the wider transformation to move towards an admin-based population statistics system to replace the census from 2021. |