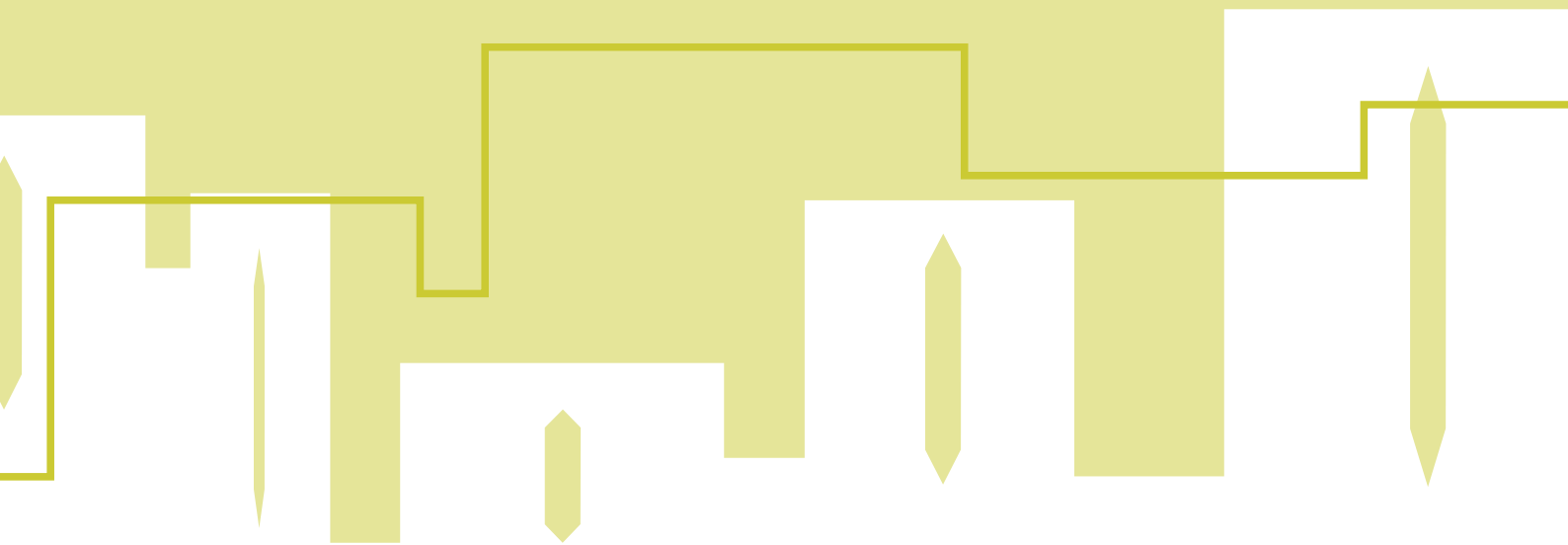UK Statistics Authority

Migration Statistics: the Way Ahead?

July 2009

Report 4

Migration Statistics: the Way Ahead

July 2009

Report by the UK Statistics Authority

Incorporating: *A Review of Migration Statistics Literature*
by the School of Geography, University of Leeds

Report 4

About the UK Statistics Authority
The UK Statistics Authority is an independent body operating at arm's length from government as a non-ministerial department, directly accountable to Parliament. It was established on 1 April 2008 by the *Statistics and Registration Service Act 2007.*

The Authority's overall objective is to promote and safeguard the production and publication of official statistics that serve the public good. The Authority is accordingly required to promote and safeguard the quality and comprehensiveness of official statistics, and good practice in relation to official statistics.

The Statistics Authority has two main functions:

1. oversight of the Office for National Statistics (ONS) – the executive office of the Authority;
2. independent scrutiny (monitoring and assessment) of all official statistics produced in the UK.

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Summary

1.   In July 2008[1] the UK Statistics Authority initiated a review of migration statistics. At that time the statistics were already being improved in response to previous reviews[2,3] and the recommendations of a report from the House of Commons Treasury Committee[4,5]. The purpose of the monitoring review was therefore to report on progress, the adequacy of the plans for improving the statistics, and the extent and effectiveness of co-operation across government to deliver the improvements. This review concludes that much useful work is being done to deliver moderate improvements in the short to medium term, while the longer term goal – for high quality migration statistics derived from an integrated statistical system that draws on administrative and survey/census data – will take some considerable time to realise, perhaps decades.

Importance of migration statistics

2.   International migration is currently the largest component of population change in the United Kingdom – since the late 1990s it has exceeded the net effect of births and deaths and it increased substantially following the expansion of the European Union. However the statistical concept of migration also includes the movement of people within the UK. Such internal movements can have a substantial influence on the changing level and composition of the population in local areas. Accurate measurement of the net flows of people, both into and around the country, is thus essential to obtaining reliable population estimates. These estimates are at the heart of decisions around policy development, resource allocation and service delivery, both nationally and locally.

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[1]   UK Statistics Authority, *Assessment Programme and Authority Monitoring Reports*, 4 July 2008, http://www.statisticsauthority.gov.uk/news/assessment-programme-and-authority-monitoring-reports.doc

[2]   National Statistics Quality Review Series Report No. 23, *International Migration Statistics,* 2003. http://www.ons.gov.uk/about-statistics/methodology-and-quality/quality/nat-stats-qual-revs/qual-revs-by-theme/population/index.html

[3]   *Report of the Inter-Departmental Task Force on Migration Statistics,* National Statistics, 15 December 2006 http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/updates/downloads/TaskForceReport151206.pdf

[4]   House of Commons Treasury Committee, *Counting the Population,* 15 January 2008, Report HC 183-II; http://www.parliament.the-stationery-office.com/pa/cm200708/cmselect/cmtreasy/183/183ii.pdf

[5]   House of Commons Treasury Committee, *Counting the Population,* Eleventh Report of Session 2007-08, 23 May 2008, Report HC 183 http://www.publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/183/183.pdf

Difficulties faced

3.   While the registration of new births and deaths is required by law, the same is not true for international migration – there is no systematic register that records all people entering or leaving the country, or where they settle. Information on immigration and emigration is therefore largely drawn from a sample survey conducted at ports, the International Passenger Survey (IPS). The difficulties faced are not unique to the UK – the literature review (see Part 2 of this report) highlights the EU-wide research – the MIMOSA project – which examines international flows between countries. The research found that issues of poor data quality are common to many European countries. In addition, most countries struggle to measure emigration accurately – whether or not the country has an established population register.

4.   There is also no systematic registration of movement within the UK. Information about these flows is thus necessarily based on administrative sources intended primarily for other purposes (for example, the ONS estimates are based on NHS patient registers).

Recognition of the problem

5.   A National Statistics Quality Review of international migration statistics in 2003[6] made a number of wide ranging recommendations that reflected the limitations of the International Passenger Survey and looked to make better use of existing sources and to develop and exploit new sources that could 'radically reshape the empirical framework for international migration estimation'. The use of administrative sources was also seen to be essential in replacing the use of population censuses in the allocation of the UK-level international immigration estimates to local areas. (This approach became increasingly problematic with the rise in migration, particularly following the enlargement of the European Union in 2004.)

6.   The then Statistics Commission made hard-hitting recommendations[7] about the need to improve statistics of migration (both internationally and between areas of the UK) in 2005. In December 2006 the National Statistician's Inter-Departmental Task Force made a series of fundamental recommendations for cross-government action to address the needs to improve migration

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[6]   ibid, footnote 2

[7]   Statistics Commission, *Census and population estimates and The 2001 Census in Westminster:* Final Report. Report No. 22, January 2005 http://www.statscom.org.uk/uploads/files/reports/Census%20Report%20Final%2022.pdf

statistics.[8] In early 2008 the House of Commons Treasury Committee held an inquiry reviewing the concerns raised by local authorities and others about the adequacy of official population statistics.[9] It concluded that official statistics on migration were inadequate for recording the changing levels of population movement.[10] Government ministers accepted the arguments put forward: the Minister for Local Government announced that there would be a cross-government programme to improve migration and population statistics, overseen by Ministers and a programme board, with the National Statistician having the statistical lead.[11] The ministerial committee overseeing the improvement work is chaired jointly by the Minister for Local Government and the Minister for Borders and Immigration. The oversight of the programme provided by Ministers sets an important precedent for the successful delivery of future cross-government statistical projects.

What is being done

7.   The current programme of work to improve migration statistics is, in large measure, a programme to implement the recommendations of the 2006 Inter-Departmental Task Force.[12] The Task Force recognised that the fundamental weaknesses of international migration statistics are due to the underlying means of collecting information about population movement. Substantial improvements could only be achieved through a radical solution that more effectively tracked the complex migration processes. In the absence of a population register, it was concluded that record linkage across different administrative sources, such as those for employment, benefits and international border control, had to be used to obtain better statistical information on migrants.

Timescale for change

8.   It was clear that this new approach would take some considerable time and resources to put in place – the Task Force report suggested 5-10 years, that is to say completion of the programme somewhere between 2012 and 2017.

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[8]   ibid, footnote 3
[9]   ibid, footnote 4
[10]   ibid, footnote 5
[11]   Statement by John Healey MP, Minister for Communities and Local Government made on 4 February 2008 http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/updates/downloads/20_May_IMPS_Progress.pdf
[12]   ibid, footnote 3

The most recent information suggests that statistics on long-term international migration based on the e-Borders programme (see paragraph 3.18) *may* be available in 2013, in time for the publication of the mid-year population estimates relating to 2012. An integrated population statistics system remains the long-term vision and a project has been initiated by the Office for National Statistics (ONS) to investigate alternative census and survey designs, alongside the potential use of administrative data.

And until then

9.   The Task Force also recognised that, in the meantime, more modest improvements could be made to the existing system for estimating migration flows. It made several recommendations for improving the International Passenger Survey, on which estimates of international migration currently rely. These improvements have been taken forward and the most significant change to the sample survey – a new survey design which should lead to more reliable estimates – was implemented in January 2009. Other changes to migration estimates have been investigated: for example, adjustments for student migration (a major issue for some local authorities with high student populations); improving the way international migrants are distributed at a local level (based on administrative data rather than on the 2001 Census); and building a package of local level indicators that will provide a migration profile for individual local authorities (to begin to be available from May 2009). These are developments that will either directly improve the estimation of migration or, as with the indicator package, provide further information about local areas that could support decision making in the funding round in 2010.

Who is involved

10. A cross-government programme – the Migration Statistics Improvement Programme – is responsible for delivering the improvements, although most of the short-term improvements are being developed by ONS. However, the work requires close co-operation and the most critical improvements cannot be delivered by ONS alone. A number of departments have said that they will be carrying out substantial work of their own that will contribute to the statistical improvements. However, the information available to this review is insufficient to indicate precisely what each department plans to contribute, or when. We think therefore that more detailed information of this kind should be made publicly available by departments.

Progress so far

11. The developments undertaken to date within the Migration Statistics Improvement Programme will help to lay the ground for delivering the Task Force goals. While high level information on the programme was released, users were unclear about the detail of what was being done and the current state of progress overall. This led to some frustration. We welcome the significant steps taken recently by the MSIP programme to communicate more effectively with users and we encourage further engagement. We suggest supporting the new migration quarterly report by presenting the data using a diagrammatic framework.

Remaining risks

12. Despite these developments the risk remains that there will be significant discrepancies between the population estimates derived from the 2011 Census, those rolled forward from the 2001 Census (adjusting for births, deaths and migration) and data from administrative sources, at least in some geographical areas. This may make cross-checking between data sources problematic and prompt questioning of the reliability of the Census results simply because figures differ from earlier estimates. ONS will need to find ways to explain clearly the reasons why such discrepancies are to be expected and this may require more public acknowledgement of the short-comings of the current regular estimates.

13. While administrative sources are undoubtedly central to any future system for migration and population statistics, they are not without their own short-comings and should not be regarded as a panacea for the existing methodological problems. For example, it has not been made clear how migration statistics can be produced using the e-Borders system and the NHS Personal Demographic System. Until the statistical potential has been clarified, doubts will remain over the feasibility of delivering more significant improvements to migration statistics.

Recommendations

14. Our final recommendations are set out below. Successive governments in the UK have historically been opposed to maintaining a comprehensive register of everyone in, and entering and leaving, the country, on the lines of some Scandinavian countries. From studies of those systems, it is clear that - while they do not obviate all problems – they can give much better and more up to date information on migration. But, whatever the merits of such an approach – and from a purely statistical point of view there would be great advantages in having such a system in place – there is no practical prospect of the UK government introducing a comprehensive register on these lines in the foreseeable future. That being the case, it is inevitable that current, substantial efforts to improve statistics on migration into and around the UK will take a long time to reach their maximum potential, and will meanwhile produce only modest short-term improvements in what we know.

15. The recommendations made in our interim report have been reviewed in the light of comments received and from a consideration of the full range of evidence that has now been gathered. We focus here on the major recommendations coming from our review. ONS has already taken steps in a number of areas raised in the Interim Report and this is reflected in the full listing of the Interim Report recommendations given in Annex A. The recommendations below are largely directed towards the Migration Statistics Improvement Programme (MSIP) or ONS, but we suggest that other producers of statistics, for example in the devolved administrations, consider the implications for their own work.

- We **recommend** that ONS's quality assurance methodology is made clear to users and that a phase of quality assurance involving local government experts occurs before the final version of the estimates is released. [paragraph 45]
- We **recommend** that ONS flag those local authority population estimates where there are higher levels of uncertainty, indicating the reason for the uncertainty. [para 48]
- We **recommend,** as soon as practicable, the release of information to clarify how e-Borders data might be used in the estimation of migration statistics. [para 53]
- We **recommend** the online release of project papers which, together with details of investigations currently underway and their progress, would give users a better understanding of progress. [para 76]
- We **recommend** that each department involved in the Programme provides the programme board with details of the work being undertaken, together with the associated expenditure, and update this every six months. [para 79]
- We **recommend** that ONS, Home Office and the Department for Work and Pensions adopt a 'conceptual framework' in their releases of migration statistics, to enable users to understand how the different sets of figures relate to each other and to the process of migration more generally. [para 91]

16. In addition, the Statistics Authority will pursue discussions at a high level in government on matters such as the future of the Census beyond 2011, the longer term maintenance of a national address register, and related developments (such as the statistical case for a population register) with a view to improving migration statistics. [para 64]

Part 1:
Improving Migration Statistics

Introduction

17. Together with registered births and deaths, international and internal migration data form the basis of estimates of population change between censuses. However, whereas data on the number of births and deaths are well-documented and reasonably predictable, the movements of people into and out of the country and between areas are less so. So as well as being the larger component of population change, internal and international estimates of migration are more difficult to estimate with confidence.[13]

18. The population estimates which are affected by this problem are among the most important official statistics in terms of their impact on public services and policy. As well as providing the denominator for many important official measures – such as gross domestic product (GDP) per capita – population estimates are used extensively for resource allocation across government. Sub-regional population estimates, projections and migrant information are also essential for the planning of local service delivery.

19. The UK Government, the National Statistician and independent commentators have all concluded[14,15,16,17] that official statistics of international and internal migration are currently inadequate for the purposes for which they are required. In that sense, there is no disagreement about the nature and extent of the problem, nor is there disagreement about the broad shape of the eventual solution – a solution that relies on the integration of administrative sources and survey information.

20. The UK Statistics Authority has a statutory function (section 8 of the *Statistics and Registration Service Act 2007*) to monitor the production and publication of official statistics. It may report any concerns it has about the quality, good practice or comprehensiveness in relation to official statistics. Following the concerns expressed by the House of Commons Treasury Committee,[18] the Statistics Authority initiated a 'monitoring' review to assess progress being taken by government departments to improve population statistics, and, in particular, progress against the plans agreed by Ministers following the December 2006 report of the Inter-Departmental Task Force on Migration Statistics.[19] The review aims to draw conclusions about the

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[13] The official figures do not include counts of illegal migrants which are difficult to measure, although the Home Office has attempted to do so with the Migration Research Unit at University College London in *Sizing the Illegally Resident Population in the UK,* Home Office online report 58/04, 2004, http://www.homeoffice.gov.uk/rds/pdfs04/rdsolr5804.pdf
[14] ibid, footnote 11
[15] ibid, footnote 3
[16] Institute of Community Cohesion, *Estimating the Scale and Impacts of Migration at the Local Level,* 1 November 2007, http://www.lga.gov.uk/lga/aio/109536
[17] ibid, footnote 8
[18] ibid, footnote 5
[19] ibid, footnote 3

current adequacy of migration statistics; the adequacy of plans for improving migration statistics (including the prospective value of 2011 Census data on migrants); progress against those plans; any further steps that government needs to take; and any need to improve the communication of the statistics and their reliability to users and the public. A project board was established to oversee the conduct of the review, with representatives from the Authority supported by experts in central and local government and academia. The membership of the project board is given in Annex B.

21. This final report builds on the interim report published in April 2009 and presents conclusions following a review of:

- publicly available material on the work of the *Improving Migration and Population Statistics* programme[20] led by the Office for National Statistics (ONS);

- in-depth interviews with users from a range of organisations in local government, academia, the private sector and internationally (see Annex C for a list of participants);

- examination of unpublished papers of the current cross-government *Migration Statistics Improvement Programme*;

- discussions with representatives of producer bodies in central government;

- discussions at an open meeting following the publication of the interim report,[21] and

- a commissioned review of migration statistics literature prepared by Professor Philip Rees and colleagues from the School of Geography, University of Leeds (see Part 2).

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[20] Office for National Statistics, *Improving Migration and Population Statistics* programme: http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/updates/default.asp

[21] Note of meeting held on 22 April 2009 at the Royal Statistical Society, http://www.statisticsauthority.gov.uk/news/ migration-statistics-interim-report-open-meeting--presentations-and-supporting-information.pdf

22. A formal re-assessment of the compliance of ONS internal and international migration statistics with the Code of Practice[22] is currently underway. The assessment will determine how these statistics comply with the various principles and practices listed within the Code of Practice and may identify areas of improvement.

23. Under the *Statistics and Registration Service Act 2007*, the Statistics Authority can obtain information to enable it to undertake its statutory assessment work. However, the Authority does not have these rights in the context of other reviews and it relies, therefore, on the co-operation of government departments. The Authority is grateful that the unpublished papers of the Migration Statistics Improvement Programme board and working groups were made available to us. Papers for the ministerial group were not made available to us but we have been assured that issues raised there were fed into and acted on by the programme board.

24. Part 1 of this final report examines six questions:

- What progress has been achieved in methodological development?

- Do users feel the right areas are being investigated?

- How effective has the programme management been?

- How engaged are those departments involved in the Migration Statistics Improvement Programme?

- Are there sufficient resources available to complete the work required to ensure that migration statistics are fit for purpose?

- How effective has information sharing with users been?

25. Part 2 of this report presents the commissioned literature review. The paper raises a wide range of issues, some of which are beyond the remit of this project. ONS will wish to consider each of the findings of the literature review in relation to its work to improve migration statistics, and population statistics more generally.

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[22] UK Statistics Authority, *Code of Practice for Official Statistics,* Edition 1.0, January 2009: http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html

Context for the review

26. Following the 2001 Census a number of local authorities were concerned about the financial impact on them of disparities between population estimates based on: 1) the 1991 Census and rolled-forward adjustment to account for births, deaths and migration, and 2) the 2001 Census. Investigation of the differences showed that the rolled-forward estimates were problematic (too high in most cases) but also that, particularly in a small number of inner city areas, the 2001 Census counts were likely to be too low. The attendant uncertainty led to public criticism of, and some loss of public confidence in, the official population and migration statistics.

27. Aspects of census methodology initially received much of the criticism. For example, the Statistics Commission highlighted concerns with the completeness of address lists – particularly in 'hard-to-count' areas – in their interim report on *The 2001 Census in Westminster* in October 2003.[23] Local authority population studies by the ONS[24] further highlighted problems with population estimates, including an over-correction in some areas for estimated levels of under-enumeration in the 1991 Census in England and Wales. The ONS studies also emphasised the known weaknesses in the estimation of population change due to international migration. Investigations also took place into the migration estimates themselves – a National Statistics Quality Review of the international migration statistics was started in July 2002.[25] The report's recommendations for improvements, published in September 2003, were accepted by ONS, which began a programme to address the issues raised in the report in January 2004. The enlargement of the European Union in 2004, and the consequent increase in international and internal migration led to fresh demands for higher quality migration data at the national and local levels.

28. In evidence to the House of Lords Select Committee on Economic Affairs on the state of the monetary policy (December 2006), the Governor of the Bank of England, Mervyn King, said, 'we do not have the ability to measure accurately at present the size of the population'.[26] In July 2007 a House of Commons debate highlighted the political impact of problems with the data for London, and there were a number of written parliamentary questions on

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[23] Statistics Commission, *The 2001 Census in Westminster, Interim Report,* Report No. 15, October 2003 http://www.statscom.org.uk/uploads/files/reports/Census%202001.pdf

[24] 2001 Census, *Local Authority Population Studies: Full Report,* Office for National Statistics, September 2004 http://www.statistics.gov.uk/downloads/theme_population/LAStudy_FullReport.pdf

[25] ibid, footnote 2

[26] Cited in House of Lords Select Committee on Economic Affairs, *The Economic Impact of Immigration,* First Report of Session 2007-08, April 2008, p.20 http://www.publications.parliament.uk/pa/ld/ldeconaf.htm

the issue.[27,28,29] The Statistics Commission[30] further recommended that the 2011 Census should be the last traditional census, and that alternative methods should be found to measure the population and its characteristics, such as replacing the census with an administrative population register or developing existing administrative sources.

29. Following its inquiry into the adequacy of population estimates, the House of Commons Treasury Committee found that the estimates 'are not fit for purpose as they fail to properly account for internal migration' (May 2008)[31]. The Committee also concluded that the International Passenger Survey (IPS) was not suitable for estimating international migration and recommended that ONS replace the IPS with a new survey that was more comprehensive and more suited to accurate measurement of international movements affecting the size of the resident population of the United Kingdom.

30. The main steps taken since 2003 to improve migration statistics are summarised in box 1 below, concluding with the establishment of the cross-government Migration Statistics Improvement Programme.

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[27] *HC Deb* 25 July 2007 c1014
http://www.parliament.the-stationery-office.co.uk/pa/cm200607/cmhansrd/cm070725/debtext/70725-0030.htm
[28] *HC Deb* 21 April 2008 c1699W
http://www.parliament.the-stationery-office.co.uk/pa/cm200708/cmhansrd/cm080602/text/80602w0045.htm
[29] *HC Deb* 2 June 2008 c735W
http://www.parliament.the-stationery-office.co.uk/pa/cm200708/cmhansrd/cm080421/text/80421w0083.htm
[30] Statistics Commission, *Counting on Success: the 2011 Census – Managing the Risks,* Report No. 36, November 2007
http://www.statscom.org.uk/uploads/files/reports/Report%2036%20Census%202011.pdf
[31] ibid, footnote 5

Box 1: Improving migration statistics – key developments

1. National Statistics Quality Review on migration statistics – reported in September 2003 with wide ranging recommendations highlighting:

- limitations of the International Passenger Survey (IPS);

- extending the use of Home Office immigration control data such as landing cards;

- improving the distribution of immigrant flows geographically through the use of household surveys and administrative data.

2. Proposals by ONS for an Integrated Population Statistics System, July 2003

- combine census, survey and administrative data at an individual level to create a single, comprehensive population statistics database

3. Detailed implementation plan for responding to the NS Quality Review (published by ONS) in January 2004 included:

- improvements to IPS

  - new questions on short-term migration and intention to stay

  - examination of non-response

  - review of interview shifts to identify appropriate timings in various ports for interviewing particular migrant types

- methodological development of short-term migration estimates

4. Formalisation of development work within ONS through the Improving Migration and Population Statistics programme (2004), addressing recommendations from the Quality Review with three main areas:

- migration research (both international and internal within the UK)

- collaborative work with local authorities to investigate the potential for making greater use of administrative data sources to improve local estimates

- population definitional issues

continued over

**Box 1: Improving migration statistics – key developments
(continued)**

5. Formation of Inter-Departmental Task Force in May 2006 by the National Statistician. Publication of recommendations in December 2006 with an aim to produce progressive improvements from 2008 to 2012 across departments:

- Obtain more information about migrants as they enter or leave the country.

- Obtain more comprehensive and timely information about migrants living in this country.

- Use linkage to obtain better information relating migrants' intentions at entry to the UK to subsequent events, such as employment, having a child and when they leave the country.

- Provision of more timely, robust key indicators of migrant numbers.

- Bring together all the statistics collected across Government on migration and migrants in a single UK-wide report, as there is currently no single official source.

6. Formation of Migration Statistics Improvement Programme across government (with Local Government Association representation) to address Task Force recommendations through activities in five working groups (see figure 1 on page 16). Work plans focus on:

- improving the data available on numbers entering and leaving the United Kingdom;

- making effective use of new and existing administrative and survey data sources;

- improving local population estimates and projections used in allocating resources and developing services;

- improving the public reporting of population and migration statistics; and

- establishing a wider range of timely indicators and analysis to inform the evidence base on migration and its impacts on policy and public services.

The Migration Statistics
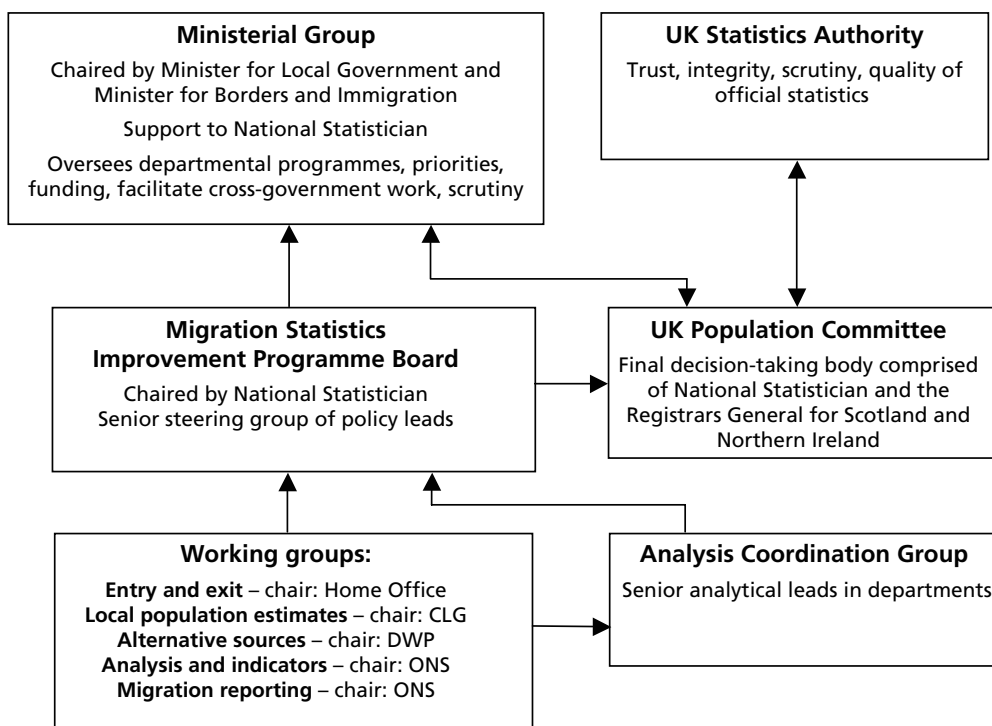# Improvement Programme

31. The current work programme is led by an inter-departmental board of senior civil servants from eight departments (alongside representatives of the Bank of England and Local Government Association). The board is chaired by the National Statistician. It met five times in the year following its first scoping meeting in February 2008 and the board has been seen to provide a positive and challenging oversight to the programme. The work of the programme is undertaken in five working groups, chaired by senior officials of the Home Office, Department for Work and Pensions, Office for National Statistics, and Department for Communities and Local Government. The UK Statistics Authority has been given access to papers for this programme for the period to February 2009 in order to review the approach taken and measure the degree of progress achieved by the departments involved.

32. The governance structure of the programme is illustrated in figure 1. A ministerial group, jointly chaired by the Minister for Local Government and the Minister for Borders and Immigration, oversees and supports the cross-government programme led by the National Statistician. It was set up to coordinate Whitehall support to enable the National Statistician to make progress and ensure pace in the development and delivery of improvements to the population and migration statistics at national and local levels. The ministerial group meets every four months and focuses on the progress of the programme in developing and delivering a package of improvements in time for the next spending review and three year local government finance settlement.

33. The devolved administrations participate in the working groups and are represented by the General Register Office for Scotland, the Northern Ireland Statistics and Research Agency, and the Welsh Assembly Government. A number of the methodological changes being investigated and implemented by ONS are relevant to the production of migration estimates for England and Wales alone and are not directly relevant to either Scotland or Northern Ireland. While the United Nations' definition of long-term migration is applied throughout the UK, there are some differences in the systems and methods used to estimate international and internal migration, particularly at a local level. The methods used in Scotland and Northern Ireland are described in box 2 below.

34. All of the constituent countries of the UK are looking to utilise administrative systems, and consequently developments to aid record linkage and the development of an integrated system to produce migration statistics are of importance to Scotland and Northern Ireland. There may be significant differences in some of the administrative systems that will need to be overcome to enable cross-border migration to be measured adequately. The current governance structure enables learning within the programme to be transferred and applied within the devolved administrations.

Figure 1: MSIP governance arrangements

Ministerial Group Chaired by Minister for Local Government and Minister for Borders and Immigration Support to National Statistician Oversees departmental programmes, priorities, funding, facilitate cross-government work, scrutiny	**UK Statistics Authority** Trust, integrity, scrutiny, quality of official statistics
Migration Statistics Improvement Programme Board Chaired by National Statistician Senior steering group of policy leads	**UK Population Committee** Final decision-taking body comprised of National Statistician and the Registrars General for Scotland and Northern Ireland
Working groups: **Entry and exit** – chair: Home Office **Local population estimates** – chair: CLG **Alternative sources** – chair: DWP **Analysis and indicators** – chair: ONS **Migration reporting** – chair: ONS	**Analysis Coordination Group** Senior analytical leads in departments

Box 2: Estimating migration in Scotland and Northern Ireland

a) International migration

Scotland

International migration to and from Scotland overall is estimated in the same way as for England and Wales. Measures of Total International Migration are produced by ONS for the General Register Office Scotland (GROS). The figures are based on the International Passenger Survey (IPS) and adjusted for visitor and migrant switchers and asylum seekers. The IPS figures are allocated to Scotland by applying the Labour Force Survey distribution. GROS then distributes the migrants to a local area level using the health administrative systems within Scotland – the Scottish National Health Service Central Register (SNHSCR) and the Community Health Index (CHI). Migrants into health board areas are distributed using SNHSCR (based on GP registrations), while CHI is used to distribute to council areas. The CHI totals are controlled to match the health board totals from SNHSCR. (http://www.gro-scotland.gov.uk/statistics/migration/methodology.html)

continued over

Box 2: Estimating migration in Scotland and Northern Ireland *(continued)*

Northern Ireland

Estimates of international migration for Northern Ireland are not based on the IPS/LFS figures for three reasons. Firstly the IPS does not cover the land border with the Republic of Ireland; secondly responses to surveys are also unclear whether a move to or from 'Ireland' refers to the province and lastly achieved survey responses are very small and thus are not robust at the Northern Ireland level. Instead international moves at the local and Northern Ireland level are based on data from the Central Health Index which records registrations and de-registrations with family doctors. It is used by the Northern Ireland Statistics and Research Agency (NISRA) to estimate flows to and from countries outside the UK, with the exception of flows to the Republic of Ireland which are derived from the Quarterly National Household Survey in Ireland. (http://www.nisra.gov.uk/archive/demography/population/migration/dev_est_mig.pdf)

b) Internal migration

Scotland

Moves within Scotland are again based on the Scottish health administrative systems. SNHSCR is used at health board level and CHI for council areas and below. By using postcode information from CHI, moves can be measured between two time points, but are adjusted to match totals at health board level obtained from SNHSCR.

Northern Ireland

In a similar way, moves within Northern Ireland are measured according to the Central Health Index, again based on re-registrations with family doctors.

c) Cross-border moves within the constituent parts of the UK

Moves to and from other parts of the UK are measured via transfers of health cards between NHSCR in Southport (for England and Wales), SNHSCR in Edinburgh and the Central Services Agency in Belfast. Flows are measured by the receiving country only.

Box 2: Estimating migration in Scotland and Northern Ireland *(continued)*

d) Measurement issues and future developments

Issues related to the IPS and LFS flagged up within the main body of the report also impact on the international migration estimates for Scotland but not Northern Ireland. Moves to establish an integrated population statistics system are of relevance though to both Scotland and Northern Ireland. Establishing data linking for the common administrative systems such as for work and pensions and e-Borders, and reconciling differences between unique local sources, such as the School Census, are important to enable consistent statistics to be available across the constituent parts of the UK.

NISRA already brings together migration reporting using a variety of sources within its annual publication. It is also looking to extend its use of the range of sources by data linking and is aiming to report on this work in 2009.

http://www.nisra.gov.uk/archive/demography/population/migration/
NI_Migration_Report(2007).pdf

A number of studies are in progress in Scotland to explore the potential of record level administrative data to help improve current approaches to the production of population statistics.

Work with a statistical extract from the SNHSCR seeks to develop a more flexible and comprehensive system for using SNHSCR data in preparing population estimates and supporting census.

There are plans to use new sources, such as the HESA Student Record and the School Census, in order to assess and improve the quality of the SNHSCR based migration estimates. HESA data on students' term-time postcode and type of accommodation are being investigated with a view to improving the available information on communal establishments.

Data on pupils attending publicly funded schools are linked to form a longitudinal record which allows their residential moves to be compared with those captured by the SNHSCR.

Arrangements are being made to access data on NI number allocations held by ONS in order to determine where international migrants to Scotland are most likely to settle, and to assess whether this is adequately reflected in current statistics.

In addition to these new pieces of work, GROS is continuing to quality assure its small area population estimates by using aggregated data on the number of child benefit recipients, older persons in receipt of state benefits, and school census pupils.

Delivery of technical developments

35. This section considers and evaluates the extent to which the programme's developments are on course to improve international and internal migration statistics. Box 3 outlines the main types of data sources and Annex D provides a brief description of the administrative sources highlighted in this report.

Box 3: Types of data sources

Official statistics are derived from three main types of data: census, survey and administrative records.

a) The census covers every person and household in the country and has been conducted every 10 years since 1801, with the exception of 1941. The basic principles of the census have remained the same throughout, though new questions have been added and others have been omitted. The next census will occur in 2011.

b) Surveys are generally targeted on specific topics using samples of the population. Often surveys sample people living in households, such as the Labour Force Survey, but the International Passenger Survey samples people passing through the principal UK train (Channel Tunnel), sea and air ports.

c) Administrative records are collected to support particular public administrative processes, for example, the registration of births, deaths and marriages. Statistical data can be derived from these systems, to monitor social and demographic trends. National Insurance number applications from overseas nationals are one source of administrative data that can be used to inform the understanding of international migration patterns.

The production of internal and international migration statistics draws on each type of data. The International Passenger Survey is the main source of information on international migration, while GP registrations are used to compile internal migration statistics. ONS combine information from the IPS with other sources, including administrative data on asylum seekers from the Home Office, to produce the Total International Migration statistics. This is the most comprehensive measure of international migration.

Administrative data can also be used to quality assure migration estimates – for example, comparing the migration estimates by region with a number of administrative measures, to identify any inconsistencies and to determine the robustness of the estimates. The New Migrant Databank developed by researchers from the University of Leeds is one tool that enables quality checking as it brings together published statistics from a variety of sources at different geographical levels. The results of a regional comparison of some of the main migration administrative sources are given in the literature review (see Part 2 Appendix 3). These charts illustrate the disparate nature of the various data sources and the difficulty of combining the various measures to obtain a coherent picture of international migration.

continued over

Box 3: Types of data sources *(continued)*

Administrative data may potentially be used in combination by linking individual records via a common identifier such as NHS number or National Insurance number. There are data protection standards and technical considerations to be met before record linkage can be achieved. Data quality issues also need to be resolved to enable administrative records that are collected in different ways and for various purposes to be joined together. These may include data cleaning to remove or resolve incomplete and duplicate records. While linking administrative records is a complex activity, it has great potential for improving the accuracy of the measures of population movement.

36. The developments being taken forward by the Migration Statistics Improvement Programme are in line both with the recommendations of the report in 2006 of the Inter-Departmental Task Force and with the government response to the House of Commons Treasury Committee inquiry. These are summarised in box 4. The Authority sees the critical measure of success being when users feel satisfied that migration statistics are sufficiently robust for their various needs.

37. The users interviewed as part of this monitoring review (Annex C) spoke of their support for the general direction of the improvement programme; in particular work to draw on administrative data sources to ensure the statistics are put on stronger foundations, and the dissemination of more timely information on the production of migration estimates and data on migrant characteristics. Some users would prefer to go further still and would like to see a population register, to monitor movement in and around the country. However, users were less clear about the extent of real progress or when population statistics would be substantially based on the use of administrative data supplemented by survey information.

38. Some of the users interviewed expressed concern at the application of statistical methodologies for the distribution of UK-level international migration estimates to regions and local authority areas, and an apparent over-reliance on relatively small sample sizes of both the International Passenger Survey (sample size approximately 280,000 respondents per annum with around 2,500 migrant contacts) and the Labour Force Survey (sample size approximately 50,000 households per quarter). Others felt that the programme was proceeding on the right track but did not yet go far enough in securing high quality data.

Box 4: Work being undertaken on improving migration statistics

a) Short term – for inclusion in sub-national population projections for 2010 funding round (for England)

- Use of aggregate HESA student data to improve flows and in turn improved local internal migration estimates.

- Use of aggregate administrative sources in modelling the local distribution of international immigrants.

- Refinements to previous package of improvements in 2007:

  – improved emigration modelling methods;

  – revisited intermediate geographies – consulting local authorities.

- Improved IPS – with increased sampling of emigrants, the inclusion of more ports (Manchester, Stansted and Luton), the implementation of the redesigned port survey in January 2009 (which will impact on estimates from 2009), and inclusion of questions on switchers and short term migrants.

b) Short term – supplementary information to assist funding decisions

- An indicator suite of migration measures at a local level for first publication in May 2009, extending the range of indicators as they become available:

  – Aggregate HESA data;

  – Local short term migration estimates;

  – Population churn measures.

  – Possibly include:
    – aggregate School Census data for England;

    – aggregate HESA data;

    – aggregate migrant worker scan (National Insurance information);

    – aggregate Work and Pension Longitudinal Study (WPLS) data.

- Quality measures – reliability of mid-year population estimates starting with a feasibility assessment in 2009.

continued over

Box 4: Work being undertaken on improving migration statistics *(continued)*

c) Medium term (2010 – 2011)

Continue use of modelling, for example, local area distribution of migrants drawing on record level data on characteristics of migrants, using where possible:

- HESA student data matched to patient register data (to correct for under-recording on GP registers)
- School Census
- Migrant Worker Scan
- WPLS
- Communal Establishment Survey (in development)
- IPS data from redesigned survey (starting January 2009)
- Points Based System
- Landing cards
- IDs for foreign nationals

d) Long term (post 2011 Census)

- Looking to develop a system along the lines of the proposed Integrated Population Statistics System in the Beyond 2011 project, based on integration of IPS data with e-Borders (from 2013)
- Supplemented with record linkage using:
  - School Census (linked with birth registrations)
  - Migrant Worker Scan
  - WPLS
  - improved quality of data from GP registers
- Survey data from sources such as IPS and Communal Establishment Survey

Changes to methods

39. Users interviewed as part of this review felt that improvements to internal migration were necessary, but were a lower priority than improvements to international migration statistics. The GP registration system is the main source of information on moves within the UK. *Internal* migration developments are largely focused on incorporating the use of administrative data in improving the estimation of student migration, since when people move to a new area they may not immediately register with a new GP. There is also major work underway in the Connecting for Health Programme to deliver a new personal demographic system, which is expected to improve the quality of GP registration information. In addition, the Advisory Committee on Resource Allocation, an independent committee that advises the Department of Health on the allocation of resources to Primary Care Trusts, is examining the feasibility of using GP registration data, rather than ONS population estimates, as the basis for those allocations.

40. The developments being undertaken by ONS largely relate to improvements to the estimates for *international* migration – and to immigration in particular. Few of the developments currently underway focus on emigration because of the very limited set of administrative information that is able to record migrants leaving the UK and because this has not traditionally been a topic of policy interest. The e-Borders system will be critical in this regard as it may improve the recording of entrances to and exits from the UK in the future (see paragraph 52).

41. In 2007 ONS implemented new methods for allocating (or 'distributing') the numbers of immigrants measured at the UK-level to regions and local areas around the UK, using the Labour Force Survey (LFS) for regional patterns of movement and introducing a new intermediate level of geography. There was no change to the method used to distribute the estimates of international migrants between local authorities within these intermediate geography areas and this lower level distribution continued to be based on the 2001 Census. The use of the LFS enabled the distribution to draw on the *actual* destination of the migrant – the IPS data is restricted to *intended* destination which is inevitably uncertain and tends to be biased towards large urban areas. Some users felt that the usefulness of the LFS is weakened by not capturing all groups of migrants. For example, as a household survey the LFS excludes those living in communal establishments and therefore some international students and migrant workers. Since the IPS and LFS do not have sufficiently large sample sizes to provide reliable information to enable estimates of migrants to be distributed to the local level, 2001 Census data are used. However this method means that no account is taken of more recent trends in migration, particularly since the enlargement of the European Union in 2004.

42. Our conclusion is that none of the above sources is ideal. ONS is currently looking at an alternative basis of distributing estimates of immigrants to a local level, using administrative sources such as National Insurance allocations and NHS patient register data, potentially in combination with 2001 Census data. ONS is also studying the application of Higher Education Statistics Agency (HESA) data to improve the estimation of student movements, and it is investigating the possibility of linking the individual student records with general practitioner registration data. These developments are intended to assist the local area distribution of migrant estimates.

43. The review of migration statistics literature (see Part 2) highlighted inconsistencies between administrative sources and the Total International Migration (now labelled 'long-term international migration') estimates both for England and regionally. ONS will want to consider the issues given in the literature review, to determine whether further steps can be taken to improve the regional estimates.

44. Some of the local authorities interviewed for this review were particularly concerned because they believe previous revisions to population estimates resulting from changes to the method for estimating migration may have had a negative impact on their 2007 financial allocations, despite not being, in their view, based on significantly improved population and migration data. These local authorities are also concerned that they may experience similar difficulties in future funding allocations. We suggest that it would be helpful if ONS, at the time it publishes revisions to population estimates, make clear in what sense these are an improvement and the extent to which they are likely to help to reduce the gap in the population count when compared with the count obtained from the 2011 Census.

45. ONS has said[32] that it will not be able to implement the latest developments in time for the initial release of the 2008 mid-year population estimates in August 2009, but intends rather to use the existing methodology followed by a revision to the 2008 estimates after a period of consultation. We **recommend** that ONS's quality assurance methodology is made clear to users and that a phase of quality assurance involving local government experts occurs before the final version of the estimates is released.

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[32] ONS, *Improvements to Migration and Population Statistics,* February 2009. http://www.statistics.gov.uk/about/data/ methodology/specific/population/future/imps/updates/downloads/msiwpfeb.pdf

Local authority indicators

46. While the development of the statistical methodology is central to some of the activities in the improvement programme, there are other important developments being planned. One improvement is the creation of a local area migration indicator package which will provide a profile of migrant activity and characteristics for individual local areas. This will be released through the National Statistics Publication Hub on a quarterly basis, together with more timely estimates of national-level international migration using provisional IPS data. The package of local area indicators is planned to include some existing, as well as some new measures – for example, estimates of population churn[33] and newly-developed estimates of local-level short-term migration. An initial release was published in May 2009. A range of other measures such as data on nationality, ethnicity and English spoken as a foreign language, extracted from surveys and administrative sources, will be added in due course. ONS is currently consulting local authorities on the composition of these indicators.

47. The migration indicator package has the longer-term potential to broaden the evidence base for decisions about local authority funding requirements. The usefulness of the package will depend on the range and quality of the data contained within it. This will be a critical development, particularly if slower progress is made on improving the underlying methodology of the migration estimates by using additional sources such as HESA and e-Borders data. The extent to which progress can be made in this area will be affected by the length of time taken to secure access to these data, and full compliance with data security rules.

48. Irrespective of progress made in respect of the migration indicator package, we **recommend** that ONS flag those local authority population estimates where there are higher levels of uncertainty, indicating the reason for the uncertainty. It would then be for users to determine how to reflect the uncertainty within their own use of the data – whether this be setting or monitoring progress towards targets; comparative analysis; or supporting resource allocation, for example.

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[33] Population churn is a measure of the extent of change: the sum of in- and out-migration expressed as a rate per 1,000 of the population

Progress in the use of administrative sources

49. Some users interviewed felt that a population register and a requirement that internal and international moves be registered with the relevant body is essential to delivering high quality migration statistics. Others felt that politicians and the public would not support such a system. By common consent among those users we interviewed, the exploitation of both existing and new administrative data sources is fundamental to the longer-term redesign of the system for the production of migration statistics. However, opinions vary as to which sources will ultimately prove the most valuable. For example, some experts are critical of GP registration records which have well-documented weaknesses in terms of their potential use for statistical purposes, while others see value in the extended use of these records, in particular 'Flag 4' data (the flagging of international migrants registering with the NHS). ONS has produced an assessment of the major sources (National Insurance number allocations, NHS patient data and Worker Registration Scheme information) and this assessment is being used to inform the developments being undertaken within the improvement programme.[34]

50. There are weaknesses in many of the administrative sources when used for statistical purposes. Extensive research is being undertaken into ways of using and improving them for estimating migration. In addition, ONS is investigating the use of aggregated administrative data to quality assure population and migration estimates – for example using pension claimant data to quality assure the estimates of the number of older people – and the scope for record linkage between different administrative sources for statistical purposes.

51. However, many difficulties remain to be overcome, not least because these sources have been developed with their primary administrative purpose in mind and are often not particularly suited to being exploited for statistical purposes. There are data linkage problems to be resolved (for example, ensuring the source provides comparable, complete and high quality information on which to link records), even after the legal and secure data sharing requirements are satisfied. This is particularly an issue for the complex DWP data on employment, benefits and pensions.

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[34] ONS, *Comparison of combined IPS (long and short-term migration) estimates with administrative sources,* May 2008, http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/updates/downloads/Reconciliation_Exercise.pdf

52. The e-Borders project (see Annex D) has the potential to enable a fundamental improvement in the way international migration is estimated at a UK-level, although it will not be able to contribute to improved allocation at a local area level. Some limited progress has been made within the Migration Statistics Improvement Programme to better understand how to exploit the e-Borders system to enhance migration statistics. The UK Border Agency (UKBA) has committed the e-Borders programme to meet the statistical requirements in relation to counting those entering and leaving the country. The improvement programme expects that the system needs to capture at least 95 per cent of passenger numbers to be able to use the data for the purposes of estimating international migration. This target is planned to be reached by December 2010. We are advised that, following its introduction, the system will take more than 12 months to identify long-term migrants, although short-term migration estimates should be available beforehand. It is anticipated that long-term migration statistics drawing on data from the e-Borders system will not be available until the publication of the 2012 mid-year estimates in 2013.

53. The UKBA's commitment to meet the statistical requirements is welcome. We suggest that regular reports on progress on the development of the e-Borders statistics programme are made to the MSIP board and published. This will help the Authority to monitor progress and to oversee the development and improvement of migration statistics. We **recommend**, as soon as practicable, the release of information to clarify how e-Borders data might be used in the estimation of migration statistics.

54. Other UKBA developments have encountered difficulties: for example a plan to scan landing cards completed by foreign passengers arriving in the UK has been abandoned. The scanned cards were seen as a potentially valuable and early additional source of information to support the improvement of migration statistics. While new landing cards are now being introduced, with a new question on intended length of stay, the latest information indicates that landing card data will not be provided to ONS and therefore not available for statistical purposes.

55. Progress on incorporating statistical needs into the new points-based immigration system – a method of controlling immigration of non-EU nationals for work, training or study in the UK on the basis of qualifying points – has been slower than originally assumed. The system is not seen by the improvement programme as central to improving the migration data underpinning population estimates, partly because it does not record EEA migrants, and also because it will not capture information about some non-EEA migrants such as asylum seekers. However, users of migration statistics

are likely to find the information useful for other purposes. It is understood that the UKBA has yet to specify a statistical system to monitor the numbers and types of migrants entering the UK via the points-based system. We suggest that such a system is put in place, and that the possibilities for further integration of the PBS data with migration statistics are fully investigated to determine whether useful additional data can be obtained from this source to improve the measurement of international migration.

Data-sharing permission

56. Ensuring that ONS has sufficient access to data from other departments is central to the improvements that rely on the statistical use of administrative data. The MSIP will need to obtain data-sharing permissions for existing data systems, as well as ensuring that permissions are granted for any new systems such as e-Borders. This process is expected to be time-consuming and allowances should be made within programme planning. However, the granting of permission to share data is not an end in itself but should be seen as enabling the start of detailed development work.

57. A number of the users interviewed expressed frustration at the time being taken to obtain access to administrative data. The process of securing permission can be lengthy, partly because in most instances specific secondary legislation is required under the *Statistics and Registration Service Act 2007*. There are potentially challenging steps to take, including seeking legal opinion, taking account of potential ethical, data handling and related security issues, and allowance for the required length of time for parliamentary consideration in advance of the secondary legislation being brought into force by Ministers. Following the Hannigan Review[35] of data handling procedures across government, higher security requirements are now in place and may further delay the granting of access. While we are convinced of the importance of linking administrative records, we also fully accept the need to ensure complete confidentiality and note that ONS has a strong record in this regard.

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[35] Cabinet Office, *Data handling procedures across government: Final report,* November 2008, http://www.cabinetoffice.gov.uk/reports/data_handling.aspx

58. The first data source to go through this process was the School Census in England. After a feasibility study to determine the usefulness and relevance of the data, ONS and the Department for Children, Schools and Families began the process to put in place the required secondary legislation to enable data sharing from the School Census. This work started in March 2008, with Parliament approving the Order in January 2009.

59. Enabling secondary legislation under the *Statistics and Registration Service Act 2007* was not required for the sharing of data on National Insurance number allocations to migrant workers, since a legal gateway has been identified (under the *Social Security Administration Act 1992*) that can be used to obtain access to information held by HM Revenue and Customs. The 'Migrant Worker Scan' is a quarterly cumulative scan of details of all adult overseas nationals using HMRC's National Insurance Recording System. The scan is received by the Department for Work and Pensions and they combine it with benefit information. Internal security protocols have now been met and the data shared with ONS. Progress is expected to be made in using this new source of shared data from early 2009.

2011 Census and future censuses

60. The 2011 Census of Population is a considerable logistic and financial undertaking which, for England and Wales, is expected to cost £480 million.[36] The Census will provide data to be used for resource allocation and many other purposes over the subsequent decade. The quality of the Census data is therefore crucial.

61. In view of the points raised in this section, and while recognising that incremental improvements have been made, we are concerned whether there will be substantial improvement in migration statistics and hence the reliability of the mid-year population estimates in advance of the 2011 Census. Users interviewed expressed strong reservations about the degree of improvement that will be achieved in estimating migration. Users felt that unless migration estimates are substantially improved, there will be significant discrepancies between estimates of the population for 2011 derived by rolling forward estimates from the 2001 Census, those measured using the 2011 Census itself, and data from administrative sources, at least in some geographical

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[36] 2011 Census White Paper, http://www.ons.gov.uk/census/2011-census/2011-census-questionnaire-content/2011-census-white-paper--english-.pdf

areas. The gap may in turn impact on the credibility of the 2011 Census itself. It would also mean that cross-checking the 2011 Census results could be problematic. We consider that it is particularly important to be able to compare Census data with data from relevant administrative sources, for quality assurance purposes.

62. Steps are being taken to increase the contribution that the Census can make to understanding patterns of migration. The 2011 Census will be the first to estimate the number of short-term migrants (a migrant born outside the UK who has stayed or intends to stay in the UK for between 3 and 12 months[37]), and thereby require short-term migrants to complete a census form (although they will be excluded from the count of the usual resident population). These data will enable better comparisons with administrative data. Questions on migration have been also extended in the 2011 Census, to cover citizenship, and the month and year of arrival. Some users question the usefulness of 'intention to stay' data, believing that the Census is not the right vehicle to ask about migration intentions, while others feel that they provide opportunities to cross-calibrate the data with administrative sources.

63. Some commentators argue that the case for holding traditional censuses in future is weakening due to rapid population movements and the potential of administrative sources to give a more up-to-date picture. Others point out that only a census enables the production of small area statistics and multi-dimensional analysis (such as ethnicity, by age and sex) and it is felt by many users to be vital for local analysis. In 2003, ONS proposed[38] an integrated system for producing population statistics underpinned by census and/or survey data, together with administrative data at an individual level. However, work on this system was deferred to prioritise improvements to migration statistics more generally. These proposals are now being revisited as part of a cross-government project, 'Beyond 2011', led by ONS to investigate alternative census and survey designs, and the potential use that could be made of administrative data sources in place of a future traditional census. An up-to-date address register[39] is regarded by both users and producers as being a necessary condition for the establishment and maintenance of an integrated system. The developments proposed by ONS in the 2011 Census programme

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[37] The General Register Office for Scotland does not plan to include the intention to stay question in Scotland's 2011 Census

[38] Office for National Statistics, *Discussion paper: Proposals for an Integrated Population Statistics System,* October 2003, http://www.statistics.gov.uk/downloads/theme_population/ipss.pdf

[39] The National Gazetteer has been developed in Scotland to provide an accurate, up to date database of land and property data/assets for use by Scottish councils and other parts of the public sector. The Scottish experience could inform the development of an address register for the rest of the UK.

were widely welcomed by those users that we spoke to. They considered that investment in creating an up-to-date register for the 2011 Census should be sustained by the relevant government bodies in order to support future population statistics (although this is beyond the formal remit of both ONS and the MSIP).

64. The future of the Census is both a technical and a policy issue and it has major implications for the funding and priorities of ONS and the Statistics Authority in the years after 2011. The Statistics Authority will pursue discussions at a high level in government on matters such as the future of the Census beyond 2011, the longer term maintenance of a national address register, and related developments (such as the statistical case for a population register) with a view to improving migration statistics.

Co-operation between departments

65. The critical developments needed to provide good quality migration and population statistics can only be achieved through the close collaboration of central government departments. The National Statistician endorsed this view in the Inter-Departmental Task Force in 2006.[40] Progress in achieving a joined-up approach was slow at first but it took a significant step forward in April 2008 with the formation of the cross-government Migration Statistics Improvement Programme (MSIP).

Departmental engagement

66. The bulk of the day-to-day development work is undertaken by ONS, with some involvement of several other departments who hold relevant administrative data sources: Department for Work and Pensions (DWP); Home Office; Department for Children, Schools and Families (DCSF), the former Department for Innovation, Universities and Skills (DIUS) and Department of Health (DH). A central support role is also provided by the Department for Communities and Local Government (CLG) as a major customer of the official migration statistics. DCSF and DIUS have been mainly involved in work to establish the legal basis for the sharing of the School Census in England and Higher Education Statistics Agency (HESA) data, respectively.

67. The Home Office and the UK Border Agency have played an active role on the programme board and ministerial group, as well as in the working group on migration reporting. The Home Office has taken a central role in the 'entry and exit' working group but, as noted previously, progress has been slower than expected. The programme's work during 2008 on UKBA entry and exit systems tended to be focused largely on specifying requirements for the statistical aspects of the systems. There was also close liaison between Home Office statisticians, UK Border Agency staff and ONS. This enabled some detailed investigation into the ways that the e-Borders system might be utilised to improve migration statistics.

68. The UK Border Agency is investigating the feasibility of conducting a large-scale survey of migrants. The survey is intended to provide richer information on reasons for migrating to or from the UK, on migrant work and education, and the economic and social impacts of migration on the UK. The review of migration statistics literature (Part 2) raises some concerns about the value of introducing a new migration survey and suggests that greater benefit will be gained through further investment in the administrative sources. We suggest that UKBA considers these views during their feasibility assessment.

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[40]   ibid, footnote 3

69. One data source of particular interest to users is National Insurance (NI) data on overseas nationals held within DWP and HM Revenue and Customs. The potential for linking NI data with benefits and employment information is widely supported by users. In recent years there has been substantial in-house development by DWP of its own data sources and those data it holds jointly with HMRC. DWP have increased the frequency, and improved the timeliness, of releases of statistics using NI data for overseas workers – with publications now released four times a year and within five months of the reporting period.

70. Another area of development has been the Work and Pension Longitudinal Study (WPLS), which enables benefit and employment information to be linked. There is much further work to be done to examine the coverage of the WPLS and HMRC data. As part of the 'Beyond 2011' project, DWP and ONS are assessing the extent to which these could be used to form the 'spine' of an integrated population statistics system from which data from other administrative and survey sources would be combined to estimate internal migration. Similarly, the e-Borders system has the potential to provide a 'data spine' for the estimation of international migration.

71. This early work to improve understanding of the nature of the data and related linkage issues is being carried out jointly by DWP and ONS, and further progress is expected in the second half of 2009. We welcome the close liaison between DWP and ONS in delivering these developments.

72. Data from GP registers play a central role in providing estimates of migration within the UK. Work to develop a new single patient demographic register service database is underway and we understand that ONS has worked closely with DH in this area. We welcome the recent steps taken by DH and ONS to ensure that the overlap between the developments is fully understood. We also welcome the commitment by DH to participate actively in the MSIP. The need for further information on these developments is flagged in the literature review (see Part 2). We suggest that information be published about how the NHS Personal Demographics System could be used to assist in the estimation of migration.

Programme management

73. As discussed earlier in this report, work to improve migration statistics was initiated following the 2001 Census and subsequently driven by the findings of the National Statistics Quality Review of International Migration Statistics and the Inter-Departmental Task Force. The recommendations for change have been wide ranging – from addressing fundamental problems with data collection sources through to finding innovative ways to model migration within the UK. While ONS has worked to address these issues, its approach has tended to be evolutionary rather than driven by a robust programme and project management strategy.

74. Our research suggests the project management arrangements adopted by ONS in the Improving Migration Statistics (IMPS) programme from 2004 did not adequately focus on assessing progress, identifying where delays were emerging, and ensuring the timely delivery of objectives. While the more recent programme, the Migration Statistics Improvement Programme (MSIP), seemed initially to suffer from a similar lack of robust programme management, we have seen evidence of real improvement in this regard during 2008 with more specific timetabling and specification of major activities. We further welcome the recent public release of programme board papers on the ONS website.[41]

75. MSIP project management has been described by ONS as 'light touch', which may simply reflect the limited resources for this available within the ONS Centre for Demography. The cost (see paragraph 77) and complexity of the programme – to deliver a wide range of methodological developments against a tight schedule involving a number of departments – suggests to us the need for stronger programme management arrangements.

76. It would be helpful to the programme and to users if a regular report on the progress of major developments was published, including the schedule for the delivery of objectives and the short, medium and long-term goals of the programme. We **recommend** the online release of project papers which, together with details of investigations currently underway and their progress, would help to build a higher level of confidence among users.

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[41] Migration Statistics Improvement Programme Board papers,
http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/improvement-prog.asp

Funding

77. The amount required for the redevelopment of the migration statistics system was estimated in a response to a parliamentary question[42] in April 2008 by the National Statistician to be £48 million over five years (2008/09 to 2012/13). The total for development of migration statistics includes committed funds of £12 million from ONS over 4 years and £3 million provided to ONS by other departments over three years. On top of these funds are departmental contributions through work 'in kind' (where their own programmes of work will contribute to this improvement of migration statistics).

78. ONS has provided information demonstrating sufficient financial resource to cover its part of the development work for the current funding period (which runs to 2010/11) and a strong expectation that the required funding will be in place for the final two years of the programme. The position with respect to other departments is less clear. An outline of departmental expenditure for 2008/09 was provided to the MSIP Board, amounting to substantially less than might be expected from the total estimate provided in the 2008 parliamentary answer. Policy departments which hold the administrative data necessary to take forward the programme, and which have committed to 'work in kind', should provide more details of their planned activities and associated costs. This information is vital to understanding the range of work that can be delivered to improve the sources and methods used to estimate migration, and an assessment of the resources required and the time involved to complete delivery. In the absence of explicit commitments, we are concerned that other funding pressures will undermine the planned progress in migration statistics.

79. We **recommend** that each department provide the programme with details of the work it is undertaking, together with the associated expenditure, and update it every six months. It would be helpful if the MSIP regularly publish information about the range of activities being undertaken by individual departments and an outline of the relevant expenditure. We suggest that ONS, the Department for Communities and Local Government and the Home Office review how best to coordinate and communicate departmental activities across the programme.

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[42] HC Deb 21 April 2008 c1701W,
http://www.publications.parliament.uk/pa/cm200708/cmhansrd/cm080421/text/80421w0084.htm

Communication and engagement with users

80. Issues relating to the effectiveness of communication arose in a number of areas of the development programme, and they have been discussed above in the sections on 'Delivery of technical developments' and on 'Funding'. Users' views are now considered regarding ONS's approach to communicating developments in improving migration statistics, and how departments communicate the changes they are making to ensure delivery of more coherent reporting of migration statistics.

Nature of communication with users

81. Engagement with users by ONS has been characterised by high-level presentations of its developments, usually at conferences and seminars, or to specific stakeholder groups such as the Local Government Association (LGA) and the Central and Local Information Partnership (CLIP) Census and Population sub-groups. Users have told us that they find this approach to be unsatisfactory – they feel that information has usually been disseminated at the end of a development phase, with little opportunity for an exchange of views or a chance to influence the development work. This has led to problems when, with little warning, substantial revisions were made to data. There were instances of this kind in relation to the revisions made to population and migration data in 2007.

82. The structures of groups such as CLIP do not lend themselves to enable consultation with local authorities not represented in the membership. Alternative approaches could be considered, such as the LGA's approach to consultation on geographic information issues. In addition it is important to engage with local government in the devolved administrations.

83. Only very general information has been made publicly available about the work of the Migration Statistics Improvement Programme (MSIP) via the ONS website. As indicated above, users do not understand the nature of the work being undertaken, details of the developments being considered, the progress being made, or when they can expect to see improved population and migration estimates. With minimal information released from the MSIP, the work of the programme appears to users to take place behind closed doors. We see this as running counter to the longer-term ambitions of the programme.

Developments in communicating with users

84. ONS has accepted and acted on the criticisms regarding the handling of revisions to the mid-2006 population estimates published in 2007 and it has begun a series of meetings with treasurers, planners and demographers in local authorities to discuss the implementation of the new methodology for the mid-2008 population estimates.

85. The recent formation by ONS of reference panels looking into migration distribution modelling, short-term migration, student migration and London issues, on the advice of the CLIP, are welcome steps forward. Confidence in the estimates will be increased if a quality assurance role for local authorities is established, so that they can review the planned modifications to methodologies. This is especially desirable for areas that experience particular population issues, such as high student populations, but such developments need to be balanced with the limited level of technical resource available in some of the smaller local authorities.

86. Several of the users we interviewed felt that ONS involved academic and local government experts too late in the development process to be able to influence changes, and felt it was largely a 'rubber stamping' exercise. ONS is looking to address this criticism through collaborations with academic experts on the published list[43] and with local authority experts. ONS and the devolved administration in Scotland, in particular, will also be working with the ESRC Centre for Population Change.

87. We welcome the steps taken by ONS to extend the early involvement of experts and users in academia and local government and the commitment made by ONS to peer review the next methodological changes using expert panels and local insight groups. We suggest that it would be helpful if other government departments involved in the improvement programme considered involving external experts in their development work, and utilised the ONS 'expert list' for this purpose. We further suggest that the Local Government Association, and other representative bodies where appropriate, work more closely with ONS to increase the opportunities for wider engagement with local authorities.

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[43]   ONS, *Specialist List of External Experts,* February 2008, http://www.statistics.gov.uk/about/data/methodology/specific/population/future/imps/updates/downloads/ONS_Use_of_External_Experts.pdf

Joined-up releases of regular publications

88. The ONS, Home Office and Department for Work and Pensions brought together their (previously separate) publications on migration topics into a joined-up release in 2008. This was widely welcomed by the users interviewed, and it was seen to be a helpful development. However, one problem noted was the potential for an overwhelming volume of material to be released simultaneously.

89. The departments have responded positively to feedback from users and recently produced a new quarterly report that has focused on their major migration information in line with user requests. The report, released for the first time in May 2009, has a new structured approach which summarises the information at a high level and provides links to all detailed tables. By drawing on provisional IPS data, ONS has also been able to substantially reduce the time taken to make available the latest international migration estimates. This is particularly helpful for users of emigration statistics, since the IPS is the only source of these estimates.

90. The Code of Practice for Official Statistics emphasises the importance of providing clear information about published statistics to ensure appropriate interpretation is made.[44] User understanding of the range of migration statistics may be enhanced by relating each of the sources to the underlying processes of international and internal migration through a conceptual framework, and explaining clearly how newly-published estimates update the 'bigger picture'. An example is given in Annex E of one way of illustrating the processes of migration and the interfaces with the various data sources.

91. We **recommend** that ONS, Home Office and the Department for Work and Pensions adopt a 'conceptual framework' in their releases of migration statistics, to enable users to understand how the different sets of figures relate to each other and to the process of migration more generally.

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[44]   UK Statistics Authority, Principle 8, *Code of Practice for Official Statistics,* Edition 1.0, January 2009,
       http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html

Annual migration report

92. In 2006 the Inter-Departmental Task Force recommended the production of a single UK-wide annual report. Departments and devolved administrations are currently developing such a report. It is intended to provide an assessment of recent trends in migration and estimates of the current number of migrants in the UK. The recommendation for such a report was generally viewed to be a positive development by the users we interviewed, although there was some concern that its production might deflect resources away from the more urgent work to improve the estimation methods and might further delay the release of the underlying data. Some users suggested an interactive release which could be used to 'drill down' to the local area information or specific topics of interest. We suggest that the MSIP Migration Reporting working group considers these concerns in their preparation of the annual migration report and in determining the timing of its release.

Annex A: Recommendations presented in the Interim Report

An interim report from this monitoring review was published on 7 April 2009, to enable a discussion of the emerging findings. Following the feedback we received, we have focused on the key points for action. The full listing of recommendations from the interim report is given below. We understand that steps are being taken with respect to a number of these and flag the developments in italics. We also indicate if the interim recommendation is retained in this final report, with the recommendation number shown in square brackets.

- ONS should, at the time it publishes revisions to population estimates, make clear in what sense these are an improvement and the extent to which they are likely to help reduce the gap in population count when compared with the counts obtained from the 2011 Census.

- ONS should engage users in a full discussion of changes to the methodology and their impact on the estimates, including a phase of quality assurance involving local authorities (particularly in hard-to-count areas) before the final version of the estimates is released. [Final recommendation 1]

The reference panels set up by ONS on migration distribution modelling, short-term migration, student migration and on issues involving London, have now met and have a quality assurance role to advise on methodological developments and review the outcome of the developments. ONS have also committed to a peer review of the next methodological developments with expert panels and local insight groups, and a formal consultation at the end of 2009 of the changes to be implemented in May 2010.

- ONS should flag the level of reliability of individual local authority population estimates, possibly in a manner similar to the method it already uses in its international migration estimates by Government Office Region. [2]

- Regular reports on progress on the development of the e-Borders statistics programme [to be] made to the improvement programme board, and that [to be] are published. [3]

- A statistical system [to] be put in place to record the numbers of migrants entering the UK under the Points Based System; and that the possibilities for further integration of the PBS data with migration statistics are fully investigated to determine whether useful additional data can be obtained from this source to improve the measurement of international migration.

- In the light of the complex dependencies involved, discussions about matters such as the future of the Census beyond 2011, the longer term maintenance of a national address register, related developments (such as identity cards and a population register) and the best way to improve migration statistics, should now be taken forward together at the highest level. Discussions should involve the Statistics Authority and ONS and the relevant government departments – notably HM Treasury, the Cabinet Office, Department for Communities and Local Government, Home Office, Department for Work and Pensions, and the devolved administrations. [Action to be undertaken by the Authority]

- ONS, the Department for Communities and Local Government and the Home Office should consider urgently how best to strengthen the top level of MSIP programme management, including oversight of departmental activities, and report the outcome to the Statistics Authority by summer 2009.

The departments involved have met to discuss how to strengthen programme management arrangements and further consulted the Statistics Authority on ways of achieving this.

- The online release of project papers which, together with details of investigations currently underway and their progress, would help to build a higher level of confidence among users. It would be helpful to users if a regular report on the progress of major developments was published, including the schedule for delivery of objectives and the short, medium and long-term goals of the programme. [4]

Programme board papers have been released on the ONS website for the first year of the programme but working papers have yet to be released.

- Each department should provide the programme with details of the work it is undertaking, together with the associated expenditure, and update this every six months. The MSIP should regularly publish information about the range of activities being undertaken by individual departments, and an outline of the relevant expenditure. [5]

- ONS should seek further ways of engaging with users from a range of backgrounds to review methodological changes and priorities for the production and dissemination of population statistics.

- Other government departments involved in the improvement programme [to] also consider involving external experts in their development work and utilise the ONS 'expert list' for this purpose.

- The Local Government Association, and other representative bodies where appropriate, [to] work more closely with ONS to increase the opportunities for wider engagement with local authorities.

- The batch release of major migration outputs [to] be accompanied by a stand-alone commentary. Such a commentary should specifically explain the nature of the various sources and their relative quality and reliability, and also highlight which of the associated releases provides the full detailed information that users may wish to refer to.

ONS, Home Office and DWP have worked together to produce a new quarterly report on migration statistics. Responding to feedback, the report focuses on the major migration statistics from the departments and summarises the information at a high level with links to the detailed tables.

- A conceptual framework of migration statistics [to] be developed to provide further context to enable users to understand how the different sets of figures relate to each other, and to the process of migration more generally. [6]

ONS have welcomed the guidance provided in the conceptual framework presented at the open meeting on the interim report and are discussing further with the Authority the design of a framework for migration statistics.

Annex B: Composition of the Migration Statistics Monitoring Review Project Board

Name	Organisation	Position on board
Professor David Rhind	Non-Executive Director, UK Statistics Authority	Chair
Richard Alldritt	Head of Assessment, UK Statistics Authority	Member
Richard Laux	UK Statistics Authority	Member
Duncan Macniven*	Registrar General for Scotland, General Register Office for Scotland	Member
Guy Goodwin*	Office for National Statistics	Member
Janet Dougharty*	Department for Communities and Local Government	Member
Tim Allen*	Local Government Association	Member
Professor John Salt*	Migration Research Unit, University College London	Member
Penny Babb	UK Statistics Authority	Project Manager
Cathy Kruger	UK Statistics Authority	Secretary

* Members attending in a personal capacity as experts and not representing their organisation

Annex C: List of interview participants

Name	Organisation
Professor David Coleman	University of Oxford
Richard Cooper*	Nottinghamshire County Council
Keith Dugmore	Demographic Decisions; Demographic Statistics Users Group
Jan Freeke	Glasgow City Council
Anne Green	Institute for Employment Research, University of Warwick
Gill Green	Audit Commission
Damian Highwood	Westminster City Council
John Hollis*	Greater London Authority, Data Management Analysis
Nick Holmes	Welsh Local Government Data Unit
Professor David Martin	University of Southampton
Nicola Morton*	London Councils
Professor Phil Rees	University of Leeds
Professor Ludi Simpson	University of Manchester
David Thorogood	Eurostat

* A member of the Central and Local Information Partnership

Annex D: Outline of highlighted administrative data sources

Migrant Worker Scan (MWS)

DWP is responsible for the publication of statistics regarding the allocation of National Insurance numbers (NINo) to migrant workers from overseas. When a migrant enters the country and registers for a NINo (either for work or benefit purposes) their age, sex, postcode of residence, country of origin and year of arrival are supplied to HM Revenue and Customs. DWP receive a quarterly 100 per cent extract of these data (the MWS) to link with employment information. There are no records of departures.

Work and Pensions Longitudinal Study (WPLS)

The WPLS links data on employment and benefits which can be used to provide individual client histories back to 1998 for all individuals on the PAYE scheme. The WPLS is a rich source and could potentially be linked with records detailing NINos allocated to overseas nationals to identify work and benefit flows. It has the potential to identify histories of migrant workers and in particular identify those who have left the UK.

GP registers

The NHS Central Register (NHSCR) provides a comprehensive system to assist with NHS patient administration in England and Wales. A move is assumed if a patient who is already registered with a GP re-registers with another GP in a different (former) Health Authority area. These data form the basis for estimating internal migration. Parallel systems are used in Scotland and Northern Ireland – see box 2 in the main body of the report.

Flag 4 registrations

When a person whose previous address is outside the UK registers with a GP in the UK for the first time, a flag is added to the record at the NHSCR. The flag is removed when the person registers with a different GP. In Scotland the process of identifying migrants from overseas does not use Flag 4 registration. A count of overseas migrants is provided through a related system called the Community Health Index – see box 2.

School Census

The School Census (formerly the Pupil Level Annual Census) provides a termly snapshot of school pupils in state education in England, while the equivalent censuses in Wales, Northern Ireland and Scotland are annual. The information collected includes ethnicity and counts of pupils whose first language is not English on arrival at school. There is no single unique pupil number and it does not contain information on all pupils: for example, it excludes those educated in the independent sector. The School Census will be useful to understand changes to the school-age population and to quality assure mid-year population and internal migration estimates.

HESA student data

The Higher Education Statistics Agency collects data about students attending all publicly-funded higher education institutions in the UK. This is done shortly after the end of each academic year. The data include all students that have been registered at an institution at any point during the preceding academic year, including those who fail to complete their studies and leave their institution early. From January 2009 students' term-time postcodes are included. The data will inform both internal migration estimates of students and international migration of foreign students.

Workers Registration Scheme (WRS)

The WRS was introduced by the Home Office just prior to the accession to the EU of the A8 countries (the Eastern European countries which joined in May 2004: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia). The system is used to monitor the impact of the EU Accession on the labour market and to restrict access to benefits among A8 nationals. It produces a cumulative figure of the number of workers applying to the WRS from the A8 countries – it does not record departures.

Points Based System

The Points Based System is a scheme being phased in from 2008 to manage the flow of non-EEA nationals coming to the UK to work or study. The PBS will collect a range of additional demographic data about migrants which will be linked to their application. It is intended to capture granted 'leave to remain' information. The PBS excludes EEA nationals and asylum seekers and is less useful for measuring outflows.

Landing Cards

All non-EEA nationals seeking to enter the UK from outside the common travel area (UK, the Channel Islands, the Isle of Man, and the Republic of Ireland) are required to complete a landing card on arrival at a point of entry to the UK. The statistics are used to measure the number of passengers granted entry to the UK by both category of entry and nationality. A landing card is completed for each journey; a person who makes more than one journey is counted on each occasion. No information is available on when individuals leave the UK, although landing cards now collect information on intended length of stay. Not all landing card data are captured – the system focuses on 'controlled' arrivals, which are non-EEA arrivals intending to stay for at least six months, and excludes those intending to stay for less time. Landing cards are likely to be phased out once the e-Borders system is fully rolled out.

e-Borders

The e-Borders system is currently under development with the primary aim of securing the UK borders. It will eventually record all people travelling in and out of the UK (except across the Irish land border). This provides the statistical benefit of being able to count people into and out of the country. Carriers arriving in the UK will be required to provide passport details to the UK Border Agency in advance of travelling. The system is being rolled out over a number of years, aiming to achieve 95-100% of passenger numbers by December 2010.

Annex E: A conceptual framework for international and internal migration statistics

A framework is defined here as a set of organising principles which support the compilation and presentation of a set of statistics. These principles relate to:

- The concepts and definitions underpinning the statistics
- The sources and methodologies used to derive them
- The structure and tables used for presenting them
- Links with other areas of statistics.

These principles, as relating to the provision of migration statistics, may be brought together as follows.

Concepts and definitions underpinning the statistics

These, ideally, should follow well-established international recommendations, embracing also the need for comprehensive coverage of the statistics. Underpinning the estimation of international migration is the United Nations' definitions of long-term and of short-term migrants. These definitions are applied in the International Passenger Survey. Administrative data sources apply unique definitions of 'migrants', depending on the purpose and need of the collection; for example, the allocation of National Insurance numbers to migrant workers from overseas is restricted to those migrants applying to work or claim benefits.

Sources and methodology used for the derivation of the data

A picture of migration can be built up from a variety of data sources and methods. These should reflect the appropriate level of aggregation and analysis (eg geographical); consistency over different measurement variables (eg stocks and flows); establishment of appropriate estimates of error; and consistency of the data over time. Data from a variety of sources are published on migration-related topics, including immigration control, National Insurance number allocation and demographic data on population movement.

Arrangements for presenting and disseminating the data

Users' understanding of the timeliness and coverage of the data and the way in which they are published and interpreted can be enhanced through illustrating the relationships and processes within a framework. Timeliness should be related to accuracy, mentioned above, while publication and interpretation should recognise the inter-relationships of the variables and sources.

Links with other statistics

Migration data are closely linked with other statistical information, particularly population estimates, as well as being important in understanding labour market and economic issues related to migrant workers and social issues associated with international and internal migration.

The framework, as shown below in diagrammatic form, illustrates the components of international and internal migration. It shows the types of migrants entering and leaving the UK, with information being collected via immigration control and a sample of international migrants completing the International Passenger Survey.

The framework also shows the main activities of migrants that result in administrative data. It is by taking part in these activities that information can be obtained indirectly about migration into the UK and moves around the country. For example, people arriving to work in the UK need to register for National Insurance purposes (unless self-employed). Information about international students is gathered through universities and is being used to help understand their migration patterns around the country. The major source of information about internal moves is collected through the National Health Service through people re-registering with a GP in another part of the country.

These sources of information can also provide a more detailed profile of international and internal migrants such as their age, sex, where they originate from and their destination – this can be from abroad as well as within the UK. Other information is also available about migrants' economic activity status – whether they are employed, unemployed or economically inactive.

The major source of information about people emigrating from the UK comes from the International Passenger Survey, plus information collected through the immigration control system. The IPS is used to produce data about long-term and short-term emigrants, while immigration control gathers information about enforced removals such as the deportation of foreign national prisoners and voluntary departures such as failed asylum seekers.

Framework for international and internal migration statistics

Rest of the world

United Kingdom

Rest of the world

Border control & Port survey

RESIDENT STATUS

Area 3
Area 2
Area 1

Non-resident visitors

Temporary residents

Residents
– New
– Pre-existing

ACTIVITIES LEADING TO DATA

Informing estimates of internal migration

Education
– Schools
– Universities
Healthcare

Informing estimates of international migration

Employment
Benefits
Criminal Justice

Age group
Gender
Country of birth
Country of origin/ destination
Nationality
Ethnicity
Economic activity status

CHARACTERISTICS

Border control & Port survey

RESIDENT STATUS

Area z
Area y
Area x

Non-resident visitors

Temporary residents

Residents
– New
– Pre-existing

Visitors
Short term immigrants
Asylum seekers
Long term immigrants

Illegal immigrants

Refusals

Visitors
Short term emigrants
Enforced removals
Voluntary departures
Long term emigrants

Part 2:
A review of migration statistics literature

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Executive Summary: A review of migration statistics literature

Context

Robust and reliable migration statistics are a key input to national and sub-national population estimates and projections. These in turn, provide a crucial evidence base for research, analysis, policy formulation and public funding across the UK.

Despite its importance as a driver of population change, definitive statistics on migration within, to and from the UK remain elusive. In the absence of a population register there is no single source of statistics that provides a comprehensive measure of the migrant population and its many dimensions.

The uncertainty surrounding migration measurement, particularly international migration, has resulted in calls for fundamental changes to the collection and dissemination of UK population statistics to ensure they are more 'fit-for-purpose' at a time of significant demographic change.

Requirements

The UK Statistics Authority (UKSA) has a remit to review and monitor the production and use of official statistics. It has commissioned this review of migration statistics to: produce a summary of relevant methodological developments that have been discussed in the literature that are relevant to official UK migration statistics; and to provide a commentary which evaluates the potential of these methodological developments.

Methodology

The review has been completed using a number of methods, including: a general search of the academic literature published in journals and by research institutes; a review of existing migration estimation methods which underpin population estimation by the UK's national statistics institutions; direct consultation with the Office for National Statistics (ONS) to ensure recent methodological developments and publications are captured as part of the review process; and integration of the project team's existing knowledge and expertise on data sources and estimation methods gained through research and analysis into UK and international migration.

General observations

The robustness of population estimates and projections for local authority areas remains a source of concern due primarily to the difficulty of accurately measuring international migration.

ONS has an ongoing programme of enhancements to the methods for migration estimation (particularly international migration), extending the range of migration statistics (short-term migration) and engaging the user community (reference panels and roadshows).

The priority must be to produce the most accurate mid-year estimates of population with improved estimates of long-term immigration. These revised estimates can then be used as inputs to new sub-national projections and as the basis for validating the new estimates of short-term migration.

It is likely that a new immigration estimation methodology will have a significant impact upon mid-year population estimates and sub-national population projections; but it is better to make these changes if they improve the robustness of population statistics.

Suggestions for improving methods of migration estimation based on current datasets

Despite a large volume of literature on the subject of migration in the UK, there is little which focuses specifically on methods for improving migration statistics. However, a number of suggestions are made.

Immigration estimation

Administrative sources need to become an integrated and ongoing source of migration intelligence for international migration as the PRDS is for internal migration. In the absence of definitive migration statistics, the New Migrant Databank provides an illustration of how a combination of data sources can both help to validate migration estimates and/or become an integral part of the estimation methodology.

It is suggested that ONS considers enhancing its existing methodology to use register count 'proportions' directly to allocate flows to local areas. This approach has been demonstrated using data from the New Migrant Databank and is the method employed by GROS, allocating IPS immigration flows to sub-national areas using CHI register statistics.

Whichever method is selected for estimating sub-national immigration it is suggested that it must re-estimate flows <u>from GOR to local authority</u> (not just NMG to local authority). This approach will ensure that any inconsistencies that may exist at regional level do not adversely affect the robust application of new methodologies at a local level.

Emigration estimation

Due to the lack of available data, emigration estimation has received little research attention. However, ongoing research at ONS has identified an improved approach to the exisiting migration propensity method, the results of which should be subject to external scrutiny prior to general application, in tandem with improvements to the immigration estimation methodology.

Intermediate geography for immigration and emigration estimation

The intermediate geography has been created to provide an appropriate scale for the application of survey data. More extensive use of administrative datasets for immigration flows at GOR and local authority level, plus the direct estimation of emigration flows at local authority level may remove the need for this artificial geography.

Split flows

A number of methods have investigated the estimation of international migration using gross flows 'split' into specific types. The validity of this approach is not proven but it could provide the basis for improved validation or calibration of IPS estimates against administrative systems which capture different population sub-groups, e.g. workers (NINO), students (HESA) or children (School Census).

Short-term migration

With inadequate information on length of stay, short-term migration estimation remains problematic. It is suggested that ONS uses a sub-national estimation method that is consistent with the long-term migration method, to ensure that the two sets of statistics can be used in concert and that they align with evidence from administrative datasets.

Data access

Access to important administrative datasets (HESA and WPLS in particular) should be expedited to facilitate further research and analysis into how they might improve local area migration estimation.

Mirror statistics

It is suggested that an ongoing programme of collaboration between ONS and other NSIs (within and outside the EU) could help to refine and improve estimates of international migration from both survey and administrative sources in the UK.

Synthetic data

There is a case for constructing synthetic estimates of migration statistics that are richer than the administrative data sets and that are more reliable than the survey data sets, using estimation methods that have been applied in the UK and Europe.

Scrutiny function

It is recommended that ONS creates a 'scrutiny' function consisting of local expert panels supported by a range of datasets to 'validate' results of long-term and short-term migration estimation and to encourage greater 'collective responsibility' for official statistics.

Observations on developing better migration statistics – a longer-term view

New surveys

ONS and the Home Office should think carefully before commissioning new surveys designed to capture 'better' migrant statistics. It might be more appropriate to concentrate on more effective use of integrated administrative sources than embark on costly surveys which may struggle to adequately capture migrant populations.

Alternative mid-year estimates

It is recommended that consideration is given to the development of a suite of alternative mid-year estimate population bases that reflect different population concepts (mid year estimates which include short-term migrants, for example).

Maximising the utility of e-Borders

Consideration should be given to maximizing the information on immigration and emigration that can be generated from the e-Borders system, including the addition of IPS questions that might yield the required information.

Maximising the use of the Personal Demographic System of the NHS

Greater clarity is required on the potential for generating all types of migration statistics from the new Personal Demographic System and how this data might complement existing administrative sources.

Integrated Population Statistics System

A UK Population Register would provide the basis for much improved population and migration statistics. The linkage of such a register to other government population databases could generate population and migration information of radically enhanced accuracy and utility.

1. Introduction

1.1 Context

Over 6.2 million people in the UK changed their place of usual residence in the 12-months prior to the last census in 2001. This represents approximately 10% of the total population of the UK. Migration, in its many forms, remains a dominant driver of population change.

In twentieth century Britain as car ownership became a reality for many families, the process of suburbanisation characterised most large towns and cities, shifting population to a widening urban sprawl. In the 1970s and thereafter, the phenomenon of counterurbanisation was observed, with migrant flows away from major metropolitan centres and down the urban hierarchy to more rural areas. Major net migration losses from the big conurbations have continued in the twenty-first century with increasingly long-distance commutes a feature of the UK labour force. But new migrant streams have emerged in recent years as gentrification of inner city neighbourhoods has attracted new residents whilst retaining those who might otherwise have considered moving out. 'City living' (Unsworth, 2007) has been encouraged by the policies of central and local government to promote urban renaissance and by the increasing numbers of students in higher education requiring accommodation relatively close to their place of study.

These latest trends in internal population redistribution have been occurring at a time when the UK has experienced an unprecedented inflow of migrants from overseas. At the beginning of the decade asylum seekers and refugees contributed a major inflow of new migrants to the UK, settling initially in London and the South East but moving to provincial locations under the dispersal arrangements put in place by the Home Office. More recently, the expansion of the European Union (EU) has left few parts of the UK and its economy unaffected by the impact of international migration. This inflow has had an impact upon existing migrant communities but has also created new, ethnically diverse communities in areas previously untouched by the effects of economic migration (Bauere *et al.*, 2007).

However, the current economic situation has begun to affect migrant flows, both internally and to and from the UK. Falling property prices have dramatically reduced the rate of churn in the housing market whilst the latest migrant worker statistics suggest a significant slowdown in levels of immigration.

In order to understand the patterns, processes and drivers of these diverse migration flows there is a requirement for comprehensive and reliable data. Robust migration statistics are a key input to national and sub-national population estimates and projections. These in turn, provide the crucial evidence base for research, analysis, policy formulation and public funding across the UK. Despite its importance as a key driver of demographic change, definitive statistics on the movement of the population within, to and from the UK remain elusive. In the absence of a population register there is no single source of statistics that provides a comprehensive measure of the migrant population and its many dimensions.

The uncertainty surrounding migration measurement, particularly international migration, has resulted in calls for fundamental changes to the collection and dissemination of UK population statistics to ensure they are more 'fit-for-purpose' at a time of such significant demographic change (House of Commons Treasury Committee, 2008). In response, improvements in the collection and delivery of migration statistics are now part of the Migration Statistics Improvement Programme (MSIP), a wide-ranging cross-government initiative with a four-year time horizon.

Issues of more accurate measurement of migration are not confined to the UK. There remains considerable inconsistency in the coverage and completeness of statistics on the movement of population between EU member states. Statistical harmonisation is a key EU objective for migration statistics (European Commission, 2005) but achievement of this goal in the short to medium term is likely to remain constrained by a lack of consensus over precisely what constitutes a 'migration' and a diversity or absence of adequate instruments for measuring immigration and emigration flows.

It is within this context that this review of the literature on migration data and estimation methodologies has been conducted. The UK Statistics Authority (UKSA) has a remit to review and monitor the production and use of official statistics and it will report on its review of migration statistics during Spring 2009. The research presented here will form part of that final report.

1.2 Requirements

The UKSA has commissioned this review of migration statistics. The specific requirements of the review were:

- a summary of relevant methodological developments that have been discussed in the literature which are relevant to official UK migration statistics;

- a commentary which evaluates the potential of these methodological developments.

The review has covered the following aspects of migration data:

- statistics on international immigration into the UK and emigration from the UK;

- statistics on internal population movement between local authority areas within the UK.

1.3 Methodology

The project team has conducted this review of the literature on migration data and estimation methodologies using a range of methods:

- A general search of the academic literature was undertaken to capture recent journal articles and other publications on the subject of migration data estimation, both internal and international (a selection of the key journals is provided in Appendix 4).

- A search of specific policy and research institutes was completed to identify new ideas and methodologies (a list of institutions searched is provided in Appendix 4).

- A specific search of other national statistics institutions was completed to confirm the migration measurement methodologies employed for population estimation and projection.

- The project team has consulted directly with ONS (and UKSA) to ensure recent methodological developments and publications are captured as part of the review process.

- The project team has contributed its existing knowledge and expertise on the subject matter gained through research and analysis into UK and international migration.

1.4 Document structure

Section 2 introduces the concept of migration and summarises some of the definitional issues involved in the collection, use and dissemination of migration statistics.

Section 3 provides a short review of the sources of migration data available, identifying both internal migration statistics and international migration statistics.

Section 4 summarises how migration data and estimation methods are employed in the production of estimates and projections of the UK population, both nationally and sub-nationally; examines a number of international initiatives for estimating international migration; and summarises the status of the ongoing programme of improvement to migration and population statistics that is underway across a number of government departments.

Section 5 summarises the more recent literature on alternative methodologies for the analysis and estimation of migration.

Section 6 concludes with a number of observations on the current state of migration data and estimation methods and makes a number of suggestions for consideration as part of the future development of migration statistics in the UK.

All references with associated URLs are provided in the bibliography and supporting material has been placed in the Appendices where appropriate.

2. A framework for migration statistics

2.1 A definition of migration

One definition of migration is *the event of transfer from one residential location to another by a person, who is termed a migrant.* In this context, an *event* is an activity that takes place over a short interval of time and *transfer* involves travel over some distance from one location to another. It is not useful to define a threshold distance below which migration is labelled residential mobility and above which it is labelled 'proper' migration, because such a threshold is arbitrary. *Residential location* means the place where the person spends his/her sleeping time and may be permanent, when it is called the usual residence, or temporary, such as when a person is visiting other people or spending time at a second home or when residing away from the usual residence for work reasons. Since a *migrant* is a person who experiences one or more migration events in a time interval, the number of migrants is always equal to or less than the number of migration events. Given this broad distinction, there are many different operational definitions of migration, each related to the purpose for which different sets of migration statistics are assembled.

2.2 Key attributes of migration statistics

The key attributes that characterise a set of migration statistics are set out in Table 1.

Each migration statistics dataset is characterised by a combination of the choices specified against each dimension. It is not possible to specify which combination of choices is appropriate until we know the purpose of the analysis in which the migration statistics are being used. Different migration statistics will be required, for example, to estimate *usually resident populations* (including long-term migrants only), *usually resident plus temporary populations* (including long-term and short-term migrants), present populations (also including visitors but excluding residents away from their usual residence) or *average populations* (person time in a time interval, in which each component is weighted by length-of -stay in the target spatial unit).

Table 1: Definitional dimensions for migration statistics

Dimension	Examples of classifications
Residence	Usual/Temporary Weekend/Weekday
Spatial scale	Internal (within country migration) International (between country migration)
Stock/flow	Stocks of persons by migrant status (e.g. born abroad, foreign nationality) Flows between origins and destinations (e.g. migration from Leeds to Westminster)
Event/person	Movement (Migration) Transition (Migrant) Last migration (last migrant)
Duration	Long-term (12 months or more) Short-term (3 up to 12 months) Visitor (less than 3 months)
Perspective	Retrospective (where did you live one year ago?) Prospective (do you intend to stay for 12 months or more?)
Time interval	Movement data (any interval) Transition data 1 year, 5 years, 10 years, years since birth
Age-time plan	Period-age Period-cohort Lifetime Single years of age, five years ages, some other age classification
Auxiliary information	Other socio-economic characteristics: ethnicity, employment, occupation, religion
Flow direction	Inflows (immigration, internal in-migration) Outflows (emigration, internal out-migration) Net flows (international, internal)

2.3 Using migration statistics

The broad purposes which migration statistics serve are indicated in Table 2.

Table 2: The uses of migration statistics

Use/purpose	Attributes
Description/ monitoring	Publication of migration statistics informs interested parties about key demographic trends. Migration statistics enable monitoring of flows in terms of size and composition and potential impact on housing and labour markets and policital developments.
Explanation/ analysis	Academic research focuses on explanations for and consequences of migrations processes. Official research is mainly confined to desction and monitoring.
Context for other studies	Migration analyses provide the context for surveys of migrant behaviour, establishing the position of case studies in a broader framework.
Components for population estimation	Migration is an essential inpur to population estimates. It is extremely important that the most accurate and appropriate information is used.
Component assumptions for population projections	Migration assumptions for the future are usually infomed by recent trends. At the moment most attention has been paid to international migration trends. Virtually no sub-national projection uses assumptions other than recent migration rates of flows continue into the future at a constant intensity.
Resource allocation via population estimates/ projections	Population estimates and projected populations are used in various government resource allocation formulae to sub-national government units (e.g. by Communities and Local Government to LAs, by Department of Health to PCTs, by the Home Office to Police Authorities).

It is important to match the migration statistics used to the purpose to which they are put. Migration statistics from the census provide detailed composition and spatial structure of flows at local and small area levels. It would be ideal if census-type migration statistics were available annually, but this would be prohibitively expensive until such time as an Integrated Population Statistics System (ONS, 2003) is in place. So, to fill this gap, various estimation methods are adopted to marry the spatial richness of census migration statistics with the temporal richness of annual data based on surveys or administrative registers.

One particular matching requirement is poorly understood in current practice by both official statisticians and academic researchers. There is a need to match the event/person dimension of a migration statistics dataset (dimension 4 in Table 1) to the model being used to estimate or project the population (Table 3).

Table 3: Matches of data type and model type

Data type	Model type	
	Transition based	**Movement based**
Transitions	A	B
Movements	D	C

The *transition* type of data results from a comparison of a person's location at time t-n with his/her location at time t-n, n years earlier (the retrospective view) or at time t+n, n years later (the prospective view). So, in the UK census a question is asked about a person's usual residence one year ago. A comparison of the two locations results in a classification of a person as a stayer (who has not changed usual residence) or as a migrant (who has changed usual residence). Transition data has some crucial features: only one migration is recorded and intermediate moves are omitted; only survivors are recorded in a retrospective question and non-survivors and their migrations are omitted. In the UK census migrant tables infant migrants (less than one year of age) are not tabulated (by a comparison of census location and place of birth). When a prospective question is asked about intentions to reside in a location for 12 months (as in the International Passenger Survey) then the difficulty is that these intentions may not be fulfilled: the prospective migrant may decide to emigrate and so become a 'migrant switcher' or conversely an intending visitor may stay longer and become a 'visitor switcher'. If a prospective migrant dies then the migration has been counted even though the person is not present in the population at the end of the 12 month period used in the question.

In England and Wales the Patient Register Data System (PRDS) is used to measure migration between local authorities and between primary care trusts. These data are derived by comparing patient NHS numbers and postcodes in a frozen version of the register on 31 July in year y and a similar frozen version for 31 July in year y+1. Hence they are, in conceptual terms, transition data. The PRDS provides good year by year migration data between censuses, apart from some undercounting of young adult men who are slow to re-register with a doctor after migration and the migrations of students may not be fully tracked

to, during and after Higher Education courses if they retain the registration with their family's GP. Researchers have corrected for this deficiency by using male/female ratios of migrants at young adult ages in the census to adjust upwardly the migration estimated for young adult men, when using NHSCR or PRDS data.

The *movement* type of data results from recording of the event of migration between locations over a defined period of time (e.g. a quarter, a year). The event of movement occurs whenever a change of address is reported to a register such as the NHS Central Register although a count of migrations is only kept if the migration crosses the boundary of a body funding general practice. In this system a person may make more than one migration between areas in a time interval so that the count of moves is always higher than the count of transitions and the surplus increases with the length of the interval. The *NHSCR migration* time series, in principle, extends from mid-1976 to the present and has been used by researchers at the University of Leeds for various studies (see Dennett *et al.*, 2007 for an account) and in a migration analysis for the predecessor departments of Communities and Local Government (Champion et al., 2003). The NHSCR migration series suffered from a dependence on the changing geography of the NHS and has been superseded by the PRDS system and its equivalents in Scotland and Northern Ireland which provides greater spatial flexibility and stability. It is, however, still used to obtain a consistent measure of migration between the Government Office Regions of England, Wales, Scotland and Northern Ireland.

Where a comprehensive longitudinal *population register* is maintained it is possible to count both transitions and moves and show that although they differ in size, the surplus moves cancel out and they yield the same population change (Rees, 1985).

These two types of migration data are associated with corresponding *population projection models*. Movement (migration) data are used in multiregional population projections in which the inter-regional migration rates (event intensities) are converted into inter-regional transition probabilities needed in the projection model. This input corresponds to cell C in Table 3. Transitions (migrants) are also used in multiregional population projections but the transition probabilities can be computed directly from census populations and census migrant data. This corresponds to cell A in Table 3.

The sub-national population projection model for England uses a multiregional framework based on PRDS migration data of the transition type, adjusted to agree with the migration flows reported at GOR and country scale in the NHSCR. This is a compromise that mixes two migration data types and corresponds with cell D in Table 3. It is also possible to adjust transition data to movement data by applying estimated ratios of moves to transitions. This

corresponds to cell B in Table 3. For example, at regional level there are about 1.2 moves per transition in the UK (Boden et al., 1992). So this ratio might be used to adjust upwards the migration flow statistic from a transition base to a movement base.

These issues of matching data concept and projection model form are discussed in Rees (1985) and Rees and Willekens (1986). If the migration statistics are handled properly, then it should not matter for population estimation or population projection which is used. The models will contain different migration flow statistics but differences will cancel out to yield the same net migration balances. However, care should be taken by official statisticians that the migration data are handled in a manner appropriate to the concept being measured or errors may ensue.

3. Migration data sources

In the absence of a definitive and continuous source of robust and reliable data on migration it is necessary to rely on a variety of sources to support the uses identified in Table 2. The last comprehensive description and appraisal of internal migration data sources by ONS was conducted in 1991 and made a number of recommendations for improvement in their utilisation (Bulusu, 1991). International migration has been subject to much greater scrutiny as new migrant inflows have reached unprecedented levels following EU expansion in 2004 and a number of data reviews have been produced to highlight the availability of data and the issues associated with their use (Rees and Boden, 2006; Green *et al.*, 2008b).

The main sources of migration data are summarised in Table 4 (internal migration) and Table 5 (international migration). Sources are classified into one of four types depending upon the method of data capture: census, survey, composite or administrative. A more detailed description of each dataset is provided in Appendix 1 of this report, with further comment on a number of the under-exploited sources included in Section 5.

Census statistics typically provide the most geographically comprehensive and data-rich coverage of migration (with the exception of emigration) but data ages rapidly between decennial censuses. Surveys are rich in detail but their measurement of local area migration is constrained by a small sample size and the difficulty of adequately capturing migrants (particularly international migrants) in the survey process. Administrative sources generally provide comprehensive geographical coverage and are a more timely source of statistics but they have little richness of data and may only capture information from a sub-set of the population (e.g. workers or students).

In a perfect statistical world, migration data from each of the sources would provide a single, integrated repository of migration statistics, with data linked on a unique person reference number (UPRN) to allow aggregated statistics to be published at a variety of spatial scales and time periods with accompanying migrant profiles by age, gender, ethnicity etc.

The DWP's Works and Pensions Longitudinal Study (WPLS) is probably the single dataset that comes closest to providing this type of information, with its comprehensive coverage of the UK labour force linked to an individual's national insurance number. The WPLS remains an under-exploited source of migration statistics (although its coverage is limited to those individuals who are active in the labour force).

In the absence of a definitive source of migration data, official statistics rely on a combination of census, survey and, in some cases, administrative sources. The PRDS is a mainstay of internal migration statistics and provides direct input to mid-year estimates and sub-national population projections. International migration estimation has relied upon a combination of survey (IPS and LFS) and census sources but is soon to integrate intelligence from key administrative sources (GP registrations and NINO statistics). These methods and enhancements are discussed in more detail in sections 4 and 5.

For 'local' analysis, researchers have typically relied on a variety of migration statistics, often combining a spatio-temporal analysis using secondary sources (WRS, GP registrations, NINO statistics) with an assessment of migrant profiles and attitudes through primary data collection. Understanding and estimating the likely 'length of stay' is an issue that constrains the more effective use of almost all sources of migration statistics, particularly those measuring international migration.

Table 4: Internal migration: data sources

	Reporting period	Coverage	Lowest level of geography	Migrant sample	Flows	Age	Sex	Ethnicity	Data sourced from
Censuses									
Census of Population									
Main tables	2000–01	UK	OA	Total pop			✓	✓	CASWEB/ONS
Special Migration Statistics (SMS)	2000–01	UK	OA	Total pop	✓	✓	✓	✓	CIDER
SARs (including SAM and CAMS)	2000–01	UK	LAD	1-5% pop	✓	✓	✓	✓	SARS
LS (including Scottish)	2000–01	GB	Ward	1% pop (5.5% Scot)	✓	✓	✓	✓	CeLSIUS
Customised commissioned tables	2000–01	UK	OA	Total pop	✓	✓	✓	✓	ONS
School Census (PLASC)	Annual	England and Wales	LSOA (Unit postcode with special permission)	All school children	✓	✓	✓	✓	PLUG/DCSF
Surveys									
General Household Survey	Annual to 2006	GB	GOR	20,000 people, aged 16+	✓	✓	✓	✓	ESDS
Annual Population Survey	Annual since 2004	UK	LAD (special licence)	350,000 people	✓	✓	✓	✓	ESDS/NOMISWEB
Labour Force Survey	Quarterly	UK	LAD (special licence)	125,000 people	✓	✓	✓	✓	ESDS/NOMISWEB
Acxiom lifestyle survey	Annual	GB	SOA	Approx 750,000, aged 18+	✓	✓	✓	✓	Acxiom
Administrative Sources									
NHSCR	Annual	GB (separate Scot/Eng and Wales)	2001 HA	Total pop	✓	✓	✓		ONS
Patient Register data system (PRDS)	Annual	England and Wales	LAD	All NHS patients	✓	✓	✓		ONS/CIDER
Community Health Index (CHI)	Annual	Scotland	Council Area	All NHS Patients	✓	✓	✓		GRO Scotland/CIDER
Central Health Index (NI–CHI)	Annual	Northern Ireland	Local Govt Dist	All NHS Patients	✓	✓	✓		NISRA
Higher Education Statistics Agency	Annual	England & Wales	MSOA (unit pc possible)	Approx 900,000 HE students	✓	✓	✓	✓	HESA
Electoral roll/register	Annual	UK	LAD	Voting age population	✓	✓	✓		Local Authorities (no central sources)

Table 5: International migration: data sources

	Reporting period	Coverage	Lowest level of geography	Immigration	Emigration	Migrant population	Stocks	Flows	Age	Sex	Ethnicity	Data sourced from
Censuses												
UK Census	Decennial	UK	OA	✓		All	✓	✓	✓	✓	✓	ONS
Pupil Census	Biannual	England & Wales	LSOA	✓		Children attending State Schools	✓		✓	✓	✓	DCSF
Surveys												
International Passenger Surveys (IPS)	Quarterly	UK	GOR	✓	✓	All migrants		✓	✓	✓		ONS
Labour Force Survey	Quarterly	UK	GOR	✓		All (but with survey exclusions)	✓	✓	✓	✓	✓	ESDS
Composite												
Total International Migration (TIM)	Annual	England & Wales	LADUA	✓	✓	Long-term migrants		✓	✓	✓		ONS
Administrative Sources												
Immigration Control	Annual	UK	National	✓		Non-EEA migrants		✓				HO
Work Permits	Annual	UK	LADUA	✓		Non-EEA migrants		✓	✓	✓		HO
Points Based System	Annual	UK	tbc	✓		Non-EEA migrants		✓				HO
Seasonal Agricultural Workers (SAW)	Annual	UK	Postal District	✓		Seasonal Workers from Bulgaria & Romania		✓				HO
National Insurance Number (NiNo) Registration	Quarterly	UK	LADUA	✓		Migrant Workers		✓	✓	✓		DWP
Works & Pensions Longitudinal Study (WPLS)	n/a	UK	Postcode	✓		UK Labour Force		✓	✓	✓	✓	DWP/HMRC
Worker Registration Scheme (WRS)	Quarterly	UK	LADUA	✓		A8 workers excluding self-employed		✓	✓	✓		HO
GP Registrations	Annual	UK	LADUA	✓		All		✓	✓	✓		ONS/NHS
Higher Education Statistics	Annual	UK	LADUA	✓		Students	✓	✓	✓	✓		HESA
Electoral Register	Annual	UK	LADUA	✓		Voting age population		✓	✓	✓		Local Authorities (no central source)

4. National Statistics on migration

4.1 Introduction

Robust and reliable migration statistics are a fundamental component of official population estimates and projections. In the UK, current national and sub-national population estimates are produced on a mid-year or quarterly basis. Sub-national population projections are released every two years and provide constraints to official household projections which have a similar biennial cycle.

The Office for National Statistics Centre for Demography (ONSCD) is responsible for producing the population estimates for England and Wales as well as sub-national projections for England and population projections for the UK (ONS, 2007d). The Welsh Assembly Government (WAG) produces sub-national population projections for Wales, whereas the General Register Office for Scotland (GROS) is responsible for Scottish population estimates and sub-national projections. The Northern Ireland Statistics and Research Agency (NISRA) generates the population estimates and sub-national projections for Northern Ireland.

All estimates and projections use cohort component models (GROS, 2008; Jefferies and Fulton, 2005; NISRA, 2008) which make assumptions about the levels of births, deaths, internal and international migration. However, the data sources and precise methodologies used vary between national agencies. Here we are concerned only with the migration components of these methodologies.

4.2 England and Wales

4.2.1 Migration data in population estimates

Estimates of internal migration within England and Wales and between England and Wales and the rest of the UK for both quarterly and mid-year periods, are derived from patient register and NHSCR data (ONS, 2007d). For moves across the Scottish and Northern Irish borders, total flows are agreed using evidence from the destination country (Jefferies and Fulton, 2005). Both Scotland and Northern Ireland have comparable registration systems for patients to England and Wales. Where estimates of internal migration are required for local authority geographies the GP patient register data system (PRDS) is the key data source (Jefferies and Fulton, 2005). As patient register data fail to capture migrations

of individuals who move but who were not registered with a GP at the time data are collated, migration statistics derived from this source are constrained to NHSCR data at a more aggregate geographical scale (ONS, 2007a). An assessment of the quality of the combined data sources for internal migration estimates is available (ONS, 2009d).

The population estimation methodology uses a number of alternative sources of data to derive its estimates of Total International Migration (TIM) (NSCD, 2006). The principal source is the IPS, which samples around 300,000 passengers travelling through 34 air and sea ports (ONS, 2009b) in Britain every year – of which around 1% can be considered migrants (Jefferies and Fulton, 2005; NSCD, 2006). Adjustments are made to the IPS data to account for visitors who stay for longer than 12 months and become migrants ('visitor switchers') and migrants who do not stay as long as expected and become visitors ('migrant switchers').

Supplementing data from the IPS are data from the Irish Central Statistical Office and NHSCR data which give more accurate information on migrants travelling to and from the Republic of Ireland. As the IPS does not record information on asylum seekers and their dependents, data on these flows are supplied by the Home Office.

The methodology for estimating sub-national immigration and emigration flows (which is consistent between the population estimation and projection methodologies) is described below.

4.2.2 Migration data in population projections

Sub-national population projections in England are based on similar cohort-component concepts as the mid-year estimates. Projections are carried out on a biennial basis and estimate populations for a 25 year time horizon. To smooth single year anomalies in the data, internal migration estimates are based on the trends in the last five years of GP patient register data with migration schedules (Rogers and Castro, 1981) being used to estimate age specific rates (ONS, 2008a).

For international migration estimates, the last six years of data based on the IPS (and the other sources which go into producing TIM estimates (ONS, 2009b)) are combined. The estimation process works at four different levels: national, regional, intermediate geography and local authority area. The intermediate geography or 'new migrant geography' (NMG) groups local authority areas outside London based upon their contiguity and economic association. Within London, boroughs are grouped based on similarities in historical migration profiles. There are different sets of these new geographies for both immigration (NMGi) and emigration (NMGo).

For immigration estimation the LFS is used to allocate gross national IPS flows to the ten Government Office Regions (GOR). LFS statistics on 'long-term' migrants calibrate the proportional distribution of flows to each region. IPS data, smoothed over an extended time-series, are used to allocate immigration flows to the NMGi outside London, with the LFS sample size believed to be sufficiently robust to enable it to be used for estimation for the London NMGi areas. The final stage of immigration estimation involves the proportional allocation of flows to local authority areas using the migrant distributions evident from 2001 Census data.

The emigration estimation process has a similar hierarchical structure but does not have the luxury of additional data from either the LFS or the Census. As an alternative, it incorporates a 'migration propensity' model to estimate the distribution of flows at a local authority level (ONS, 2008d).

The principal innovation of the latest ONS methodology is to use the LFS to re-weight regional distributions. Since the LFS is an even smaller sample than the IPS with only *circa* 700 international immigrants per year and with very small sub-samples for home countries and GORs (*circa* 50 per region), it is likely that the confidence limits around any estimate are very wide. The LFS is a household survey which does not cover communal establishments. Since nearly 25% of immigrants, according to the IPS, come to study, this is likely to lead to distortion of the sub-national distributions. The method of calibration of the IPS to the LFS is probably responsible for the increased allocation of immigrants to Yorkshire and the Humber (ONS, 2007b). At the lowest level, from intermediate geography to local authority, ONS uses the distribution found in the 2001 Census. Huge changes have occurred in the volume and distributions of immigration since 2001, so this final step is likely to be more and more error prone as the decade proceeds. The distribution of A8 immigrants, for example, is very different from the 2001 Census all-immigrant distribution (Bauere *et al.*, 2007).

At present, the process of local estimation does not incorporate additional intelligence from administrative sources, although initial analysis and investigation was completed to compare WRS, NINO and GP registration statistics with those derived from the TIM estimation process (ONS, 2007e). The conclusion of this preliminary research was that the administrative sources would require further adjustment, linking or modelling if they were to contribute to an improvement in migration estimation. Since this initial review, a new methodology which uses administrative sources for sub-national allocation is being prototyped and is discussed further in section 5.2 (ONS, 2008c).

Sub-national projections for Wales are produced by WAG using a different methodology based on a single region cohort-component model with net migration. and data inputs averaged over the past five years (WAG, 2008).

4.3 Scotland

GROS produces population estimates and projections for Scotland and applies similar methods to ONS to estimate internal migration flows using patient register Community Health Index (CHI) data constrained by NHSCR statistics.

For international migration estimation GROS differs from ONS in that no adjustment is made for migrant switchers as GROS assumes the number of in-migrant switchers is balanced by the number of out-migrant switchers. Visitor switcher adjustments are based on non-EEA visitors only, and then only for inward switchers – assuming that there are no outward visitor switchers. (GROS, 2007a, NSCD, 2006). Furthermore, GROS does not adjust asylum seeker data from the Home Office as ONS does, preferring to use raw data. Importantly, CHI data rather than LFS/Census data are used to allocate international migrants to council areas, using the administrative data in preference to the less representative survey sample.

Cross (UK)-border migration flows are estimated based on the average of the last ten years of data recorded through the Scottish NHSCR (GROS, 2007b).

GROS has produced a report on migration in the Tayside area examining GROS official migration estimates and includes (i) Council level migration flows split by within Scotland, rest of UK and overseas; (ii) Council level historical net total migration; (iii) Council level outside Scotland migration flows; (iv) historical overseas migration for Tayside Health Board; and (v) Council level age-profile of migrants. Where appropriate, the data are presented as migrants per head of population. The report presents other data that informs on migration including: NHS registrations of people who have come from overseas; LFS country of birth data; Scotland level WRS data from the Home Office Accession monitoring reports; National Insurance Number allocations to overseas nationals; Mothers' country of birth by Council area; and data from the Pupil census such as English as an additional language and number of pupils from minority ethnic groups. The final section discusses the methodology used to produce the GROS migration estimates and gives background on what the other data shows. There is currently no commentary or analysis of the data, other than information on where the data can be obtained and methodological notes.

4.4 Northern Ireland

NISRA uses the Central Health Index (NI-CHI) – a patient register data system very similar to the CHI in Scotland and PRDS in England and Wales – as the main data source for estimating internal migration flows (NISRA, 2005). However there is no indication that other data sources such as the NHSCR are used to constrain any estimates produced from this source. To estimate flows to other UK countries, NISRA does make use of NHSCR data (both Scottish NHSCR and England and Wales NHSCR). For flows between Northern Ireland and the Republic of Ireland both the NI-CHI (inflows) and the Irish Quarterly National Household Survey (outflows) are used (NISRA 2005; 2006).

To project gross internal migration flows, NISRA uses a weighted average of the last four years of flows estimated by the NI-CHI – the most recent year weighted 4 and the earliest year weighted 1 (NISRA, 2008). All local area projections are constrained to the national projections produced by ONS (ONS, 2009b).

NISRA does not make use of the IPS for international migration flows in the same way that ONS and GROS do (NSCD, 2006). The IPS does not cover the land border between Ireland and Northern Ireland. Furthermore, there is uncertainty surrounding the ambiguous use of "Ireland" as an origin or destination response to survey questions. As an alternative, the NI-CHI is also used to estimate international migration flows.

4.5 An international perspective

The implementation of EU Regulation 862/2007 has provided a statutory basis for greater harmonisation of international migration statistics in Europe. However, harmonisation of data collection remains a long way from being realised (Poulain *et al.*, 2006) and the matrix of inter-country flows is subject to significant issues of coverage and inconsistency between reporting countries (Kupiszewska and Nowok, 2005).

Eurostat has emphasised that a purely national approach to migration statistics will no longer be sufficient and that EU states must be prepared to collaborate on migration estimation for official statistics and to produce far more socio-economic information about migrants (Eurostat, 2008). It suggests that existing household surveys (such as the Labour Force Survey) could be extended to increase the range of socio-economic information available about migrant

stocks, but recognises survey limitations in adequately capturing the size and characteristics of migrant flows (Martí and Ródenas, 2007). It recommends that the owners of administrative systems (for immigration control) take statistical needs into account when implementing new or redesigning existing systems. It also recognises the value of increased data sharing between national systems for measuring emigration, for example, which is often better recorded by the destination country than by the country of origin.

Eurostat has financed two initiatives to assist EU Member States in meeting their obligations under Regulation 862/2007. The THESIM (Towards Harmonised European Statistics on International Migration) initiative was established to provide support for making best use of available data sources. Nowok *et al.* (2006) report that, with respect to the 2002 matrix of flows between EU countries, nine countries including the UK submitted no data at all to Eurostat. In the case of the UK the reason was that the IPS could not provide reliable statistics for these flows. The entries in the resulting table (Nowok et al. 2006, Table 17a, pp.229-231) are based on the estimates in the origin country (immigration to the UK) or the destination country (emigration from the UK). If the UK is to fulfil its obligations in the future under EU regulations about migration statistics (Nowok *et al.* 2006, p.203), national level statistics about international migration need to be radically improved.

The MIMOSA (Migration Modelling for Statistical Analysis) initiative supports the application of statistical modelling methods to estimate missing data on migration flows and foreign population stocks (Raymer and Abel, 2008). The MIMOSA project has been coordinated by the Netherlands Interdisciplinary Demographic Institute (NIDI) in collaboration with experts from the Central European Forum for Migration and Population Research (CEFMR), Southampton Statistical Sciences Research Institute (S3RI) and Université Catholique de Louvain. Its approach uses the 'most reliable' statistics (sourced from Nordic country registers) as key constraints on the iterative estimation of inter-country immigration and emigration flows (see Section 5.6 for further discussion of the methodology).

The Nordic countries are held up as a model of efficiency in the production of official statistics from their respective register-based systems. They operate centralised registers which contrast to the 'municipal' registers in countries such as Italy, Netherlands, Spain and Switzerland. System development has been a gradual, evolutionary process but the plan is for Denmark, Finland, Norway and Sweden to have a totally register-based population and housing census system by 2011. The barriers to implementation of a register-based system in the UK are well documented but there are a number of prerequisites for the effective operation of such a system (Tønder, 2008): a sound legal base covering

the use of administrative data and the processing of personal data; public approval; a unified identification system (unique person reference number); and comprehensive and reliable register systems developed for administrative needs.

Finland has an efficient and integrated system of administrative registers from which it has been drawing population and housing statistics since 1990. The basic registers are the population register of persons, the register of buildings, dwellings and real estate and the register of enterprises and establishments. A number of 'unique identifiers' facilitate record linkage between registers and allow surveys to be linked directly to register-based statistics (Törmälehto, 2008).

Derived migration statistics differentiate immigration and emigration from internal moves and data are available for national, regional and sub-regional geographies (Statistics Finland, 2009). Data are published by age, gender, marital status, native language, country of birth, and region of arrival and departure of migrants (although a person may appear in one year's statistics several times if they undertake several moves in the time period).

Each move within or between municipalities or across the Finnish territorial boundary is captured by the population register, which provides data directly to Statistics Finland. Only move notifications made by persons permanently resident in Finland on the day of the move are used in the compilation of statistics on migration. Immigration into Finland from abroad is also included in population statistics if an administrative court approves the place of residence reported by a person in a move notification as his or her permanent place of residence. The statistics are published once a year in May with a sub-national time series of annual statistics available from 1975 onwards.

In the absence of a population register, other countries have made creative use of administrative data systems to derive migration information. In Canada, migration statistics are now derived from address information recorded by the Canada Revenue Agency's database of annual tax returns (Statistics Canada, 1998, 2008). Approximately 70% of the population files an annual tax return. Non-filers are assumed to have a similar geographical distribution to filers and dependents are identified either from the tax form or from supplementary statistics on Child Tax Benefit and the Vital Statistics birth file. A migrant is identified by comparing a filer's address from successive tax returns.

International migration statistics combine tax file information with records from Human Resources Development Canada (HRDC) and the Demography Division of Statistics Canada. The tax data provides the sub-national distribution of migrants; the HRDC and Statistics Canada data provide the actual level of

migration at a provincial level. Net migration statistics derived in this way have been used to produce population estimates for Census Divisions (CD) and Census Metropolitan Areas (CMA), with an estimated average absolute error of 2% when compared to census statistics.

The Australian Bureau of Statistics has a similar method to the UK for constructing population estimates, including 'long-term' international migrants in its estimated resident population (ERP) but excluding 'short-term' migrants. The net overseas migration (NOM) component of population change has been derived from an analysis of data recorded in incoming and outgoing passenger cards. However, this method has revealed differences between stated and actual length of stay and has introduced uncertainty as to whether 'travellers' or 'overseas movements' are being recorded (the transitions versus moves issue identified previously).

A new method for NOM calculation has been implemented which links 'traveller' information to measure duration of stay over an extended 16-month period (ABS, 2006, 2007). The accurate measurement of duration of stay is integral to the improved method. Persons are included in the resident population if they are in Australia for a total of 12 months or more over a 16 month period (referred to as the 12/16 month rule). A cycle of 'preliminary' and 'final' estimates is necessary to balance the requirement for regular statistical reporting and the need to link information over a 16-month period.

The new method ensures that all estimation is based on actual individual travellers and their travel histories, rather than a synthesis of movements converted to represent a traveller. Sub-national distributions are based directly on location information recorded in passenger cards. The Australian experience of data capture from established border control administrative systems is a useful benchmark for identifying how data might be best derived from the new e-Borders system in the UK.

4.6 Migration Statistics Improvement Programme

In 2006, an Inter-departmental Task Force on Migration published a set of 15 recommendations for timely improvements to estimates of long and short-term migration and migrant populations in the UK (Appendix 2). These recommendations were adopted by the resulting Improving Migration and Population Statistics (IMPS) initiative, led by ONS, with a remit to produce:

better passenger survey estimates of migration; better estimates of the geographic distribution of international migrants at regional level; stock and flow estimates of short-term migration; and greater clarity of definitions for producing population statistics, future surveys and the 2011 Census.

In 2008, following the publication of the Treasury Committee's report into UK population statistics (House of Commons Treasury Committee, 2008), five working groups were established under a broader Migration Statistics Improvement Programme (MSIP). The MSIP initiative has a four-year time horizon (2008-2012) and has subsumed the work of the IMPS programme of work within its remit. A summary of the activities of each working group is summarised below:

Working Group 1: Entry & Exit (Home Office)

The focus of this working group is on enhancements to the IPS and the capture of migration statistics from the UK's immigration systems. Improvements to the IPS have largely been focused on increasing the amount of data captured, with enhanced sampling at Stansted, Luton and Manchester airports from January 2008; with more efficient allocation of IPS shifts to better reflect migrant flows at different ports and with increased coverage at additional ports (Belfast and Aberdeen).

The use of landing card data was originally considered as a method for capturing more detailed migration statistics on people entering the UK but this appears to no longer be an option that is being considered by the Home Office due to the prohibitive cost of processing the data (ONS, 2008e). In addition, the new Points Based System is in its infancy and as yet there is no clear indication of whether and how migration statistics might be reported from the new process. The UK Borders Agency (UKBA) e-Borders initiative has the greatest potential for providing comprehensive statistics on migrants to and from the UK but evidence suggests that precisely how this might be achieved remains unclear (ONS, 2008e).

The main aim of the e-Borders system (operational by 2010) is to monitor all arrivals and departures for purposes of national security. The system will collect information from travel agents when flights or trains are booked as well as when the electronic passports record a border crossing by a passport holder. It will require all travellers leaving or entering the UK from any international station, port or airport to supply detailed personal information as well as travel itineraries. The aim is to capture 60% of journeys out of the UK by the end of 2009 and 95% by the end of 2010.

A secondary aim is to generate migration statistics, although it remains unclear whether this will replace or supplement existing data. The key issue here is whether it is possible to work from a set of person records of border crossings over periods of time to a set of statistics on long-term migration/migrants, short-term migration/migrants and visiting/visitors. This conversion raises issues of truncation or censoring of observations, for example. The migration information that may ultimately be extracted from the database is not seen as a replacement to the IPS, but rather an additional set of statistics. There is no proposal at the moment to add any IPS-type questions to the e-Borders process. IPS and e-Borders immigration systems are viewed as mutually exclusive methods for collecting migration statistics.

Working Group 2: Local Population Estimates (CLG)

The Local Population Estimates working group is charged with implementing a number of key short-term improvements to the migration estimates which underpin the mid-year population estimates. It is understood that these short-term improvements will not form part of the 2008 round of mid-year estimates (due in Autumn 2009) but will be formalised by Spring 2010 following consultation and review. Retrospective changes may then be implemented to previous mid-year estimates and new sub-national projections (2008-based) will be produced.

Methodological developments have focused on: Student migration (see page 89); administrative data for sub-national distribution (see page 88); emigration estimates (see page 92); and short-term migration (see page 89).

In addition, a number of minor changes are to be made to the intermediate geographies used in the process of sub-national immigration and emigration estimation. To enable consultation and review with a wider research and end-user community, four Reference Panels have been created. These Panels cover 'students', 'distribution to local authorities', 'short-term migration' and 'London'; the latter being handled separately as an amalgamation of all three.

Working Group 3: Alternative Sources (DWP)

A third working group has a remit to evaluate and develop alternative sources of migration data. Access to individual level HESA data remains constrained by the complexity of data ownership issues that are proving difficult to resolve. However, agreement has been reached between ONS and the Department of Children, Schools and Families (DCSF) to share data from the School Census. These datasets provide valuable intelligence on key sub-groups of the migrant population, both internal migrants and international migrants.

The WPLS is a valuable source of information on the UK labour force that could potentially provide the crucial 'missing-link' for international migration statistics – the length of stay of migrants measured from tax, benefits and national insurance contributions. The use of this dataset for migration analysis is again subject to legal barriers on usage but a business case is being compiled by ONS for consideration during 2009.

ONS is also considering the development of a Communal Establishment Survey to compensate for the fact that the IPS is grossed up using LFS data which excludes migrants living in communal properties. The survey would capture boarding houses and hostels but would exclude prisons, university halls of residence and certain hospitals. The identification of an appropriate sampling frame is a major issue with a combination of the Inter-Departmental Business Register (IDBR) and the postcode address file (PAF) being investigated.

In addition, the Home Office is considering the development of a New Migrant Survey targeted at capturing the characteristics of migrants within UK households. The Survey is in the process of being scoped but once again the derivation of an appropriate sampling frame for data capture is likely to be a major hurdle to effective implementation.

Working Group 4: Analysis & Indicators (ONS)

The Analysis and Indicators Working Group is to develop a web-based information system containing (i) a set of UK indicators of international migration, and (ii) a suite of migration indicators at the local level. The aim of this work is not to produce better mid-year population estimates but to provide a more timely set of national and local counts. In May 2009, ONS plans to release its first set of 'quarterly' UK indicators of international migration based on data collected from the IPS. This is designed to produce the most timely view of the overall trend in UK immigration and emigration.

At a local level, the aim is to create a 'one-stop shop 'of migration indicators for local authority areas based on different data sources. Initially, two or three indicators, likely to be based upon nationality, country of birth or ethnicity from the Annual Population Survey (APS) will be provided. Other indicators will be added in August 2009 and quarterly thereafter as data become available. New sources of migration indicators (e.g. DCSF, HESA, Communal Establishment Survey) are also being examined and there is consideration of a new migration index (a score for each LA based upon its levels of migration and potential impact).

Working Group 5: Migration Reporting (ONS)

The release of key population and migration statistics is now coordinated across Government departments with specific publication dates in the calendar. Whilst improving coordination, there remains a large amount of statistical material to digest at each release, with no common reporting format or commentary on the data. It is planned to convert the release of statistics on international migration and internal migration into an annual report on migration statistics. The timing and format of this publication has yet to be confirmed. This annual report would likely be a more comprehensive version of the current MN series produced by ONS.

4.7 Migration Impacts Programme

The CLG has a policy focus on the impact of migration on local areas and communities; positive and negative, economic and social. The aim of this Migration Impacts Programme set out in *Managing the Impacts of Migration: A Cross-Government Approach* (Communities and Local Government, 2008) is to optimise the local benefits of migration and manage its transitional impacts by working across government and with other key stakeholders. The programme is attempting:

- to understand changes taking place in communities by improving local population and migration statistics by examining the drivers and economic benefits of migration;

- to help public services respond to migration through specific funding streams for local services and sector support, and

- to provide support for community cohesion through a programme of work to help new migrants integrate.

The CLG has its own research programme which is focused mainly on economic issues with work being commissioned on (i) the impact of the economic downturn on migration inflows, and (ii) the economic drivers of international migration into the UK. The former involves work by Anne Green (University of Warwick) on the likely impact of the economic downturn on inflows from the A8 countries, quantitative work by Oxford Economics on the likely impact of the economic downturn (and subsequent upturn), on migrant inflows into the UK; and quantitative work by the National Institute for Economic and Social Research (NIESR) on how the economic downturn is likely to affect inflows from the various source regions.

In connection with the latter, work being carried out by NIESR updates the panel-based modelling approach of Mitchell and Pain (2003) and re-examines their model to take into account the accession of the A8 countries in 2004, and the likely impact of the most recent policy changes (e.g. the introduction of the PBS) on future inflows (CLG, 2008). The earlier work based on use of the IPS at a national level showed the importance of the following: friends and family of existing migrants; income differentials between host and source location; demographic structure of the source location; population growth in source location; and pull effects due to rising stock of migrants and per capita incomes in UK relative to the source location. The proposed work will also examine the drivers of migrant settlement at the regional level (with a focus on the labour market drivers and the effect of existing networks) and the length of stay by migrants from the various source regions.

5. Methodological developments – migration estimation

5.1 Introduction

This section reviews a selection of the more recent methodological developments in migration estimation in two (overlapping) categories: looking at new methods that have been developed using different data sources and looking at methodologies that have been applied where data are incomplete or unknown.

Using datasets that are readily available, there has been considerable research undertaken in the UK to analyse migration propensities and patterns. There exists a wealth of analytical approaches. Bell *et al.* (2002), for example, propose a set of migration measures that can be used to compare internal migration between countries that include measures of intensity (migration rates; migra-production rates; age profiles; migration expectancies), migration concentration (Gini index; coefficient of variation), migration distance (median distance moved; distance decay parameters) and migration impact (migration effectiveness; net migration rate). Different analysis methods are discussed and exemplified in a UK context in Stillwell *et al.* (forthcoming).

Whilst the literature on migration analysis is rich, academic work on the estimation of migration statistics is relatively limited in comparison. However, as the movement of the population within and between countries has become such a dominant driver of population change in the twenty-first century, interest in the robustness of the data and methods used for measuring migration in the context of population estimation and projection has increased. The following kinds of migration estimation techniques have been applied and are discussed in the sub-sections that follow: *using proxy data to produce better migration estimates* (5.2), *filling gaps in migration flow data using explanatory models* (5.3), *estimating a spatially consistent time series* (5.4), *estimating age specific migration flows* (5.5), *estimating unknown migration flows from known data* (5.6) *and forecasting international and internal migration* (5.7).

5.2 Migration estimation using different data sources

Section 3 of this document has summarised the sources of migration data which are available to measure both internal and international migration. The programme of 'improvements' detailed in Section 4 suggests that this list of potential data sources is likely to increase over time. The interest in international

migration, in particular, has resulted in a number of studies which have reviewed and reported on available data without attempting to derive alternative migration estimates from the sources identified (Green *et al.*, 2008b, ICOCO, 2007, Rees and Boden, 2006).

The LFS (with successors the Annual Population Survey and the Integrated Household Survey) is the definitive source of data on the UK labour market and follows a common methodology across all EU-15 countries. Its value as an alternative and consistent source of European statistics on migration stocks and flows has been examined with a comparison of LFS statistics versus population registers and national censuses in EU countries (Mónica Martí, 2007). The technical analysis reveals a substantial under-estimation of migration flows from the LFS when compared to alternative sources. The size of the migrant population relative to the total is identified as a major constraint to the effective operation of traditional sampling methods. The problem is generally worse for migrant flows than migrant stocks. Potential bias in the LFS is also identified, particularly with the failure of surveys to capture communal households – a feature that has recently been corrected in the UK LFS. The report concludes that, at present, the LFS does not provide a suitably harmonised source of migration statistics.

Pollard *et al.* (2008) used the LFS and the WRS in combination to examine the length of stay of migrants to the UK, providing a unique perspective on the likely number of A8 migrants who remain. The comparison demonstrates innovative use of the datasets but results are subject to considerable uncertainty due to the unrepresentative coverage of short-term migrants in the LFS and the analysis provides only 'ballpark' estimates and not definitive statistics.

Throughout the UK, local and regional organisations have sought to develop their own research initiatives to measure the scale and impact of international migration upon local communities. To examine the impact of migrant workers upon health and safety in the workplace a review of this multitude of local studies has been undertaken (Boden and Rees, 2009c). Many studies used a combination of secondary datasets (LFS, NINo, WRS, Work Permit statistics, GP registrations) to produce a summary view of the level, profile and distribution of migrants. These studies have provided commentary, presentation and interpretation of the available statistics but have generated no new data and have not attempted to synthesise locally the different sources of statistics into a 'one number' count of new migrants.

A more substantial number of studies have supplemented the national statistics with data generated from surveys and/or interviews with a sample of migrant workers, employers and labour providers. The focus of research has typically been on the impact of migrant workers upon the economy and the workplace, integration and cohesion in the community and the effect of the new workforce upon local service provision. In a number of cases attempts have been made to produce improved estimates of migrant worker numbers but have been constrained by an inadequate sampling process. These studies were shown to have a number of common characteristics:

- a small sample size with various methods used to select respondents;

- different definitions of the migrant population;

- one-off studies, with data generated for a specific time-period;

- primarily designed for qualitative analysis, and

- data not statistically representative of a target 'population' of new migrants, with any quantitative statistics derived from the samples subject to substantial bias.

Some of the largest migrant surveys have been conducted by Anne Green's team at Warwick University. The East Midlands, West Midlands and South East 'Migrant Worker Surveys' were conducted to assess the regional impact of migrant workers (Green *et al.*, 2007a, 2007b, 2008a). Each survey used a quota sampling method to generate a sample of migrant respondents. The authors emphasised the difficulty of obtaining a representative view due to the lack of sampling frame from which to draw a sample of migrant workers. They also highlighted the 'snapshot' nature of the surveys, with the value of data ageing rapidly at a time of significant demographic change. The authors report on statistics from national sources but stop short of producing alternative regional estimates of migrant numbers based on the respective Migrant Worker Surveys.

The proliferation of research on international migration has produced a bewildering number of publications with consistent messages concerning issues of integration and cohesion but with little evidence of any improved methods for migration estimation using alternative data sources. A recent study conducted for Yorkshire Futures identified a total of 120 separate studies completed in this region alone since 1999 (Lewis *et al.*, 2008) but with very little evidence on improvements to methods for data estimation.

The New Migrant Databank (NMD) was a concept originally recommended to the Greater London Authority (GLA) as a solution to its requirement to more accurately measure and monitor international migration at a local level (Rees and Boden, 2006). Since the recommendation was made the GLA has produced its own descriptive analysis of international migration comparing TIM estimates with NINo registrations and GP registration statistics (Hollis, 2008).

The development of the NMD has been taken forward by a team at the University of Leeds to produce a unique repository of migration statistics for a hierarchy of geographical areas in the UK, from national to local authority level (Boden and Rees, 2009b). The driver for the creation of the NMD was to provide a single source of migration statistics for each local authority but also to facilitate the development of alternative migration estimation methods, specifically for international migration.

The analyses undertaken using the NMD have revealed inconsistencies between ONS estimates of sub-national immigration and evidence from administrative sources on the distribution of new migrant registrations (see Appendix 3 for an illustration of how TIM regional estimates compare to evidence from GP registration statistics). To illustrate the potential impact of these inconsistencies upon population estimates and projections an alternative methodology for distributing immigration flows has been derived which combines TIM statistics at a national level with sub-national statistics from three administrative sources: HESA, NINo registrations and GP registrations (Boden and Rees, 2009a). The methodology uses flow 'proportions' to distribute national TIM totals to sub-national areas. The methodology results in a re-distribution of immigration flows that would have a significant impact upon mid-year estimates, sub-national projections and household projections in England and Wales.

ONS has made significant progress in its analysis of a number of alternative models for distributing international migration using administrative sources (ONS, 2008c). The focus of these new developments has been on the final stage of distribution, replacing census data with administrative data as the basis for allocating NMGi-local authority flows. ONS has used regression estimation models to explore the association between a range of explanatory variables and immigration. However, a relatively simple model, using a combination of NINo statistics and GP registrations appears to produce the most robust estimates. Significant differences between current estimates of immigration and those based on these new methods are illustrated for a number of local authority areas.

It is unclear whether the NMGi geography is necessary if administrative datasets are to be used for sub-national allocation of migration flows. However, ONS believes that IPS data is sufficiently robust at this level to continue with the use of NMGi. Its prototyped methodology therefore assumes that the GOR allocation of migrants is also robust. The NMD analysis has suggested that inconsistencies may exist at regional level. It may therefore be advisable to incorporate the use of administrative data at all levels, if only for validation purposes, to ensure that any inconsistencies do not adversely affect the robust application of new methodologies at a local level.

This last point on 'validation' is important as much of the criticism of migration statistics has been due to the inconsistencies that exist between official statistics and evidence from other (administrative) sources, as well as the difficulty of distinguishing between long-term and short-term flows. With such a rich source of administrative data available it is important that official statistics either integrate this administrative data evidence directly or use it indirectly to validate the scale, distribution and/or profile of migrants for the full hierarchy of geographical areas.

ONS has also made important developments in the use of HESA data for the estimation of student migration for both internal and international flows. There are concerns about the accuracy of the PRDS in recording student migration from parental domiciles to university residences. It is planned to link HESA records to PRDS data directly using term-time address details, although there remains a legal barrier preventing the use of individual HESA records at the moment. Aggregate HESA statistics are being used as an interim solution, substituting PRDS flows between local authorities with HESA flows in cases where the latter are larger (ONS, 2009a).

A methodology has also been developed to allocate student flows post-graduation. This method combines census data on graduate flow distributions with HESA counts of students finishing their studies, intelligence from HESA's 'first destination' survey and PRDS registrations.

HESA data on international student migrants are to be used within London only. They will be used as a simple replacement for the 2001 Census data which is used currently to distribute the total number of international migrant students at London level to LA. HESA data on international migrants remains limited by the fact that they cover students in higher education only and that the term-time address data has only been collected since 2008.

The feasibility of making short-term (3-12 months duration of stay) migration estimates from the IPS has been investigated (Smith and Sharfman, 2007). The report concluded that *national* level estimates could be robustly produced but that sub-national estimation would be constrained by an inadequate sample size. ONS has continued to develop its methodology for producing short-term migration estimates from the IPS. A first set of short-term immigration statistics at local authority level will be published in summer 2009 (ONS, 2009c). To ensure a sufficient sample size from the IPS, short-term migration has been redefined as 'any visit made for between one and twelve months'. The sample size from which the estimates will be derived is approximately 2,142, including 253 observations where regional geography will need to be imputed. The intention is to apply regression methods in a similar way to those applied to long-term sub-national estimates to estimate short-term flows to local authority areas. It is scheduled to supplement the recently released national estimates with a first set of local authority estimates during 2009.

Using data derived from the NMD on a number of different datasets, alternative short-term migration estimates have been produced for Accession migrants to England and Wales and London (Boden and Rees, 2009b). These results are relatively crude but they attempt to combine evidence from ONS long-term migration estimates with statistics from administrative datasets to derive the short-term migration data. The rationale for this type of approach is to ensure that long-term migration and short-term migration estimates are integrated into a single methodology – the short-term migrants being the residual of any long-term migration estimation – and that all estimates integrate (or are at least validated by) administrative statistics.

ONS has undertaken a reconciliation exercise, matching its combined long-term and short-term migration estimates at an aggregate, national level to administrative data counts (ONS, 2008f). This analysis identified issues with the employment counts from the IPS, resulting in new short-term estimates being produced. It also emphasised the difficulty of aligning the IPS migrants who state employment as their main reason for entering the UK and the NINo data which records migrants who work or claim benefit regardless of their initial stated intention. This type of reconciliation exercise at a sub-national level requires that the robustness of the long-term migration estimates are assured prior to a comparison of aggregate long and short-term statistics with administrative datasets.

Whilst not estimating migration flows directly, innovative record matching techniques have been successfully applied to derive alternative population statistics from a combination of administrative datasets (Mayhew and Harper, 2009). Using the GP Register as a base, record linkage at an individual and/

or household level are made to data from the Council Tax Register, Electoral Register, Benefits Register, School Census and the Register of Births and Deaths. All records for each address are cross-referenced to establish who is resident and who is not, producing an alternative population estimate which takes into account the impact of net migration based upon administrative data evidence. The methodology provides a useful benchmark to the issues that would be encountered in the potential use of administrative data as a long-term replacement for the Census.

The estimation of international migration flows and the differentiation between short-term and long-term migrants present particular methodological challenges. The estimation of illegal migration has proved to be even more problematic. There has been little progress made since the original report on 'sizing the illegally resident population in the UK' was released (Pinkerton *et al.*, 2004). Using evidence from 15 countries (USA, Italy, Netherlands, France, Greece, Portugal, Germany, Spain, Czech Republic, Morocco, Tunisia, Switzerland, Belgium, Costa Rica and South Africa) the research examined data sources and methodologies for estimating the stock of illegal residents. A number of estimation methods were reported to involve direct comparison of census and administrative registers, whereas others used sample surveys to gather evidence. The research concluded that the 'residual method' used in the USA was likely to be the most appropriate for estimation purposes in the UK.

The residual method uses the total foreign-born population of the UK as its benchmark. It then deducts an estimate of the foreign born population that is legally resident from this total to derive the estimated number of unauthorised migrants in the UK. Using this methodology, the Home Office 'central estimate' of unauthorised migrants in 2001 was 430,000 or 0.7% of the total UK population (which compared to a US estimate of 2.5% unauthorised migrants) with a likely range of between 310,000 and 570,000 (Woodbridge, 2005).

No new estimates or methodologies for estimating illegal populations have been forthcoming although a team at the School of Geography, University of Leeds has produced estimates of 'hidden and transient' populations for a number of Water Companies. All reports remain confidential because of the linkage to the statutory requirements concerning leakage.

5.3 Migration estimation using explanatory variables

Methods of explaining migration through deterministic modelling have a longstanding tradition in migration analysis (Stillwell and Congdon, 1991) and there is an extensive literature of macro and micro modelling approaches and applications in different countries throughout the world. Models of this type have to be calibrated on historical data before being used to estimate data in a projection context.

This approach has been a focus of interest at CLG. Work commissioned initially for the Department of Environment Transport and the Regions (DETR) in the late 1990s on the determinants of internal migration (Champion *et al.*, 1998) resulted in the development of a sophisticated migration model (known as MIGMOD) using Poisson regression modelling techniques which provided policy-makers with a planning support system (PSS) with which to investigate the impacts of explanatory variables on migration and to evaluate the impacts of policy scenarios. The model was in two parts, where out migration rates were first modelled for areas as a function of origin zone characteristics, regional variables and national characteristics. These estimates were subsequently plugged into an origin-constrained spatial interaction model which estimated flows from these origins to other destinations in the UK. Details of the model structure and results are available in a number of publications (ODPM, 2002; Champion *et al.*, 2003; Rees *et al.*, 2003; Fotheringham *et al.*, 2004).

More recently research has focused on the modelling of the independent variables which may drive migration flows, using Poisson regression techniques in preference to the more commonly used ordinary-least-squares (OLS) approach (Flowerdew, 2009).

Research into a possible replacement for the sub-national emigration methodology has been undertaken in collaboration with ONS (Heasman, 2008). The research recommends the use of 'Poisson modelling on a response of survey counts: weighting up the prediction and using forward stepwise selection of predictor variables'. A number of models were tested and, although predictor variables are not identified explicitly, the existing ONS methodology is shown to perform worse than each of the alternatives presented. A number of models were tested using 'split flows', identifying UK/non-UK nationality separately, but results were inconclusive as to whether this improved flow estimation. The research suggests that the ONS intermediate geography for emigration may be removed if a new methodology is adopted ('an artificial geography that has no natural or administrative need to exist, other than to make the

current emigration model workable'). Research continues in collaboration with Southampton University on refining the model and identifying an appropriate measure of model precision.

5.4 Estimating spatially consistent migration flows

One task that national statistical agencies neglect is maintaining the currency of past data sets in the face of changes in the boundaries of the geographic units to which they apply. The UK has the habit of re-organising its local government geography about once every 15 years and of re-organising its health service geography about once every five years. Care is taken to update vital statistics information to maintain comparability of geographic definitions in time series. In principle, this should be easy to do as long as the micro-data records in the database from which migration tables are produced have proper geo-codes.

Areal interpolation refers to the transfer of areal data based on one (source) geography onto another different (target) geography. These geographies could be two different zoning systems for one period in time, or to the same types of zones which have been altered through time as is the case with census wards. Various forms of areal interpolation method have been developed (e.g. Flowerdew and Green, 1992, Goodchild *et al.*, 1993), although the majority are associated with 'static' variables, rather than more complicated flow variables. Areal interpolation usually involves some kind of areal weighting method on the assumption that source zone data are evenly distributed within each zone. The geographical area of intersection zones between source zones and target zones can be used as the weight in estimating the data for the intersection zones. The data values can then be re-aggregated from the source and intersection zones to the target zones. Interpolating flow data is more difficult than interpolating static data and some form of modelling is required. There have been studies on 'intelligent' areal interpolation methods in which ancillary information is taken into account to give better estimates than are possible with simple areal interpolation (Goodchild *et al.*, 1993, Gregory and Ell, 2005). This information may be available for the source and target zones. Basically, the method works through establishing a regression relationship between the variable of interest and one or more ancillary variables and using it to estimate values for the variable of interest for the target zones (Flowerdew and Green, 1992).

The technique used by Boyle and Feng (2002) for estimating spatially consistent flows between wards in different censuses involves a number of phases that re-estimate flows in an earlier census (e.g. ward flows in 1991) that are consistent with flows in a more recent census (e.g. 2001). Essentially, this method involves using enumeration districts in 1981 as a bridge between the 1991 and 2001 wards. The objective is to estimate the flows between and within the 1991 enumeration districts from the known 1991 intra- and inter-ward flows using a Poisson-based gravity modelling procedure.

5.5 Estimating age-specific migration flows

Another class of techniques which are general in social science has been the fitting of functions to age distributions of demographic intensities. There are many models which seek to describe mortality curves (see Yi and Vaupel, 2003 for examples). There are also many models which seek to describe the variation of fertility by age (see Schmertmann, 2003 for a recent application). The relationship between migration intensity and age is more complex and needs modelling using a combination of functions. Model migration schedules are widely used to produce estimates of migration intensity by age in many different contexts (Rogers and Castro, 1981). They have been used in the England Sub-national Population Projection model (Bates and Bracken, 1982; 1987) while Raymer and Rogers (2006) have examined which of the migration age schedule models (two or three or four exponential models in linear combination) should be used to represent particular interregional flows. Raymer and Rogers (2008) provide a useful overview of principles and applications.

5.6 Estimating unknown migration flows from known data

When direct measurements of a phenomenon are not available, then the measures must be approximated from the data that are available, which may be either partial or proxy in nature. The purposes of migration estimation are to fill gaps in migration statistics series, when only partial information has been published, to smooth migration statistics where the raw data are not reliable enough, exhibiting high standard errors, high variability across categories or high volatility over time. A body of work has developed that seeks to use the best statistical and mathematical methods available to fulfil those purposes.

Categorical data analysis (Agresti, 2007, Fienberg, 2002) is used to determine the structure of count information present in multi-way tables with categorical dimensions. The structure of the data in categorical tables can be described using log-linear models. These methods can be used to infer more detailed information from partial information.

In the analysis of migration, there is a long tradition of fitting explanatory models to migration flows (see section 6.3.1 for UK examples). Zipf (1946) proposed use of the Newton gravity model and to this structure were added regression models of the mass terms at the origins and destinations and methods to determine an empirical value for the power of distance. Lowry (1966) developed a classic application for migration between US cities while ODPM (2002) developed an extremely detailed SIM-regression model for migration between health authority areas in England. Cohen *et al.* (2008) have developed a statistical model building on the gravity framework for international migration and proposed the model for use in supplying the international migration component of national population projections models. Gravity models became spatial interaction models (SIMs) as the result of Wilson's re-derivation of the basic equations using entropy maximization methods borrowed from statistical mechanics and their systematization into a family of models (Wilson, 1971).

Willekens (1980) and Willekens *et al.* (1981) developed methods of migration estimation needed for a 17 nation comparative study of migration between regions within countries that drew on the statistical literature, particularly log-linear models. Later Willekens showed how these methods linked to the Wilson derived SIMs (Willekens, 1999), proposing that spatial interaction models can be viewed as specific instances of log-linear models in which the emphasis is on the interaction structures. The estimation technique was termed multi-proportional fitting as the aim was to estimate the full contents of a migration array using information from many partial arrays. Because a repeated circular computation is needed to solve most such estimation problems, the technique is called iterative proportional fitting (IPF). This was first proposed by Deming and Stephan (1940) for adjusting data from the US Census. The Deming-Stephan algorithm still provides a frequently used scheme for IPF. An example of the application of a Deming-Stephan algorithm to a migration estimation problem is given in Appendix 4. Statistical raking is the name used by the many statisticians for the method while RAS is the name of the technique in macro economics applied to the estimation of national accounts tables.

The IPF technique is built into many statistical packages (e.g. SPSS, S-PLUS/R, SAS, GLIM) but authors often find that either the implementation is very inefficient or that their application needs features not supplied in the package. Van Imhoff et al. (1997) found that GLIM could not compute the necessary

estimation of a set of inter-regional migration flows by age and sex efficiently and so wrote their own IPF routines.

In this decade, Raymer and colleagues have been active in applying log-linear modelling techniques to a variety of European migration estimation problems. Two papers tackle the problem of estimating migration flows between European countries. In Raymer (2007) techniques are worked out for the 'easier' case of migration between Nordic countries while Raymer (2008) attacks the 'harder' case of migration flows between all EEA states.

Raymer *et al*. (2006) describe and project interregional migration by age in Italy using log-linear models. A multiplicative component model (analogous to log-linear models) is used to describe migration data from five previous time periods. Using this information the origin and destination main effects are projected for a future time period. Using these projected marginals along with origin-destination (OD) flows from the most recent time period, OD flows are projected for different age groups.

Raymer *et al*. (2007) outlines a methodology for combining census (attribute rich, temporally limited) and patient registration (more frequent, attribute poor) migration data to produce estimates of elderly migration flows for a series of time periods between types of area in Britain. The models used for prediction are log-linear derivations of a standard gravity/spatial interaction model. The methodology described could be used to model migration flows for particular types of migrant where only aggregate, less detailed data are available.

A recent application has been the estimation of ethnic migration patterns between and post-censuses for government office regions (Raymer *et al*., 2008). This is the system for which an example of the method is provided in Appendix 3. Raymer and Rogers (2007) have also worked on a model for migration estimation in Mexico. This research takes a log-linear (statistical) specification of a standard spatial interaction/gravity (mathematical) model and uses it to estimate migration flows using the structures observed in previous datasets. Using the proportions of in-migrants, out-migrants and origin/destination interactions between zones observed in one dataset, and applying these to another incomplete dataset where marginal totals for the interaction matrix are known (or estimated) but the interactions themselves are unknown, estimation of flows within the matrix is possible. Adding an age component into this model (based on known age-specific migration schedules) allows for the estimation of age specific flows.

Rogers, Willekens and Raymer (2001) explored how log-linear techniques might be used to estimate inter-regional flows if the US Bureau of the Census carried out its intention to drop a migration question from the census (heaven forbid!).

The MIMOSA project has prototyped an approach to harmonise and correct for inadequacies in available inter-state migration data and to estimate missing cells in the matrix (Raymer and Abel, 2008). It has applied a categorical data analysis methodology to the structures in the migration flow tables of 31 European countries, representing the gross flows of immigration and emigration and the interaction flows between countries. The multiplicative component model makes a distinction between an overall level of migration, main origin effects, destination effects and origin-destination interaction effects in contingency tables with parameters that are used to guide the estimation process.

In the most recent version of MIMOSA's international migration flow model, countries are categorised into the following groups:

- Those that provide the most reliable data over time (Austria, Denmark, Finland, Germany, Norway, Latvia, Lithuania, Netherlands, Spain, Sweden).

- Those that provide incomplete data (Italy, Luxembourg, Iceland).

- Those that provide less reliable data (Cyprus, Czech Republic, Poland, Portugal, Romania, Slovakia, United Kingdom).

- Those that provide (practically) no data (Belgium, Bulgaria, Estonia, France, Greece, Hungary, Ireland, Liechtenstein, Malta, Switzerland).

The methodology uses data from the first group of countries to drive the iterative estimation process. Flow counts to and from other countries are then successively 'corrected' for harmonisation with the more reliable data until a full set of inter-country flows is produced. The method does not rank countries based on how accurate their data are but the research does publish the 'correction' factors which are applied by the iterative fitting process to derive the final set of flows.

Migration data for three countries was deemed to be insufficiently reliable to use within the estimation process. For Portugal immigration statistics do not include nationals and there are no data on emigration for 2004-2006. For Romania migration data have insufficient coverage and they are based on a very narrow definition. For the United Kingdom the data exhibit too many fluctuations over the required time-series due to the process of 'survey' data capture.

The model has added an additional 'age' dimension to the migration estimates but again excludes data from a number of countries due to uncertainty over the reliability of the information. Age-specific emigration data reported by Cyprus and the United Kingdom and age-specific immigration data reported by Cyprus, Malta, Portugal, Romania, and the United Kingdom (2003-2004) are excluded because they exhibit high levels of irregularity in their patterns.

Further validation of the derived matrix of flows is necessary but MIMOSA has provided a first important attempt at harmonisation using statistical modelling methods and the resulting estimations are, at present, the only consistent and plausible set of inter-country flow statistics for Europe.

5.7 Forecasting international and internal migration

Migration statistics are used in both the national and sub-national population projections. These projections play a significant role in both economic and social planning, when combined with analyses of, for example, labour force participation, disability or income levels. However, to date, the assumptions about both international and internal migration and the methods used to produce them have been very simple.

For example, the international migration assumptions are set by examining the migration statistics for recent years, consulting with experts about their views and then making judgements about short term flows and a long term assumption which is held constant. But these assumptions have had a huge influence on the projected size of the UK population. A long term assumption of 190 thousand net immigrants will lead to 5.7 million extra people in 30 years time, assuming very low mortality of youthful migrants and additional contributions from the extra children they will have.

Forecasting international migration has attracted increasing academic attention in recent years. Bijak (2008) reviews forecasting methods used for international migration. He describes mathematical models of population flows (e.g. auto-regressive moving average models), econometric models for forecasting international migration which seek to establish the underpinning forces, stochastic forecasts of migration time series and finally Bayesian models for forecasting migration flows. Bayesian methods are intuitively attractive in that they test prior beliefs about probabilities of particular outcomes and are able to produce probabilistic distributions of those outcomes. However, the mathematics is challenging and the computations considerable, though a shareware package, WinBUGS, is available.

ONS has developed simple stochastic versions of its national population projection (NPP) in which the uncertainty of migration assumptions is estimated and then used, with similar estimates for mortality and fertility, to produce a probability range of forecasts (Shaw, 2009).

De Beer (2008) argues that international migration forecasts should consider and model separate migration streams (e.g. native and foreign, EU and extra-EU), which can be related explicitly to national policies and to economic events. GAD have in the past made their international migration assumptions on the basis of an analysis of the different migration streams (EU, Commonwealth, foreign countries). This approach and most of the others require modelling of the gross migration streams, which has not been a feature of recent GAD/ONS national projections.

Very little attention has been given to the methods underpinning internal migration assumptions. The only issue that has been considered is the need to update migration matrices from the last census and to combine several years of data to obtain a smoother long run set of out-migration rates or net migration figures. The assumption is then that these inputs continue unchanged for the duration of the projection. This is reasonable most of the time as the structure of inter-regional migration is very stable. But this stability can be disturbed by two general developments: the reaching of housing capacity ceilings in regions which will dampen down inflows and the implementation of major new developments (e.g. the four growth poles of development in SE England). Because such developments are subject to business cycles and funding availability, they are probably best handled through scenario (what if?) type projections.

This brief overview of developments in forecasting migration suggest that it is still an experimental field, but one in which ONS could usefully engage with academic experts.

6. Suggestions and observations

6.1 Suggestions for improving methods of estimation based on current datasets

ONS is very active in its programme of enhancements to the methods for migration estimation (particularly international migration), extending the range of migration statistics (short-term migration) and engaging the user community (reference panels and roadshows). It is producing excellent quality analysis from what appears to be a relatively small team of analysts. Its immigration estimation methods have been subject to greatest scrutiny. The proposed new methodology for sub-national estimation of immigration is a significant step forward but the chosen method must ensure that existing anomalies in mid year population estimates (MYE) and sub-national population projections (SNPP) are dealt with appropriately.

The MYE are key government and UK statistics. Migration statistics must be robust enough to support the critical MYE to avoid the ongoing issues with perceived 'inaccuracies' in population estimates. Local authorities only complain when their estimates are perceived to be too low (e.g. Newham, Slough). There are other cases where the estimates are too high (e.g. Leeds). Where possible, inconsistencies in population statistics should be rectified through the application of improved estimation methods.

The priority must be to produce the most accurate MYE of population with improved estimates of long-term immigration. These revised estimates can then be used as inputs to new sub-national projections and as the basis for validating the new estimates of short-term migration. However, it is likely that a new immigration estimation methodology of this type will have a significant impact upon mid-year population estimates and sub-national population projections.

There is a huge volume of literature in the UK on a wide range of aspects of migration but relatively little which focuses on methods for improving migration statistics. This review of literature has identified no new data/methods that might immediately transform migration measurement, although there are a number of important methodological initiatives which ONS might consider as it strives to improve migration estimation in the UK. These are summarised below.

Immigration estimation

Administrative sources need to become an integrated and ongoing source of migration intelligence for international migration as the PRDS is for internal migration. In the absence of definitive migration statistics, the New Migrant Databank provides an illustration of how a combination of data sources can both help to validate migration estimates and/or become an integral part of the estimation methodology (Boden and Rees, 2009a). At this stage, this does not require complex record linkage between datasets but simply the use of aggregate statistics from alternative sources.

ONS's latest methodological developments (ONS, 2008b) have focused on regression methods for estimating small area immigration using a variety of datasets. Given that the most appropriate model appears to be a relatively simple combination of GP registrations and NINO registrations it might be more appropriate to consider using register count 'proportions' directly to allocate flows to local areas (Boden and Rees, 2009a). This is the method employed by GROS, allocating IPS immigration flows to sub-national areas using CHI register statistics.

Whichever method is selected for estimating sub-national immigration it is suggested that it must re-estimate flows from GOR to local authority (not just NMG to local authority). This approach will ensure that any inconsistencies that may exist at regional level do not adversely affect the robust application of new methodologies at a local level (Boden and Rees, 2009a). (*See page 90*)

Emigration estimation

Due to the lack of available data, emigration estimation has received little research attention. However, ongoing research at ONS on improving the method of sub-national estimation has identified benefits to using an alternative approach to the exisiting migration propensity method (Heasman, 2008). The recommended Poisson modelling on a response of survey counts using a selection of predictor variables remains work-in-progress but its ability to improve on existing emigration estimates and to avoid the use of the 'intermediate' geography suggests an important advance in methodology, the results of which should be subject to external scrutiny prior to general application. (*See page 94*)

Intermediate geography for immigration and emigration estimation

A number of research projects have questioned the need for an intermediate geography if alternative local area estimation methods are to be employed (Boden and Rees, 2009a, Heasman, 2008). The intermediate geography has been created to provide an appropriate scale for the application of survey data. More extensive use of administrative datasets for immigration flows at GOR and local authority level, plus the direct estimation of emigration flows at local authority level would remove the need for this artificial geography. (*See page 91*)

Split flows

A number of methods have investigated the estimation of international migration using gross flows 'split' into specific flow-types (Boden and Rees, 2009a, De Beer, 2008, Heasman, 2008). Flow categorisations include UK/non-UK or worker/student/other, for example. The validity of this approach is not proven but it could provide the basis for improved validation or calibration of IPS estimates against administrative systems which capture different population sub-groups, e.g. workers (NINO), students (HESA) or children (pupil census). (*See pages 90,91,94*)

Short-term migration

With inadequate information on length of stay, short-term migration estimation remains problematic. It is suggested that ONS uses a sub-national estimation method that is consistent with the long-term migration method to ensure that the two sets of statistics can be used in concert and that they align with evidence from administrative datasets. (*See page 92*)

Data access

Access to important administrative datasets – HESA and WPLS – should be expedited. These could add immediate value to migration estimates and form the next phase of 'improvement' in long-term and short-term migration estimates. The WPLS is a valuable source of information on the UK labour force that could potentially provide the crucial 'missing-link' for international migration statistics – the length of stay of migrants measured from tax, benefits and national insurance contributions. (*See section 3*)

Mirror statistics

Eurostat has emphasised that EU states must be prepared to collaborate on migration estimation and has used the MIMOSA project to demonstrate the extent of the inconsistency between respective immigration and emigration datasets. It is suggested that an ongoing programme of collaboration between ONS and other NSIs (within and outside the EU) could help to refine and improve estimates of international migration from both survey and administrative sources in the UK. (*See page 79 and 99*)

Synthetic data

There is a strong case for constructing synthetic estimates of migration statistics that are richer than either the administrative data sets (large numbers but few attributes) and that are more reliable than the survey data sets (many attributes but small numbers). The methodology for achieving these synthetic estimates is well established. Raymer and colleagues at the University of Southampton have been applying the methods to current UK and European migration data. A shared official and academic programme of such synthetic estimates should be considered. (*See page 98*)

Scrutiny and collective responsibility

It is suggested that ONS should extend its use of local expert panels to 'validate' results (not just methods) of internal, long-term and short-term migration estimation. Local collaboration will ensure greater 'collective responsibility' for official statistics on migration and therefore population. A 'scrutiny' function could be created to undertake this task, supported by alternative datasets such as those within the New Migrant Databank and CIDER data systems. This type of scrutiny process could help to avoid the challenges that have been made by local authorities to recent migration and population estimates. (*See page 91*)

6.2 Observations on developing better migration statistics – a longer-term view

New surveys

The Home Office should give careful consideration to the commissioning of a new surveys targeted specifically at migrants. It might be more appropriate to concentrate on the most effective use of integrated administrative sources rather than embark on costly surveys which may inadequately capture migrant populations. (*See page 84*)

Alternative mid-year estimates

Consideration might also be given to the development of alternative mid-year estimate population bases that reflect different population concepts. These are (1) mid-year estimates that include/exclude short-term migrants, (2) mid-year estimates that include/exclude visitors, (3) mid-year estimates that include/exclude weekday/weekend residents. The different population bases will have different uses and enter the various funding allocation models with different weights.

Maximizing the utility of e-Borders

There remains a lack of clarity on how information on immigration and emigration will be generated from the e-Borders system. If UK citizens, residents and visitors are to be monitored as never before, then they should receive some reward in the form of radically improved migration statistics. It is as important to improve emigration statistics (for population estimate and projection purposes) as it is to improve immigration statistics. Failure to do so resulted in the "missing million people (mostly men)" revealed when the 2001 census results were published and compared with the roll forward population estimates for 2000 and the projections for 2001.

Maximising the utility of the Personal Demographic System of the NHS

The Department of Health is seeking to replace populations based on the SNPP in the NHS resource allocation formula by populations based on the NHS registers in order to align funding to the population for which NHS commissioners are responsible. This goal depends on improvements to the currency of register information, which will help in the estimation of internal migration via the PRDS. Greater clarity is required on the potential for generating all types of migration statistics from the new PDS.

Long-term goal of a population register and integrated administrative databases

The case for a UK population register has been made over several centuries (Coleman, 2008). The linkage of such a register to other government population databases through a Unique Person Reference Number (UPRN) would generate information of radically improved accuracy and utility. The development of such an integrated data system by Statistics Finland (2008) stands as a model for the UK. The Finnish experience demonstrates no loss of human rights (because of the safeguards), potentially huge savings in surveys and censuses and radically better migration statistics (among other products).

Appendix 1: Migration data sources

Censuses

Census of Population   *Internal* ✓   *International* ✓
                                            Migration   *Migration*

The 2001 census provides a range of data products from which migration information for the UK population can be obtained. Census tables – including Key Statistics (KS) Standard Tables (ST) and Census Area Statistics (CAS) – provide migrant count information to Output Area (OA) level. These data can be readily accessed though ONS or the CASWEB interface provided by the Census Dissemination Unit (CDU).

Migration data are derived from a question, which asks for an individual's address twelve months prior to enumeration day. Internal in-migration and out-migration, origin-destination 'flows' can be obtained principally from the Special Migration Statistics (SMS) with access provided by the Centre for Interaction Data Estimation and Research (CIDER) (Stillwell and Duke-Williams, 2003). SMS data are available at Output Area, Ward and District levels.

Flow data can also be obtained from the Samples of Anonymised Records (SARs) although at a much coarser geography than the SMS and for a much smaller sample of the population – the main benefit being the opportunity to cross-tabulate migration data with any other census variable (Norman and Boyle, 2009). Access to SARs data through the SARs data support unit (especially the controlled access microdata samples (CAMS) where the level of spatial detail is greatest) is not as straightforward as it is for census tables and SMS data.

The Longitudinal Survey (LS) provides origin-destination data with an opportunity to link individuals to previous censuses. LS data are less suitable than the SMS for cross-sectional internal migration analysis.

With regard to international migration, only in-migration is measured as there is no attempt to capture information on individuals who have emigrated during the Census year. A migrant stock picture can be derived from detailed country of birth statistics, although in the absence of a question on year of entry to the UK, it is not possible to measure the length of time a migrant has been resident in the UK.

In 2011 the Census will ask the question on *usual residence one year prior to census date* (asked since 1961) and the question on *country of birth* (asked since 1851) (ONS, 2008b). New questions will be asked on *month and year of entry to the UK* and *intended length of stay in the UK* for all those born outside the UK and on *citizenship*.

| **Pupil Census (PLASC)** | *Internal Migration* | ✓ | *International Migration* | ✓ |

The completion of the **Pupil Level Annual Schools Census** (PLASC) is mandatory for all state maintained primary, secondary and special schools (Harland and Stillwell, 2007). Data on individual pupils are collected three times a year (corresponding with the three school terms) from every school and collated by the Department for Children, Schools and Families (DCSF – formally the DfES). PLASC data are available as annual collations from 2001 for England and Wales. In 2006 Scotland started collecting similar data, although the extent to which the Scottish PLASC can be linked to the England and Wales PLASC is unknown.

Data relating to the internal migration of pupils between lower level super output areas can be easily obtained. It is possible to obtain data down to unit postcode level, although a special business case needs to be submitted and approved for this to be possible. The dataset does not provide an obvious source of statistics on international migrant flows but it does have the potential to provide an informed picture of the composition of local areas based on the changing profile of pupil numbers using captured information on ethnicity and first language.

Access to PLASC data is controlled by the DCSF although support is provided by the PLASC/NPD user group (PLUG) based at the University of Bristol.

Surveys

| **International Passenger Survey (IPS)** | *Internal Migration* | ✗ | *International Migration* | ✓ |

The IPS is the only instrument for measuring UK immigration and emigration, for nearly all types of migrant. It is a multi-dimensional survey, of which the migrant questions are just one part. It surveys approximately 250 thousand passengers each year: about 1 in 400 of the total number entering or leaving at the UK ports. Of this sample, about 1% are migrants whose stated intention

is to stay or leave the UK for more than 12 months. This is equivalent to approximately 3,000 respondents, 70% of which are immigrants and 30% are emigrants, which need to be re-weighted to provide representative statistics. From 2007, the number of interviews with departing migrants has been boosted to a comparable level to those on entry.

IPS respondents are asked their 'intended length of stay'. Estimates of long-term migration (where duration of stay is more than twelve months) feed directly into National Statistics of Total International Migration (TIM) produced by ONS.

Labour Force Survey (LFS)   *Internal* ✔   *International* ✔
                                Migration   *Migration*

The LFS is a quarterly sample survey of 60,000 households living at private addresses in the UK and provides the most detailed statistics on the UK labour market. It asks the question, 'where were you living one year ago', providing a count of the 'flow' of migrants within a single year. Standard LFS data are available for GOR geographies, although a special licence version of the dataset is also produced which includes variables identifying local authority of residence and local authority of previous address 3 months ago and one year ago.

The LFS also records information on year of entry to the UK, which provides a picture of the length of time international migrants have been resident – thus producing the most reliable statistics on the 'stock' of migrant workers in the UK. As an accurate measure of international migration the LFS has had a number of constraints. It has excluded students in halls of residence who do not have a UK resident parent, plus it excluded people in most types of communal establishments and those migrants who have been in the UK for less than six months. In addition, LFS totals are grossed to population estimates that only include long-term migrants. The LFS contains a sample of about 700 international migrants per year (i.e. persons who state they were resident overseas one year ago). This small sample size precludes more detailed analysis of migrant inflow by local geographical area.

The LFS has been combined with the Annual Population Survey (APS), the General Household Survey (GHS), the Expenditure and Food Survey (EFS), and, the National Statistics Omnibus Survey (NSOS) to create the Integrated Household Survey (IHS). This single survey approach has created a much larger sample size, with migrant worker questions from the LFS being retained in a core module that is expected to cover 221,000 households (ONS, 2007f). In addition, the LFS data capture is now more likely to pick up short-term migrants, with respondents interviewed at their current address regardless of how long they have lived there.

The APS, in existence since 2004, is broadly comparable to the LFS. The extent to which it can be used to analyse internal migration is exactly the same as the LFS. Data are readily available at GOR level with local authority origin and destination data available through a special licence.

General Household Survey (GHS)   *Internal* ✓   *International* ✖
                                                      Migration   *Migration*

The GHS is a continuous annual survey sampling around 20,000 individuals (numbers vary with each annual sample) across Britain. Internal migration data can be derived from the GHS, although only for flows between GORs.

Acxiom lifestyle survey   *Internal* ✓   *International* ✓
                                                      Migration   *Migration*

Acxiom is an international company that carries out an extensive opinion poll survey twice a year in January and September. Migration questions were asked in 2005, 2006, 2007 as follows:

- 'When did you move to this address? (month and year)';

- 'Please tell us the house number and postcode of your previous address';

- 'Are you planning to move in the next: 0-3 months; 4-6 months; 7-12 months; No?

These questions, together with the address and postcode of the respondent, provide data on the origin, destination and timing of the last move together with some indications of future migration propensity. The major advantage of the survey is that it is very large (448,547 cases in 2007, for example)

Acxiom's data acquisition team spend a large amount of time planning the survey distribution to ensure an even and demographically robust response. However, survey responses do have an inherent bias. For this reason a weighting process is used to remove any bias and ensure that the aggregated data counts are representative of the UK at every level of geography. The weighting process is based on the company's population estimates, which ultimately reconcile with published UK statistics from the ONS based on both the Census and the Expenditure and Food Survey (EFS).

Acxiom's data variables are created by 'aggregating' data upwards, which means that local trends can be analysed and are not lost through propensity modelling. To quantify the geographical coverage achieved, in 2007 out of the 40,883 Super Output Areas, only 0.42% did not return a response.

Composite sources

Total International Migration (TIM)   *Internal*   ✗   *International*   ✓
                                           Migration   *Migration*

TIM statistics provide the most accurate estimates of <u>long-term</u> immigration and emigration at a national level (ONS, 2008d) and the basis for estimating the immigration and emigration components used in the production of MYE and SNPP statistics.

TIM estimates combine data from the IPS with additional statistics from the Home Office on asylum seekers and their dependants and from the Irish Central Statistical Office (ICSO) on estimates of migration between the UK and the Irish Republic based on the LFS in Ireland. Visitor switchers, those people whose original intention was to stay for less than twelve months but who subsequently stay for longer, are estimated from IPS visitor data. Migrant switchers, those people who intended to stay for more than twelve months but decide to leave within a year, are derived from Home Office data on non-EEA citizens.

ONS has an ongoing programme of improvement for its international migration statistics that has included changes to the way sub-national estimates of long-term migration are produced. This has removed the tendency for over-estimation of immigration into London by incorporating statistics from the LFS to calibrate IPS migration flows for Government Office Region (GOR) and by creating a new 'intermediate' geography to improve the allocation to local area (ONS, 2007b; 2007c)

Administrative sources

Home Office Immigration Statistics   *Internal*   ✗   *International*   ✓
                                          Migration   *Migration*

The Home Office regularly publishes National Statistics on immigration and asylum. British Citizens, those Commonwealth Citizens who have freedom of entry to the UK and nationals from the EEA are not subject to immigration control and are not included in Home Office statistics. No information is

recorded on people emigrating from the UK. National Statistics produced by the Home Office fall into three broad categories: asylum; control of immigration and persons granted British Citizenship (Home Office, 2008b). Most statistics are only available at a national level, with no sub-national provision.

Work Permit statistics for each local authority district and unitary authority (LADUA) have previously been made available through a freedom of information request but these data are no longer routinely produced by the Home Office. Asylum statistics are still available at a local authority level.

The UK Border Agency (UKBA) is deploying its new Points Based System for immigration. It remains unclear how and when the new administrative system will deliver additional statistics on immigration to the UK.

The Seasonal Agricultural Workers (SAWS) scheme manages the entry of non-EEA migrants coming to work for up to six-months in the agriculture and food processing industry. From January 2008 the scheme has been exclusively for migrants from Bulgaria and Romania. SAWS data is available via a freedom of information request, providing migrant numbers by postcode and nationality.

Workers Registration Scheme   *Internal* ✗   *International* ✓
                                    Migration   *Migration*

Until April 2009, nationals from the Accession 8 countries of the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia who come to work in the UK are required to register with the WRS. A new registration is required when a person changes employment or an applicant is employed by more than one employer. Year of registration is recorded, as is nationality of the individual. Date of birth, gender and occupational status are also routinely captured. There is no method for tracking how long each applicant stays in the UK as, like the NINo system, there is no de-registration process necessary. A detailed statistical picture produced from the WRS is regularly published, illustrating the profile of applicants and of registered workers and detailing type of employment, hours of work, wages and a regional disaggregation (Home Office, 2008a).

The WRS provides richer data detail than NINo statistics but has a number of limitations. It records the location of the employer but not the residential location of the applicant. It only records information on A8 migrants and it also excludes those who are self-employed. In addition, the WRS will not record A8 migrants who come to the UK for reasons other than work, including students. The WRS is also only a temporary administrative system and is scheduled to terminate in April 2009.

National Health Service statistics   *Internal* ✓   *International* ✓
                                            Migration   *Migration*

The National Health Service Central Register (NHSCR) records patient movements between Health Authority areas (2001 definition) in England and Wales and Area Health Boards (AHBs) in Scotland and Northern Ireland. The NHSCR supplies ONS with weekly data on these moves. These data are tabulated and processed for quarterly and 12 month periods, with ONS releasing inter-regional migration estimate matrices for the whole of the UK on an annual basis.

The Patient Register Data System (PRDS) maintains information relating to NHS patients and their home addresses in England and Wales. The list is updated annually and supplied to ONS, with changes of patients' postcodes being used to estimate migration. Patient register data differs from NHSCR data in that it records a transition between the area of residence at the beginning of the annual period and the area of residence at the end, rather than every movement made over a year. In this way it is comparable to census migration data. Whilst moves are recorded between unit postcodes, only data on movements between local authority areas are released by ONS. Furthermore, it is not estimates based on raw patient register data that are released, rather estimates that have been constrained by NHSCR data at a more aggregate level. This is because PRDS data fail to capture migrant babies (under 1 year of age), new non-birth registrations (ex-armed forces personnel and international immigrants who join the NHS and then move within the same year), and people who move but then drop out of the patient register (new armed forces personnel, international out migrants and the deceased) (ONS, 2009d).

When new migrants from outside the UK first register with a General Practitioner (GP), they are explicitly identified as an individual whose previous address was outside the UK and who has spent more than three months abroad. The PRDS records the age and gender of new migrants but does not provide any more detailed information on nationality, country of origin or country of birth. No information is captured on patients who have emigrated from the UK. GP registrations capture all migrants, regardless of age and employment status, so in theory they provide the most comprehensive view of migration inflows. Migrants captured by the registration process will include short-term migrants, in addition to those who have been resident for at least twelve months. It is not possible to identify actual or intended length of stay from the data. For the majority of migrants, there will be a time-lag between entering the UK and registering with a GP and some migrants may never complete the registration process during their stay in the UK. Young men, in particular, will delay registration after migration more than older men or women. Also, a PRDS record loses its migrant status once a patient moves within the UK and registers with a new GP.

Scotland and Northern Ireland have similar systems to the PRDS – the Community Health Index and Central Health Index respectively. Both GROS and NISRA use very similar methodologies to ONS to provide patient register-based sub-region (council areas – Scotland, Local Government Districts – Northern Ireland) internal migration estimates – constrained to NHSCR data (GROS, 2003, NISRA, 2005). Whilst the methodologies are comparable, no effort has been made to harmonise estimates across the national statistics agency to provide internal migration estimates for the whole of the UK.

National Insurance Numbers (NINo)	*Internal Migration* ✗	*International Migration* ✓

For a new migrant to the UK, acquiring a National Insurance Number (NINo) is a necessary first step for employment/self-employment purposes or to claim benefits or tax credits. NINo statistics, managed by the Department of Works and Pensions (DWP) record an individual's residence, 'country-of-origin', age and gender. The Information Directorate (IFD) within DWP is responsible for the publication of statistics from its National Insurance Recording System (NIRS) and a summary of NINo registrations to A8 migrants is published periodically as part of the more general release of migration statistics coordinated by ONS (Home Office, 2008c). NINo statistics exclude dependents of applicants, unless they claim benefits or work themselves. They will also exclude most students and those migrants who are not of working age and not claiming benefits. They provide no indication of the length-of-stay of a migrant worker and there is no formal de-registration process. Migrants can actually leave the UK and return at a later date without the necessity to re-register for a new NINo.

The DWP has established a unique data sharing agreement with the HMRC which has brought together labour market statistics on pay-as-you-earn (PAYE) taxation, National Insurance (NI) contributions and benefits payments. The Work and Pensions Longitudinal Study (WPLS) is a large database containing a history (from 1998 onwards) of an individual's contact with the DWP, providing 100% coverage of the labour market. It combines information on benefits payments with earnings information drawn from HMRC income tax systems. An individual's NINo provides the unique person reference number (UPRN) from which DWP data records are matched directly to those from HMRC. This unique source of data on the UK labour market has yet to be exploited as a source of data on migration within, to and from the UK.

Higher Education Statistics Agency   *Internal* ✓   *International* ✓
                                                                   Migration   *Migration*

The Higher Education Statistics Agency collects data on all students entering, studying in and then leaving the UK Higher Education system. HESA maintains two main data products in relation to these individuals. The 'Student' data set records parental domicile (unit postcode) and institution of study for all UK domiciled students for each year of study. Whilst unit postcodes are recorded, in practice HESA are unwilling to release data below the MSOA level for confidentiality reasons. Whilst knowledge of precise residential destinations is impossible, estimates of student migration at the local authority level are likely to be relatively accurate, although as the location of the institution is the administrative centre, some students may actually be studying at a branch of the institution outside of the administrative locality. The 'destinations' data set contains all individuals previously recorded in the 'student' dataset who leave the UK HE system following completion of study. The 'destinations' dataset origin is identical to the 'student' dataset destination. Destination domicile records postcode unit of destination, although similar confidentiality reasons are likely to limit data released to more aggregate destination geographies.

HESA administrative systems do not capture the residential address of international students, only the location of the institution of study. Efforts are being made by HESA with other agencies and universities to record students by their term-time usual residence. Students provide information on their expected length of stay and although nationality is requested, it is not a mandatory field and coverage is typically poor. Age and gender are recorded and ethnicity is only provided on students with a UK domicile. A 'flow' picture can be produced, recording all students who arrive and depart in a particular year. In addition, by looking at all students who are studying during a particular year, a 'stock' picture can be produced. The picture is dynamic because of the constant churn of students by institution.

Electoral Register   *Internal* ✓   *International* ✓
                                                                            Migration   *Migration*

The Electoral Register is a record of all individuals resident in a local authority who are or will be eligible to vote in a particular year. There remains no centralised electoral register, with each local authority managing its own data collection process. The dataset has the potential to provide data on both internal and international migrants and a number of local authorities have used the source to examine both aspects of migration. However, the lack of central coordination and the inconsistency with which data is captured at a local level prevents this from providing useful data at present.

Appendix 2: IMPS Programme

Obtain more information about migrants as they enter or leave the country

- A port survey designed to capture a substantially increased sample of migrants is needed to provide reliable estimates of population and migration at regional and local levels. To do this, key elements of the e-Borders project need to be brought forward, including passport scanning (starting with arrivals).

- Early provision of more data on controlled migrants, from landing cards, is essential (in particular, duration of stay and destination in the UK). Access to individual level data is needed for linkage to subsequent information about the migrant. To achieve more comprehensive coverage of migrants, a sample of all travellers would need to complete a card on arrival in the UK.

- A full range of migration related information should be collected from the points based information system being developed to manage the flow of migrants coming to the UK to work or study.

Obtain more comprehensive and timely information about migrants living in this country

- Development of a communal establishment component of the Integrated Household Survey should be undertaken and a migration module included in the survey on a regular basis. Suitable survey information collected by local authorities or those covering the employers or agencies providing work for migrants should be used by the ONSCD to provide a more complete national picture of migrants in the UK.

- The 2011 Census should include questions that identify short and long-term migrants.

- ONS and devolved administrations should have access to timely administrative information that potentially identifies migrants.

Use linkage to obtain better information relating migrants' intentions at entry to the UK to subsequent events, such as employment, having a child and when they leave the country

- The Work and Pensions Longitudinal Study should be used to provide information on patterns of employment, children and benefits among migrants. The potential to identify migration histories should be explored.

- ONS and the devolved administrations should continue to have access to the population statistics items, available on individual level health registers, that are needed to estimate migration.

- Access should be provided to individual level School Census data for statistical purposes, to allow linking with other sources so as to improve the statistics on migrants and their families.

- Additional information on student migrants should be collected by HESA and access to individual level data provided for linking with other sources.

- Barriers to record linkage must be addressed urgently, building on work to improve data sharing across government.

- Work needed on record linkage to improve migration and population statistics. Initially, sample data from entry records and two or more sources should be brought together to establish feasibility, costs and benefits.

Provision of more timely robust key indicators of migrant numbers

- Improved use of statistical and demographic models to enhance migration and population estimates should be taken forward over the next two years.

- An expert committee on migration statistics should be convened, reporting to the National Statistician to provide an up to date interpretation of current UK migration statistics.

Bring together all the statistics collected across Government on migration and migrants in a single UK-wide report

- Annual Report on Migration Statistics to be produced by the NSCD.

Source: Inter-departmental Migration Task Force, 2006

Appendix 3: Immigration estimates compared

Figure A3.1 illustrates the trends in immigration that are evident from alternative data sources. In the year prior to the 2001 Census long-term immigration to England was recorded at approximately 361,000 migrants. According to TIM estimates long-term immigration has increased from 450,000 in 2001/02 (mid-year to mid-year intervals) to 533,000 by 2006/07, an 18% rise over five years. The registration of new migrants with a GP has followed a similar trend to TIM since 2001, although these registrations will include some migrants whose duration of stay was less than 12 months (although greater than 3 months as registration can only be completed after this length of stay in the UK). In 2001 there were 389,000 new GP registrations to foreign nationals, rising to 581,000 in 2007, an increase of almost 50% during the six-year time-series.
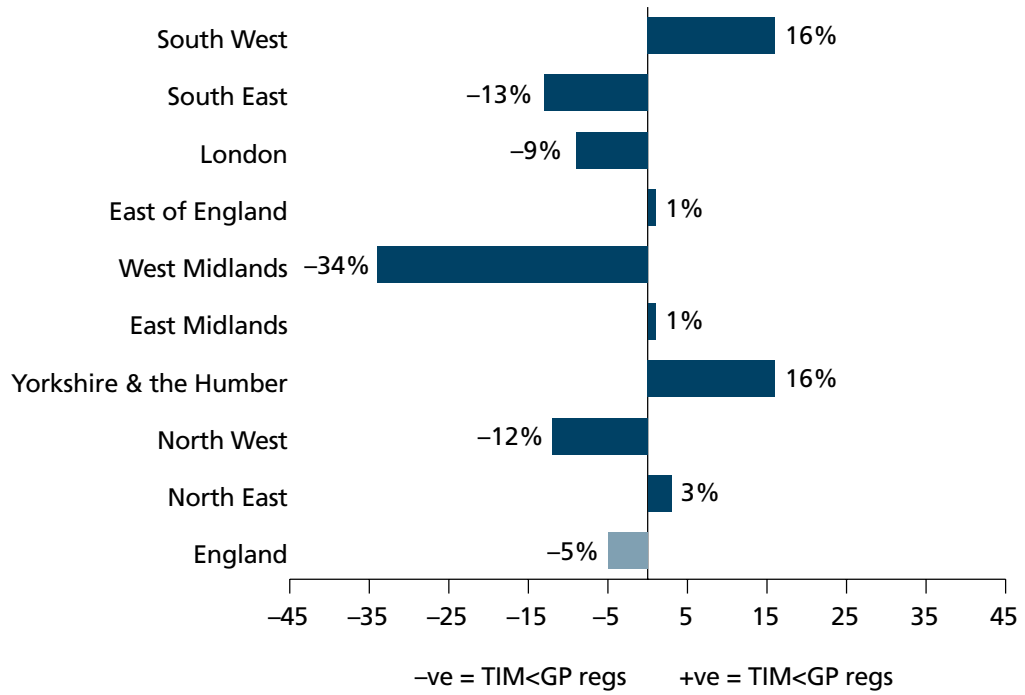
NINo statistics record all registrations, whether for long-term or short-term employment in the UK. They will, however, exclude those individuals who do not work, such as non-working partners, dependants and students. The statistics are split into 'non-Accession' and 'total' numbers to illustrate the impact of Accession migrants upon immigration flows. In 2002/03, prior to expansion of the EU, the vast majority of registrations were to non-Accession migrants: 294,000 in 2002/03, increasing to 350,000 in 2005/07 and then declining to 341,000 in 2007/08. The curve for 'all' NINo registrations illustrates the impact of Accession-country migrants, reaching 276,000 in 2007/08 giving a total number of registrations for England of 617,000.

Figure A3.1: Immigration trends from alternative data sources, England, 2001-2007
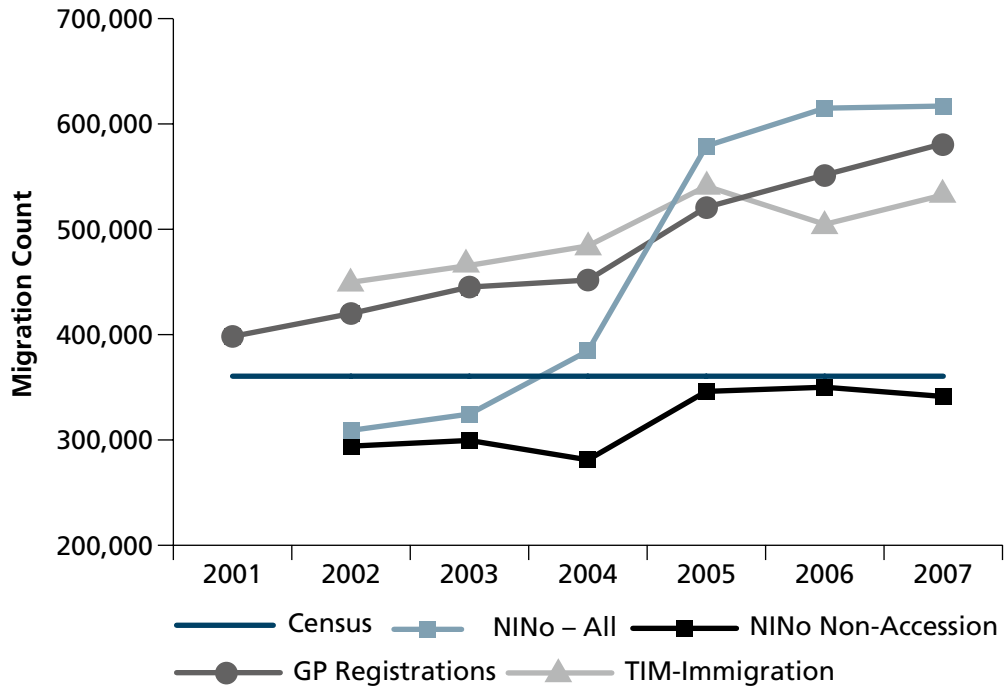
The national profile of immigration presented in Figure A3.1 illustrates that although TIM statistics and GP registrations are conceptually different measures of migration, the general level and trend of each data series for England is quite consistent. This suggests that GP registration statistics could provide a useful comparative measure of the level and distribution of long-term immigration estimated by the TIM process. Figure A3.2 compares aggregate TIM statistics and GP registration data for each of the English regions for the three-year period 2005-2007. Given the similarity in the national picture, one might expect general consistency between the two datasets at a regional level but the graph illustrates that there are significant differences evident, particularly for Yorkshire and the Humber, the South West and the West Midlands. In the South West and Yorkshire and the Humber, TIM estimates of immigration were, in aggregate, over 16% higher than the total number of GP registrations in the corresponding period. In the West Midlands they were 34% lower.

Figure A3.2: Immigration totals, TIM versus GP registrations, 2005-2007

Region	Value
South West	16%
South East	−13%
London	−9%
East of England	1%
West Midlands	−34%
East Midlands	1%
Yorkshire & the Humber	16%
North West	−12%
North East	3%
England	−5%

−ve = TIM<GP regs   +ve = TIM<GP regs

(Boden and Rees, 2009a)

Appendix 4: An example of migration estimation

This Appendix sets out an example of how unknown migration flows might be estimated from known partial data. The specification is kept fairly simple, recognising that the actual application may have some added complexities. Let us assume we wish to estimate migration flows between English local authorities by sex, age and ethnicity for 2007-8 (mid-year to mid-year interval). We want to do this to contribute to new estimates of 352 local authority populations by ethnicity and to input probabilities derived from the flows into a projection model for ethnic groups. We assume that five year ages, two sexes and five broad ethnic groups are used.

Our target variable is:

M_{ijask} = migration flow from origin i to destination j by age a, sex s and socio-economic group k for 2007-8.

This variable cannot be directly measured from any known source for 2007-8. For the period 2000-1 (the year prior to the census of 2001 held on 29 April), we do have a special tabulation of the following form:

C_{ijask} = census migrants from LA i to LA j by five year age, sex and ethnic groups.

From the PRDS (based on downloads from the NHS Registers for two successive mid-years), we are provided with:

Origin-destination flows

M_{ij} = migration flow from origin i to destination j

Total outflows by age and sex

O_{ias} = total out-flow from origin i by age a and sex s

Total inflows by age and sex

D_{jas} = total in-flow to destination j by age and sex

Information on outflows and inflows by ethnicity is available from the Labour Force Survey for 2007-8, but we have decided that it is only reliable for providing total flows by ethnicity:

T_k = total inflows/outflows by ethnicity

How can we combine this information to produce an estimate of our target variable? Using the Iterative Proportional Fitting formulation, the migration estimation model would be as follows.

Preparatory step: scale the constraint variables to a fixed known total for the target year, M
(The superscript R means revised).

$$M_{ij}^{\ R} = M_{ij} \times [M/\Sigma_{ij}\ M_{ij}]$$
$$O_{ias}^{\ R} = O_i \times [M/\Sigma_i\ O_{ias}]$$
$$D_{jas}^{\ R} = D_j \times [M/\Sigma_j\ D_{jas}]$$

These should, if the data are properly prepared, merely be checks. The adjustment of the sample number will be much more substantial, of course:

$$T_k^{\ R} = T_k \times [M/\ \Sigma_k\ T_k].$$

Step 0: set the initial values of the target migration flows for all i, j, a, s and k

$$M_{ijask}^{\ [0]} = C_{ijask}$$

Step 1: adjust the target migration flows to agree with the origin-destination flows

$$M_{ijask}^{\ [1]} = M_{ijask}^{\ [0]} \times [M_{ij}^{\ R}/\Sigma_{ask}\ M_{ijask}^{\ [0]}]$$

Step 2: adjust the target migration flows to agree with the total origin outflows

$$M_{ijask}^{\ [2]} = M_{ijask}^{\ [1]} \times [O_{ias}^{\ R}/\Sigma_{jk}\ M_{ijask}^{\ [1]}]$$

Step 3: adjust the target migration flows to agree with the total destination inflows

$$M_{ijask}^{\ [3]} = M_{ijask}^{\ [2]} \times [D_{jas}^{\ R}/\Sigma_{ik}\ M_{ijask}^{\ [2]}]$$

Step 4: adjust the target migration flows to agree with the total flows by ethnicity

$$M_{ijask}^{\ [4]} = M_{ijask}^{\ [3]} \times [T_k^{\ R}/\Sigma_{ijas}\ M_{ijask}^{\ [3]}]$$

Step 5: check the convergence of the target migration flows

First, compute the absolute differences between the step 3 (start) and step 6 (finish) estimates

$$D_{ijask} = \left| M_{ijask}^{[4]} - M_{ijask}^{[1]} \right|$$

If all D_{ijask} > z (where z is a suitable small decimal fraction e.g. 0.01) then stop the estimate and accept the current $M_{ijask}^{[4]}$ results. Otherwise go back to Step 1 and repeat the procedure.

Appendix 5: Research institutions and journals

The following research institutes and academic journals were searched for relevant literature on the subject of migration data and estimation methods. These specific searches were combined with a more general trawl of the literature using university library search facilities and the Google Scholar search engine.

Research Institutes

Centre for Interaction Data Estimation and Research
http://cider.census.ac.uk/

Centre for Research in Ethnic Relations
http://www2.warwick.ac.uk/fac/soc/crer

Centre for Research and Analysis of Migration
http://www.econ.ucl.ac.uk/cream/

Centre for Spatial Analysis and Policy
http://www.geog.leeds.ac.uk/research/csap/

Centre for Urban and Regional Development Studies
http://www.ncl.ac.uk/curds/

Centre on Migration Policy & Society
http://www.compas.ox.ac.uk/

CRONEM Centre for Research on Nationalism, Ethnicity and Multiculturalism
http://www.surrey.ac.uk/Arts/CRONEM/

Home Office
http://www.homeoffice.gov.uk/rds/

Home Office UK Border Agency
http://www.ind.homeoffice.gov.uk/

Institute of Community Cohesion
http://www.cohesioninstitute.org.uk/
Pages/default.aspx?AspxAutoDetectCookieSupport=1

Institute of Employment Studies
http://www.employment-studies.co.uk/main/index.php

Institute for Public Policy & Research
http://www.ippr.org.uk/

International Migration Institute
http://www.imi.ox.ac.uk/

Joseph Rowntree Foundation
http://www.jrf.org.uk/

London Migration Research Group
http://www.lse.ac.uk/collections/MSU/l-m-r-g.html

Migration Research Unit, UCL
http://www.geog.ucl.ac.uk/mru/

Migration Watch UK
http://www.migrationwatchuk.com/

Queen Mary College, London
http://www.geog.qmul.ac.uk/

Southampton Statistical Sciences Research Institute (S3RI)
http://www.s3ri.soton.ac.uk/

Sussex Centre for Migration Research
http://www.sussex.ac.uk/migration/

Working Lives Research Institute
http://www.workinglives.org/

Journals

Demographic Research
Demography
Environment and Planning A
European Journal of Migration Law
European Journal of Population
International Migration
International Migration Review
Journal of Ethnic Migration Studies
Journal of Official Statistics
Journal of Population Economics
Journal of Population Research
Journal of Regional Science
Journal of the Royal Statistical Society: Series A (Statistics in Society)
Mathematical Population Studies
Migration Letters
Population Studies Journal of Demography
Population Bulletin
Population Development Review
Population Environment
Population Research Policy Review
Population Review
Population Space and Place
Population Trends

Glossary

APS	Annual Population Survey
CAMS	Controlled Access Microdata Samples
CAS	Census Area Statistics
CD	Census Division
CDU	Census Dissemination Unit
CEFMR	Central European Forum for Migration and Population Research
CIDER	Centre for Interaction Data Estimation and Research
CLG	Communities and Local Government
CMA	Census Metropolitan Area
DCSF	Department of Children, Schools and Families
DFES	Department for Education and Science
DWP	Department of Work and Pensions
EFS	Expenditure and Food Survey
EU	European Union
GAD	Government Actuary Department
GHS	General Household Survey
GOR	Government Office Region
GROS	General Register Office Scotland
HESA	Higher Education Statistics Agency
HMRC	Her Majesty's Revenue and Customs
HRDC	Human Resources Development Canada
IDBR	Inter-Departmental Business Register
IFD	Information Directorate
IHS	Integrated Household Survey
IMPS	Improving Migration and Population Statistics
IPF	Iterative Proportional Fitting
IPS	International Passenger Survey
KS	Key Statistics
LA	Local Authority
LADUA	Local Authority District and Unitary Authority
LS	Longitudinal Study
MIMOSA	Migration Modelling for Statistical Analysis
MSIP	Migration Statistics Improvement Programme

NSCD	National Statistics Centre for Demography
NHSCR	National Health Service Central Register
NIDI	Netherlands Interdisciplinary Demographic Institute
NIESR	National Institute for Economic and Social Research
NINO	National Insurance Number
NIRS	National Insurance Recording System
NISRA	Northern Ireland Statistics and Research Agency
NMGi	New Migrant Geography (In-migration)
NMGo	New Migrant Geography (Out-migration)
NOM	Net Outward Migration
NPD	National Pupil Database
NSCD	National Statistics Centre for Demography
NSOS	National Statistics Omnibus Survey
OA	Output Area
ONS	Office for National Statistics
PAF	Postcode Address File
PBS	Points Based System
PLASC	Pupil Level Annual Schools Census
PLUG	PLASC/NPD User Group
PRDS	Patient Register Data System
PSS	Planning Support System
S3RI	Southampton Statistical Sciences Research Institute
SMS	Special Migration Statistics
ST	Standard Tables
TIM	Total International Migration
UK	United Kingdom
UKBA	UK Borders Agency
UKSA	UK Statistics Authority
UPRN	Unique Person Reference Number
WAG	Welsh Assembly Government
WPLS	Work and Pensions Longitudinal Study
WRS	Worker Registration System

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